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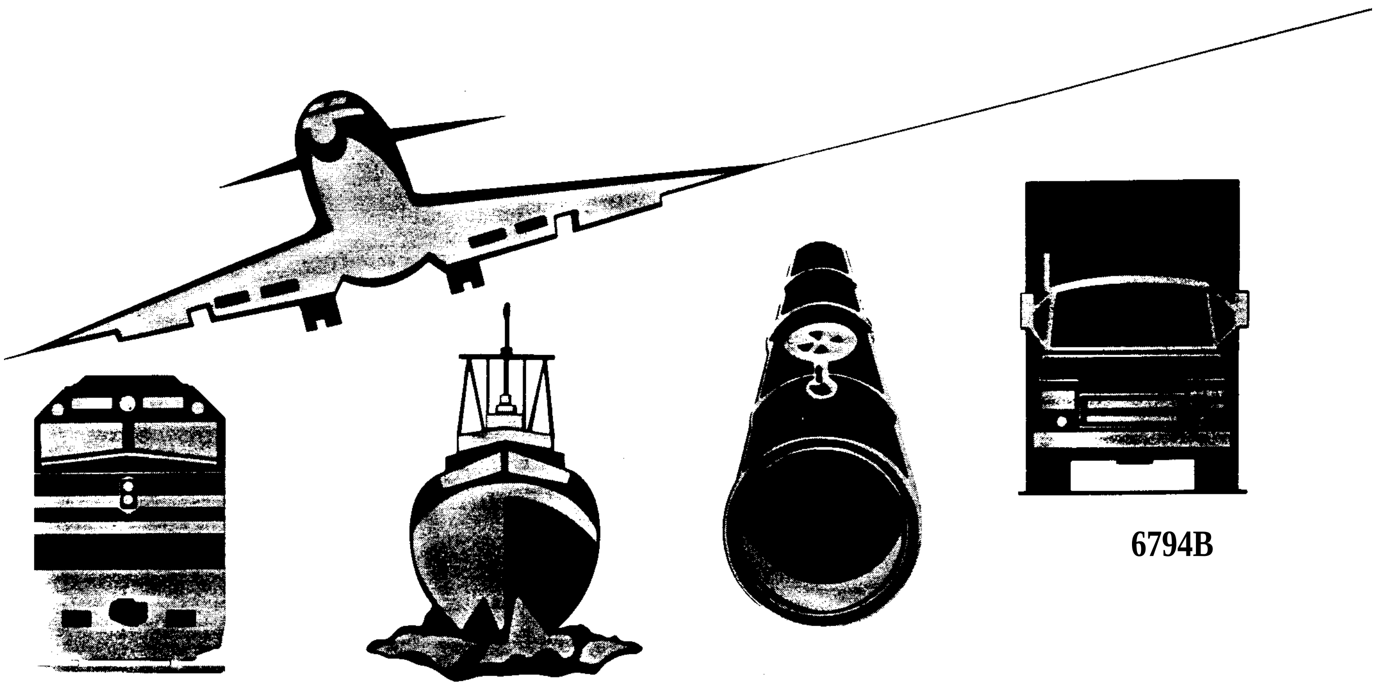
NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

Report of Proceedings

Proceedings of the
National Transportation Safety Board
Public Forum on Air Bags and
Child Passenger Safety



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The National Transportation Safety Board convened a 4-day public forum from March 17 to March 20, 1997, to discuss concerns related to the effectiveness of air bags, passenger vulnerability to injuries from air bag deployment, other countries' experience with air bags, and ways to increase seatbelt and child restraint use. The forum identified the need for safety improvements in four areas: (a) changing societal attitudes about buckling up; (b) better evaluation of seatbelt use rates; (c) better air bag design; and (d) better evaluation of changes to air bags. Safety recommendations addressing these areas were made to the Governors and legislative leaders of the 50 States and U.S. Territories; the Mayor and Council of the District of Columbia; the U.S. Conference of Mayors; the National League of Cities; the National Association of Counties; the National Association of Towns and Townships; members of the International Association of Chiefs of Police, the State Association of Chiefs of Police, and the National Sheriff's Association; the National Highway Traffic Safety Administration; the domestic and international automobile manufacturers; the Centers for Disease Control and Prevention; the Motion Picture Association of America, the Entertainment Industries Council; the Academy of Television Arts and Sciences; the National Cartoonists Society; the Newspaper Association of America; the American Society of Newspaper Editors; and the National Newspaper Association. The proceedings includes the transcript of the public forum and information about related safety issues that the Safety Board addressed in its 1996 study, "The Performance and Use of Child Restraint Systems, Seatbelts, and Air Bags for Children in Passenger Vehicles, " Volume 1 (NTSB/SS-96/01; PB96-917005).

Proceedings of the National Transportation Safety Board Public Forum on Air Bags and Child Passenger Safety

March 17–20, 1997
Washington, D.C.

Report of Proceedings
NTSB/RP-97/01
PB97-917001
Notation 6794B

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
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Conversion Factors for International Standard (SI) Units

To convert from	*to*	*multiply by*
inch (in)	centimeter (cm)	2.54
centimeter	inch	0.3937
foot (ft)	meter (m)	0.3048
meter	foot	3.2808
mile (U.S. statute)	kilometer (km)	1.6093
kilometer	mile	0.6214
pound (lb)	kilogram (kg)	0.4536
kilogram	pound	2.2046

PART 1

INTRODUCTION

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Introduction

The National Transportation Safety Board convened a 4-day public forum in mid-March 1997 to discuss concerns related to the effectiveness of air bags, passenger vulnerability to injuries from air bag deployment, other countries' experience with air bags, and ways to increase seatbelt and child restraint use. The agenda for the public forum is shown in part 6 of these proceedings. The National Highway Traffic Safety Administration (NHTSA) participated in the forum, along with representatives from Australia, Canada, and Europe; the automobile industry; air bag suppliers; insurance, safety and consumer groups; and family members involved in crashes in which air bags deployed. The list of organizations that participated as parties to the public forum is also shown in part 6**.**

Certain points become clear during the forum:

- There is no quick or simple solution to improving air bag performance.
- Air bags need to be designed to protect all people.
- With regard to cars on the road today, children need to be in the back seat, and everyone needs to be buckled up and seated away from the air bag.
- Children should be considered foremost in the design of automobile safety equipment.
- The National Highway Traffic Safety Administration needs to move quickly on a decision regarding air bag deactivation.
- More reliable data on the consequences of air bag deployment are needed. Better and quicker methods of collecting these vital data are needed.
- Societal attitudes must change with regard to seatbelt use. Elected officials need to take responsibility for tough enforcement programs and to consider financial incentives to increase seatbelt use.

In September 1996, the Safety Board issued its report of a safety study on the performance and use of child restraints, seatbelts, and air bags for children in passenger vehicles.[1] At that time, the Board recommended that various agencies and manufacturers take action to improve the design of air bags, child restraint systems, and vehicle seatbelts for children; the Board also recommended that the States strengthen their child passenger

[1] National Transportation Safety Board. 1997. The Performance and Use of Child Restraint Systems, Seatbelts, and Air Bags for Children in Passenger Vehicles. Volume 1: Analysis. Safety Study NTSB/SS-96/01. Washington, DC. 255 p.

protection laws. The executive summary of the report, conclusions of the study, and the Board's safety recommendations resulting from the study are presented in part 4 of these proceedings. In November 1995, while conducting the study, the Safety Board issued several urgent recommendations related to air bags; those recommendations are presented in part 5. On June 10, 1997, the Safety Board issued additional recommendations based on the outcome of the public forum; these recommendations are presented in part 3.

PART 2

POSITION OF THE NATIONAL TRANSPORTATION SAFETY BOARD ON SPECIFIC AIR BAG AND OCCUPANT RESTRAINT ISSUES

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Position on Issues

During the past year, the Safety Board has taken positions on several issues related to the design of air bags and vehicle occupant restraints. The positions are summarized below.

Depowered Air Bags. The Safety Board supports depowering air bags. The Board has not investigated, nor is it aware of, high speed crashes in which the air bag "bottomed out"; that is, the occupant's kinetic energy from the crash exceeded the air bag absorption capability. The Safety Board has, however, investigated several crashes in which the force of the air bag caused serious and fatal injuries in crashes that would otherwise have resulted in minor injuries or have been survivable. The Safety Board is aware of NHTSA's research indicating that a reduction of 20 to 35 percent in air bag energy would reduce the fatality risk associated with high speed frontal crashes. Thus, the Safety Board supports the approach of depowering air bags as a positive measure for reducing the likelihood of air bag-induced injuries for children as well as adults. The Board notes, however, that there is still a risk of injury if an occupant is seated too close to a depowered air bag and that it will continue to be important to wear a seatbelt, sit as far back as possible from the air bag, and place children in the back seat.

Deactivation of Air Bags. The Safety Board is very concerned about the millions of vehicles on the road that are equipped with air bags that are not safe for everyone, thus the Board supports allowing vehicle owners to deactivate their air bags if they choose to do so. The Safety Board's September 1996 safety study on the performance and use of child restraint systems, seatbelts, and air bags for children in passenger vehicles concluded that passenger-side air bags, as they are currently designed, are not acceptable as a protective device for children. The study noted that the majority of parents are not receptive to placing an infant in a rear-facing child restraint system in the back seat of a vehicle because they cannot see the infant nor monitor the infant's actions from the front seat. The Board recommended that NHTSA determine the feasibility of applying technical solutions for cars currently on the road to prevent air bag-induced injuries to children in the passenger-side seating position, including solutions such as increasing the deployment thresholds of passenger-side air bags, depowering the passenger-side air bag, installing weight sensors in the passenger-side vehicle seat, or deactivating the passenger-side air bag for families who choose to do so (Safety Recommendation H-96-21). The Safety Board urged NHTSA to move quickly on a decision regarding air bag deactivation and to establish a simple process for U.S. motorists to follow if the motorists so desired. Along with the right for a motorist to deactivate the air bag must also come an effective education program about persons who should consider deactivating their air bags.

There was no consensus at the public forum regarding who is vulnerable to injury from air bags, thus it is difficult to say definitively who should be advised to deactivate their air bag. Children age 12 and under, especially if unrestrained or in rear-facing infant seats, are at high risk of air bag-induced injuries to the head and neck. Some short-statured drivers and senior citizens are vulnerable; however, some short-statured drivers have also been protected by the air bag. Injuries to extremities are common to the driver regardless of the driver's size or age; the majority of these injuries are of minor severity. Clearly anyone, driver or passenger, whose seating position or movement prior to the crash puts them in close proximity to the air bag as it deploys may sustain significant injury. Also, both temporary and permanent impairment to hearing and vision have resulted from air bag deployment. The Safety Board believes that air bags are a proven safety device for most properly restrained adults in severe frontal crashes and that most people who are informed regarding who is vulnerable to air bag-induced injuries will not disconnect their air bag.

Deployment Thresholds. Which crashes are severe enough to warrant an air bag deployment? The Board has asked NHTSA and the automobile industry to evaluate the effects of higher deployment thresholds because air bags are killing children and adults in low severity crashes in which other vehicle occupants sustain minor or no injuries. The evidence presented at the Board's public forum indicates a consensus that the level of crash severity required for the air bag to deploy needs to be raised, especially for belted occupants. However, as often occurs in actual crash environments, some tradeoffs may be associated with that change. For example, if the threshold is increased from 12 miles per hour (mph) to 15 mph for a crash into a concrete barrier, occupants would no longer have the air bag available for protection in a range of crashes between 12 and 15 mph. Consequently, some unbelted occupants are likely to receive moderate facial bone fractures from contact with the steering wheel or instrument panel. Reasonable tradeoffs must be made, however, to minimize the risk of a child or adult sustaining fatal injuries.

Advanced Air Bag Technology. Advanced air bag designs will modify deployment based on the specifics of the crash. For example, advanced air bag designs may include sensors that can detect an occupant's proximity to the air bag compartment, the severity of the crash, and whether the occupant's seatbelt is buckled. It was clear from the public forum, however, that advanced air bag technology will not be available for several years. Advanced air bags will not significantly improve the lifesaving potential of air bags as they are currently designed. Rather, they will reduce the severity of air bag-induced injuries. Advanced air bag technology also will not solve every problem observed with today's air bags. It is unlikely that there will be an air bag design that will permit a parent to place a rear-facing infant in the front passenger seat. (The Safety Board's position regarding the proper seating position for children is summarized in a later paragraph.) The air bag will either need to be suppressed—that is, turned off—or somehow deflected away from the infant. The Safety Board has recommended that NHTSA develop a timetable for implementation of advanced air bag technology (Safety Recommendation H-96-20).

Use of Unbelted Dummies for Air Bag Certification Testing. In its September 1996 safety study on the performance and use of child restraint systems, seatbelts, and air bags for children in passenger vehicles, the Safety Board concluded that air bags are being designed, because of certification testing requirements, primarily to protect unbelted rather than belted vehicle occupants even though the air bags are promoted as supplemental restraint systems and the majority of motor vehicle occupants now use seatbelts. As a result of the study, the Board recommended that NHTSA immediately revise Federal Motor Vehicle Safety Standard 208, "Occupant Crash Protection," to establish performance requirements for passenger-side air bags based on testing procedures that reflect actual accident environments, including pre-impact braking, out-of-position child occupants (belted and unbelted), properly positioned belted child occupants, and with the seat track in the forward-most position (Safety Recommendation H-96-18). Information obtained at the public forum indicates that testing that is representative of the actual crash environment is also necessary on the driver's side. The Board encourages NHTSA to also address driver-side air bags in responding to Safety Recommendation H-96-18.

The Federal government, in response to the President's 1997 initiative regarding seatbelt use nationwide, is promoting an increase in seatbelt use to 85 percent by the year 2000 and 90 percent by the year 2005.[2] Consequently, the Safety Board believes that the automobile industry should be designing air bags that protect belted occupants. The Board recognizes, however, that even if seatbelt use increases to 90 percent, some individuals will continue not to wear seatbelts; these persons should be afforded some level of protection from the air bag.

Transporting Children in the Back Seat. The Safety Board recommends that children be transported in the back seat. The Board's 1996 safety study showed that about one-quarter of the children in the back seats sustained no injury compared to 15 percent of the children in the front seats. The Board concluded that children (especially those properly restrained) in the back seats of vehicles are less likely to sustain injury than those seated in the front seats. U.S. and Canadian studies show that children are 26 percent less likely to be fatally injured if seated in the rear of a passenger vehicle. The most severe crashes are head-on collisions, and investigations show that a child seated in the back has far more protection from the crush of the vehicle in such crashes. Transporting children in the back seat has been accomplished by law elsewhere: for years,

[2] U.S. Department of Transportation, National Highway Traffic Safety Administration. 1997. Presidential Initiative for Increasing Seat Belt Use Nationwide: Recommendations From the Secretary of Transportation. DOT HS 808 576. 20 p.

children in Australia and in many European countries never contemplated getting into the front seat until they reached adolescence. The Safety Board believes that transporting children in the back seat should be common practice in the United States. Although the preferred way to change this behavior would be through educating the traveling public, U.S. experience has shown that people are more likely to buckle up and put children in child restraint systems when required to do so by law. The Board also made several recommendations to NHTSA and the automobile manufacturers to make the back seats of cars more child-friendly through improvements in the design and installation of child restraint systems and seatbelt fit for children.

Increasing Seatbelt Use Through Legislation and Enforcement. The Safety Board has previously recommended that the States enact strong legislation regarding child restraint and seatbelt use. In 1991, the Board recommended that the 12 States without mandatory restraint use laws (MULs) enact legislation that would require occupants of all passenger automobiles, vans, and light trucks to use lap/shoulder belt systems in seating positions equipped with such belt systems. In 1995, the Board recommended that the States enact legislation that provides for primary enforcement of mandatory seatbelt use laws. Because of the importance of this issue, the Board placed this recommendation on its “Most Wanted” list of safety improvements.[3] The Board supports enactment of mandatory seatbelt use laws with driver license penalty points, fines, and highly visible enforcement. The Board also believes that evidence related to seatbelt use should be admissible in court for purposes of determining damages related to injuries sustained in an automobile crash.

Societal attitudes must change with regard to seatbelt use. The United States remains far behind other countries—such as Australia, Canada, and Germany—in seatbelt use, and the Nation pays a high price for it in terms of lives lost and injuries suffered. Elected officials need to take responsibility for tough enforcement programs and to consider financial incentives if the Nation is to increase seatbelt use. Fines for non-use of seatbelts in Australia average from $70 to $135 and include demerit points in most cases. The penalty for transporting an unrestrained child involves an even higher fine: $120 to $165 and three demerit points. In most States, however, there is only a $25 fine with no demerit points. In other countries, drivers are held responsible for their actions. In about half of the States, however, failure to wear a seatbelt cannot be used against someone in a court of law.

A national seatbelt use rate of 85 percent would prevent 4,200 traffic fatalities a year and save thousands more from serious injury. The Federal share of the medical costs of crashes is about 60 percent of total public costs. If all States passed standard enforcement laws and seatbelt use increased to 85 percent, Federal taxpayers would save almost

[3] In October 1990, the Safety Board adopted a program to identify the “Most Wanted” safety improvements. The purpose of the Board’s Most Wanted list, which is drawn up from safety recommendations previously issued, is to bring special emphasis to the safety issues the Board deems most critical.

$1 billion a year in medical costs. That is in addition to the amount the States would save. The Safety Board believes that the Governors and legislative leaders of the States, Territories, and District of Columbia should encourage and support efforts by enforcement organizations to conduct dedicated and highly visible enforcement programs that focus on increasing the use of seatbelts and child restraints.

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PART 3

SAFETY RECOMMENDATIONS RESULTING FROM THE 1997 PUBLIC FORUM ON AIR BAGS AND CHILD PASSENGER SAFETY

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Recommendations Resulting From the 1997 Public Forum

On June 10, 1997, the Safety Board adopted a series of new recommendations on air bags and automobile occupant restraint use. The recommendations, which stemmed from the Safety Board's public forum convened in March 1997, focused on safety improvements in four areas:

- changing societal attitudes about buckling up;
- better evaluation of seatbelt use rates;
- better air bag design; and
- better evaluation of changes to air bags.

To the Governors and Legislative Leaders of the 50 States and U.S. Territories, and to the Mayor and Chairman of the Council of the District of Columbia:

Enact legislation to require transporting children age 12 years and younger in a rear seat of a passenger vehicle if a rear seating position is available. The child should be restrained in accordance with the State's child restraint law. (H-97-1)

Enact legislation that provides for primary enforcement of mandatory seatbelt use laws, including provisions such as the imposition of driver license penalty points and appropriate fines. Existing legal provisions that insulate people from the financial consequences of not wearing a seatbelt should be repealed. (H-97-2) (Supersedes H-95-13)

Develop, in conjunction with the National Highway Traffic Safety Administration, uniform measurement procedures and tools for the States to use when conducting surveys on seatbelt and child restraint use, and revise the 1992 guidelines to ensure that a probability-based design is used to select a representative sample of the population. (H-97-3)

Replace the current data collection systems (State surveys, crash data) with the uniform measurement procedures, tools, and sampling design plans to be developed and provided by the National Highway Traffic Safety Administration for obtaining seatbelt and child restraint use rates. (H-97-4)

Encourage and support efforts by enforcement organizations to conduct dedicated and highly visible occupant restraint enforcement programs that focus on increasing the use of seatbelts and child restraints. (H-97-5)

Incorporate the standardized data collection/data elements guidelines for traffic crashes developed by the National Highway Traffic Safety Administration, the Federal Highway Administration, and the National Association of Governors' Highway Safety Representatives into your police accident reporting forms. (H-97-6)

To the U.S. Conference of Mayors, the National League of Cities, the National Association of Counties, and the National Association of Towns and Townships:

Encourage and support efforts by enforcement organizations to conduct dedicated and highly visible occupant restraint enforcement programs that focus on increasing the use of seatbelts and child restraints. (H-97-7)

To the members of the International Association of Chiefs of Police, the State Association of Chiefs of Police, and the National Sheriff's Association:

Actively support efforts to adopt primary enforcement of seatbelt laws in States that do not have such legislation. (H-97-8)

Conduct dedicated and highly visible occupant restraint enforcement programs that focus on increasing the use of seatbelts and child restraints. (H-97-9)

To the National Highway Traffic Safety Administration:

Develop and implement a set of crash test standards that utilize the currently available 5th percentile female crash test dummy. (H-97-10)

Develop and implement a set of vehicle crash test standards using biologically representative child dummies and appropriate injury criteria. (H-97-11)

Develop and implement, in conjunction with the automobile industry, a comprehensive crash investigation program to evaluate the effectiveness of air bags. This program should provide for long- and short-term evaluation of variations in air bag designs, advanced air bag technologies, and various methods to deactivate air bags. (H-97-12)

Develop, in conjunction with the Centers for Disease Control and Prevention, data collection procedures and establish a database for recording all air bag-induced injuries identified by the medical community. (H-97-13)

Revise the Fatality Analysis Reporting System and the National Automotive Sampling System to record specific information regarding the air bag equipment installed in the vehicle and its performance in the crash, such as the following: Did the air bag deploy, was it a depowered air bag, was there a cutoff switch, and was it on or off. (H-97-14)

Develop guidelines for the collection of standardized data elements, including data fields for air bags, which will provide for better comparisons and evaluations of traffic crashes. Revise and update the guidelines as necessary. Provide these guidelines to the States. (H-97-15)

Develop, in conjunction with the States, uniform measurement procedures and tools for the States to use when conducting surveys on seatbelt and child restraint use, and revise the 1992 guidelines to ensure that a probability-based design is used to select a representative sample of the population. Provide this information to the States. (H-97-16)

Evaluate, through public comment, the New Car Assessment Program (NCAP) test procedures to determine (a) if the crash test procedures are counterproductive to development of air bag technology that is safe for all occupants, and (b) if the NCAP program provides consumers with the safety information they need to purchase a vehicle. If necessary, develop new methods for providing meaningful information to consumers on vehicle safety in high speed and other types of crashes. (H-97-17)

Develop and implement, in conjunction with the domestic and international automobile manufacturers, a plan to gather better information on crash pulses and other crash parameters in actual crashes, utilizing current or augmented crash sensing and recording devices. (H-97-18)

To the Domestic and International Automobile Manufacturers:

Evaluate the effect of higher deployment thresholds for driver- and passenger-side air bags and then coordinate with the National Highway Traffic Safety Administration the modification of deployment thresholds based on the findings of the evaluation. (H-97-19)

Develop and implement, in conjunction with the National Highway Traffic Safety Administration, a comprehensive crash investigation program to evaluate the effectiveness of air bags. This program should provide for long- and short-term evaluation of variations in air bag designs, advanced air bag technologies, and various methods to deactivate air bags. (H-97-20)

Develop and implement, in conjunction with the National Highway Traffic Safety Administration, a plan to gather better information on crash pulses and other crash parameters in actual crashes, utilizing current or augmented crash sensing and recording devices. (H-97-21)

To the Centers for Disease Control and Prevention:

Develop, in conjunction with the National Highway Traffic Safety Administration, data collection procedures and establish a database for recording all air bag-induced injuries identified by the medical community. (H-97-22)

To the Motion Picture Association of America, the Entertainment Industries Council, the Academy of Television Arts and Sciences, and the National Cartoonists Society:

Encourage your members to show adults wearing seatbelts properly and children in the back seat of passenger vehicles in size-appropriate child restraint systems unless obviously identified or depicted as high risk behavior. (H-97-23)

To the Newspaper Association of America, the American Society of Newspaper Editors, and the National Newspaper Association:

Encourage your membership to report in news articles about passenger vehicle crashes information on the use of seatbelts and child restraints, and the injury severity that results when seatbelts and child restraints are not used. (H-97-24)

Encourage your membership to require that advertisers show adults wearing seatbelts properly and children in the back seat of passenger vehicles in size-appropriate child restraint systems. (H-97-25)

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PART 4

SAFETY RECOMMENDATIONS RESULTING FROM THE 1996 SAFETY STUDY ON CHILD PASSENGER PROTECTION AND EXECUTIVE SUMMARY OF THE REPORT

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Safety Study on Child Passenger Protection

In September 1996, the Safety Board issued its report of a safety study on the performance and use of child restraints, seatbelts, and air bags for children in passenger vehicles.[4]

Executive Summary

According to the National Highway Traffic Safety Administration (NHTSA), U.S. Department of Transportation, child restraints have been shown to be 69 percent effective in reducing the risk of death to infants and 47 percent effective for children between the ages of 1 and 4. NHTSA also estimates that lap/shoulder belts reduce the risk of fatal injury by 45 percent and moderate to critical injury by 50 percent for passenger car occupants who are older than 5 years. Despite the effectiveness of child restraints and lap/shoulder belts to reduce the likelihood of severe and fatal injuries, accidents continue to occur in which restrained children are being injured and killed.

According to NHTSA's 1994 Fatal Accident Reporting System (FARS) data, 5,972 children younger than age 11 were passengers of motor vehicles in transport involved in accidents that resulted in at least one fatality. About 20 percent of the child passengers (1,203 of 5,972) were fatally injured. Restraint use was known for 1,114 of the 1,203 fatally injured children; about 54 percent of the fatally injured children (647 of 1,203) were unrestrained. Further, about 40 percent of all the children (2,402 of 5,972) involved in the fatal accidents were unrestrained; only 12 percent of these unrestrained children were not injured. These data show that the percentage of unrestrained children who were killed (26.9 percent) was almost double that of the percentage of restrained children who were killed (14.7 percent).

The National Transportation Safety Board, therefore, conducted this study to examine the performance and use of occupant protection systems for children: child restraint systems, vehicle seatbelts, and air bags. The study also examines the adequacy of relevant Federal Motor Vehicle Safety Standards, the comprehensiveness of State child restraint and seatbelt use laws, and the adequacy of public information and education on

[4] National Transportation Safety Board. 1997. The Performance and Use of Child Restraint Systems, Seatbelts, and Air Bags for Children in Passenger Vehicles. Volume 1: Analysis. Safety Study NTSB/SS-96/01. Washington, DC. 255 p. (Available by purchase from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, (703) 487-4600. Order report number PB96-917005.)

child passenger protection. In order to fully discuss the performance of air bags and children, the Board examined the accident experience with passenger-side air bags in general.

The Safety Board selected for study accidents involving at least one vehicle in which there was a child passenger younger than age 11 and in which at least one occupant was transported to the hospital. The Safety Board used a sampling strategy designed to obtain a predetermined number of children in specified age ranges and in certain types of restraint systems to ensure equal representation of ages and restraint categories in the sample. The Safety Board investigated a total of 133 accidents. A total of 13 accidents were omitted from the study: 12 because data required for this study could not be obtained, and 1 because the restraint system used in the vehicle was not designed for automobiles. The study, therefore, analyzes data from 120 vehicle accidents. Volume 1 of the report (NTSB/SS-96/01) contains the Board's analysis of the data, its conclusions, and safety recommendations; volume 2 of the report (NTSB/SS-96/02) contains case summaries of the 120 vehicle accidents.

The safety issues discussed in this study include:

- the dangers that passenger-side air bags pose to children;
- factors that affect injury severity, including the use of an inappropriate restraint for a child's age, height, and weight; the improper use of the restraint; accident severity; and seat location;
- the adequacy of Federal standards regarding the design of child restraint systems;
- the need to improve seatbelt fit for children;
- the adequacy of public information and education on child passenger protection; and
- the adequacy of State child restraint use laws.

Prior to the completion of this study and as a result of the accidents involving children who were fatally injured by passenger-side air bag deployment, the Safety Board issued urgent recommendations to NHTSA, the domestic and international automobile manufacturers, the child restraint system manufacturers, and other organizations and agencies associated with the distribution of educational material regarding child passenger protection. [These recommendations are presented in part 5 of these proceedings.] As a result of the completed study, additional recommendations were issued to NHTSA, to the Governors and legislative leaders of the 50 States and the U.S. Territories, to the Mayor and Chairman of the Council of the District of Columbia, to the domestic and international automobile manufacturers, and to the child restraint manufacturers.

Conclusions

1. Children (especially those properly restrained) in the back seats of vehicles are less likely to sustain injury than those seated in the front seats.

2. Children of all ages need to be properly restrained and should be covered by the States' child restraint and seatbelt use laws.

3. Passenger-side air bags, as they are currently designed, are not acceptable as a protective device for children positioned in front of them and can kill or critically injure these children in accidents that would have been survivable had the air bag not deployed.

4. The number of children killed and critically injured in accidents similar to those investigated for the Board's study will continue to increase unless immediate action is first taken to determine the benefits of passenger-side air bags, as currently designed, even though the National Highway Traffic Safety Administration's databases and information provided to NHTSA by an automobile insurance provider suggest there may be some benefits from passenger-side air bags.

5. Air bags are being designed, because of certification testing requirements, primarily to protect unbelted rather than belted vehicle occupants even though the air bags are promoted as supplemental restraint systems and the majority of motor vehicle occupants now use seatbelts.

6. By not using belted child occupants and out-of-position child occupants (belted and unbelted), by not considering the effects of pre-impact braking, and by not considering the seat track in the forward-most position, the National Highway Traffic Safety Administration's air bag performance certification testing is not representative of the actual accident environments.

7. In 9 of the 13 accidents investigated for this study in which there were collisions with other vehicles and passenger-side air bag deployment, the change in velocity was less than 20 mph, yet 5 of the 9 children in the right front passenger seats in these accidents sustained serious, critical, or fatal injuries from contact with the passenger-side air bag (2 of the 5 children were in rear-facing child restraint systems).

8. The additional labeling requirements in the National Highway Traffic Safety Administration's proposed rulemaking of August 6, 1996, by themselves, do not provide sufficient encouragement for automakers to install intelligent air bag systems.

9. The number of fatalities to children from deploying air bags will continue to increase because the National Highway Traffic Safety Administration's proposed rulemaking of August 6, 1996, does not include the nearly 22 million vehicles that will be on the road by the end of 1996 with passenger-side air bags and the estimated 13 million additional vehicles that will be sold each year until the new standards are in effect. Technical solutions that are being considered for advanced air bag systems (such as increasing deployment thresholds, depowering the passenger-side air bag, and installing weight sensors) should also be considered for vehicles on the road.

10. More than two-thirds of the children in the Safety Board's study sample were not in the appropriate restraint for their age, height, and weight; over half of the children who used child restraint systems were improperly restrained; and about one-quarter of the children who used seatbelts were improperly restrained.

11. Over half of the parents or caregivers in the Safety Board's study sample who reported that they had read the child restraint manufacturers' instructions and/or vehicle owners' manuals made errors securing the children in their restraints or the restraints in the vehicles.

12. Securing a child restraint system properly in the vehicle is complicated by several incompatibilities related to the design of child restraint systems and vehicles and vehicle seatbelts.

13. Children tended to be in restraint systems too advanced for their development, such as moving from child restraint systems to seatbelts rather than using booster seats.

14. Many of the organizations working with the National Highway Traffic Safety Administration to promote proper use of child restraint systems do not focus exclusively on child passenger safety nor do they all have permanent funding to do so.

15. Integrated restraints eliminate the need for supplemental hardware, eliminate restraint system availability problems, encourage use of the back seat where the integrated restraint is installed, and provide restraint systems specifically designed for children.

16. Booster seats that restrain children who weigh more than 50 pounds are not subject to any performance standards; however, booster seats are necessary for some children above that weight.

17. Because the National Highway Traffic Safety Administration does not require adjustable lap/shoulder belts in back seats of vehicles, children may be encouraged to sit in the front seat where lap/shoulder belts can be adjusted to allow for a proper fit but where they are more likely to sustain injury in accidents.

18. Because seatbelt adjusters, as they are currently designed, can negatively influence the injury severity of children in automobile accidents, they should be subject to performance requirements.

19. Vehicle occupants seated in center rear seating positions should be afforded the same level of protection as other occupants of the back seat, who have been afforded lap/shoulder belts since January 1, 1990. Further, a center rear lap/shoulder belt provides an additional and preferable seating position for a belt-positioning booster seat.

Recommendations

As a result of this safety study, the National Transportation Safety Board made the following safety recommendations:

To the Governors and Legislative Leaders of the 50 States and U.S. Territories, and to the Mayor and Chairman of the Council of the District of Columbia:

Emphasize the importance of transporting children in the back seat of passenger vehicles through educational materials disseminated by the State. Consider setting aside one-tenth of 1 percent from all motor vehicle insurance premiums for policies written to establish a highway safety fund to be used for this and other safety efforts. (Urgent) (H-96-13)

Review existing laws and enact legislation, if needed, that would:

(a) Ensure that children up to 8 years old are required by the State's mandatory child restraint use law to use child restraint systems and booster seats. (H-96-14)

(b) Eliminate exemptions for children to substitute seatbelts in place of child restraint systems. (H-96-15)

(c) Require children 8 years or older to use seatbelts in all vehicle seating positions. (H-96-16)

To the National Highway Traffic Safety Administration:

Immediately evaluate passenger-side air bags based on all available sources, including National Highway Traffic Safety Administration's recent crash testing, and then publicize the findings and modify performance and testing requirements, as appropriate, based on the findings of the evaluation. (Urgent) (H-96-17)

Immediately revise Federal Motor Vehicle Safety Standard 208, "Occupant Crash Protection," to establish performance requirements for passenger-side air bags based on testing procedures that reflect actual accident environments, including pre-impact braking, out-of-position child occupants (belted and unbelted), properly positioned belted child occupants, and with the seat track in the forward-most position. (Urgent) (H-96-18)

Evaluate the effect of higher deployment thresholds for passenger-side air bags in combination with the recommended changes in air bag performance certification testing, and then modify the deployment thresholds based on the findings of the evaluation. (H-96-19)

Establish a timetable to implement intelligent air bag technology that will moderate or prevent the air bag from deployment if full deployment would pose an injury hazard to a belted or unbelted occupant in the right front seating position, such as a child who is seated too close to the instrument panel, a child who moves forward because of pre-impact braking, or a child who is restrained in a rear-facing child restraint system. (H-96-20)

Determine the feasibility of applying technical solutions to vehicles currently on the road equipped with passenger-side air bags, and those to be manufactured until new standards become effective, to prevent air bag-induced injuries to children in the passenger-side seating position. (H-96-21)

Review, through your Blue Ribbon Panel comprising child passenger safety advocates, automobile and child restraint manufacturers, and automobile insurance providers, the various efforts that promote child passenger safety, and then develop and implement a plan to ensure coordinated, comprehensive, continuing programs and stable funding for these programs. (H-96-22)

Evaluate, in conjunction with the child restraint manufacturers, the design of child restraint systems, with the goal of simplifying placement of a child in a restraint system. (H-96-23)

Revise the necessary Federal Motor Vehicle Safety Standards to provide for the secure and uniform installation of child restraint systems. (H-96-24)

Revise Federal Motor Vehicle Safety Standard 213, “Child Restraint Systems,” to establish performance standards for booster seats that can restrain children up to 80 pounds. (H-96-25)

Revise Federal Motor Vehicle Safety Standard 208, “Occupant Crash Protection” to require adjustable upper anchorages at all outboard rear seating positions of a vehicle. (H-96-26)

Revise Federal Motor Vehicle Safety Standard 213, “Child Restraint Systems,” to include performance requirements for seatbelt adjusters. (H-96-27)

Require installation of center rear lap/shoulder belts in all newly manufactured passenger vehicles for sale in the United States. (H-96-28)

To the domestic and international automobile manufacturers:

Install enhanced warning labels on all passenger vehicles equipped with passenger-side air bags on the road or to be manufactured prior to the effective date of the requirements proposed by the National Highway Traffic Safety Administration on August 6, 1996. The labels should be similar to those to be required for installation in newly manufactured vehicles. (H-96-29) (Supersedes H-95-19)

Develop and implement a program to reduce the misuse of child restraint systems that would include elements such as technical training for dealership personnel in the proper use of child restraint systems and promotional events at dealerships to provide parents and caregivers with information on proper use. (H-96-30)

Offer integrated restraints in passenger vehicles for sale in the United States. (H-96-31)

Voluntarily install adjustable upper seatbelt anchorages at all outboard rear seating positions in all newly manufactured passenger vehicles for sale in the United States. (H-96-32)

Voluntarily install center rear lap/shoulder belts in all newly manufactured passenger vehicles for sale in the United States. (H-96-33)

To the child restraint manufacturers:

> Evaluate, in conjunction with the National Highway Traffic Safety Administration, the design of child restraint systems, with the goal of simplifying placement of a child in a restraint system. (Urgent) (H-96-34)
>
> Simplify the written and visual instructions provided to consumers regarding the installation of child restraint devices. (H-96-35)

Also as a result of this safety study, the National Transportation Safety Board reiterated the following recommendation to the Governors of the 39 States that have secondary enforcement of mandatory seatbelt laws, the State of New Hampshire that has no mandatory seatbelt use law, and the Mayor of the District of Columbia:

> Enact legislation that provides for primary enforcement of mandatory safety belt laws. Consider provisions such as adequate fine levels and the imposition of driver license penalty points. (H-95-13)

PART 5

SAFETY RECOMMENDATIONS ISSUED PRIOR TO THE COMPLETION OF THE SAFETY STUDY

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Recommendations Issued During the Safety Study

On November 2, 1995, while the safety study was being conducted, the National Transportation Safety Board issued the following urgent safety recommendations:

To the National Highway Traffic Safety Administration:

Immediately develop and implement, in cooperation with the National Association of Broadcasters and the Advertising Council, Inc., a highly visible, nationwide, multi-media campaign to advise the public about the danger of placing a rear-facing child safety seat or an unrestrained small child in the front seat of a vehicle equipped with a passenger-side air bag. (H-95-17)

To the Advertising Council and the National Association of Broadcasters:

Develop and implement, in cooperation with the National Highway Traffic Safety Administration, a highly visible, nationwide, multi-media campaign to advise the public about the danger of placing a rear-facing child safety seat or an unrestrained small child in the front seat of a vehicle equipped with a passenger-side air bag. (H-95-18)

To the domestic and international automobile manufacturers:

Conduct a mail campaign to all registered owners of vehicles equipped with passenger-side air bags that warns of the dangers of placing a rear-facing child safety seat and an unrestrained or improperly restrained small child in the front seat of the vehicle. (H-95-19)

Develop and attach to new vehicles with passenger-side air bags a visible warning regarding the dangers of placing a rear-facing child safety seat or improperly restrained small child in the front seat of the vehicle. This warning should be permanent and visible to the front seat passengers at all times. (H-95-20)

To the child restraint manufacturers:

Conduct a mail campaign to all registered owners of child safety seats that are designed to face rearward that warns of the dangers of placing a rear-facing child safety seat in the front seat of a vehicle equipped with a passenger side air bag. (H-95-21)

Develop and attach to all new child safety seats designed to be used in the rear-facing position a visible flier that warns of the dangers of placing a child safety seat facing rearward in the front seat of a vehicle equipped with a passenger side air bag. (H-95-22)

To Shinn and Associates, Inc.:

Conduct a mail campaign to all users and purchasers of the 1990 video "Getting It Right" to advise them that supplemental information regarding the dangers of placing a rear-facing child safety seat in the front seat of a vehicle equipped with a passenger-side air bag needs to be provided to viewers of this video. (H-95-23)

Modify the video "Getting It Right" to ensure that any future distribution of this video includes the appropriate warnings to parents about the dangers of placing rear-facing child safety seats in the seat of a vehicle equipped with a passenger-side air bag. (H-95-24)

To the Reading Hospital and Medical Center:

Conduct a mail campaign to all persons who have had babies at the hospital in the past year to warn them of the dangers of placing a rear-facing child safety seat in the front seat of a vehicle equipped with a passenger-side air bag. (H-95-25)

Ensure that the childbirth education programs and other new parenting classes offered by the hospital include information that warns of the dangers of placing a rear-facing child safety seat in the front seat of a vehicle equipped with a passenger-side air bag. (H-95-26)

To the Department of Health and Human Services, the American Hospital Association, and the Association of State and Territorial Health Officials:

Ensure that all hospitals with obstetrics units conduct a mail campaign to all persons who have had babies in the past year that warns of the danger of placing a rear-facing child safety seat in the front seat of a vehicle equipped with a passenger-side air bag. (H-95-27)

Ensure that the childbirth education programs and other new parenting classes include information that warns of the dangers of placing a rear-facing child safety seat in the front seat of a vehicle equipped with a passenger-side air bag. (H-95-28)

To the Academy of Certified Birth Educators, American Academy of Family Physicians, American Academy of Pediatrics, American College of Nurse Midwives, International Childbirth Education Association, and American College of Obstetricians & Gynecologists:

Urge members to contact all persons who have had babies in the past year to warn them of the dangers of placing a rear-facing child safety seat in the front seat of a vehicle equipped with a passenger-side air bag. (H-95-29)

Urge members to ensure that information provided to new parents warns of the dangers of placing a rear-facing child safety seat in the front seat of a vehicle equipped with a passenger-side air bag. (H-95-30)

To the Lamaze Publishing Company, Inc.:

Advise parents, through the Newborn Channel and Lamaze Magazine, of the dangers of placing a rear-facing safety seat in the front seat of a vehicle equipped with a passenger-side air bag. (H-95-31)

PART 6

AGENDA OF THE PUBLIC FORUM AND PARTIES TO THE FORUM

Agenda of the Public Forum on Air Bags and Child Passenger Safety

<u>**Monday, March 17, 1997**</u>

9:00–9: 15	**Purpose of the Hearing/History of the Problem** Jim Hall, Chairman, National Transportation Safety Board
9:15–9:25	**Demographics of the Driving Population: Past, Present, Future** Elaine Weinstein, Chief, Safety Studies Division, National Transportation Safety Board
9:25–10:10	**Crash Experiences** Mr. Albert Ambrose, Nashville, Tennessee Mrs. Susan Hayes, Baltimore, Maryland Mr. Mark Lechtenberg, Longview, Texas
10:10–10:30	**Break**
10:30–11:30	**NHTSA Findings and Strategies With Respect to the Air Bag Issue** Ricardo Martinez, M.D., Administrator, National Highway Traffic Safety Administration Philip Recht, Deputy Administrator, National Highway Traffic Safety Administration Donald Bischoff, National Highway Traffic Safety Administration L. Robert Shelton, National Highway Traffic Safety Administration Dr. James Hedlund, National Highway Traffic Safety Administration
11:30–1:00	**Lunch**
1:00–2:30	**PANEL 1: The Role of Air Bags and Seatbelts—a Primary or Supplemental Restraint System?** Helen Petrauskas, Ford Motor Company Brian O’Neill, Insurance Institute for Highway Safety Dr. John Graham, Harvard Center for Risk Analysis Joan Claybrook, Public Citizen

2:30–3:00	**Break**
3:00–5:00	**PANEL 2: Air Bag-Induced Injuries—Who is Vulnerable and How Do We Know It?** Dr. Donald Huelke, University of Michigan Transportation Research Institute Dr. Harold Mertz, General Motors Corporation Dr. G. Richard Price, U.S. Army Research Laboratory Dr. Jeffrey Augenstein, University of Miami Dr. Tyler Kress, University of Tennessee

Tuesday, March 18, 1997

8:30–10:00	**PANEL 1: Is a “One-Size-Fits-All” Approach Appropriate for Today’s/Tomorrow’s Passenger Vehicle Population?** Robert Lange, General Motors Corporation Dainius Dalmotas, Transport Canada Dr. Adrian Lund, Insurance Institute for HighwaySafety George Parker, Association. of International Automobile Manufacturers
10:00–10:30	**Break**
10:30–12:00	**PANEL 2: Complexity of Implementation of Depowered Air Bags, Switches, Suppression Devices in Newly Manufactured Vehicles and Cars in Use** David Dahle, Morton International Louis Camp, Ford Motor Company Guy Nusholtz, Chrysler Corporation Dietmar Haenchen, Volkswagon of America, Inc. Douglas Greenhaus, National Automobile Dealers Association
12:00–1:30	**Lunch**
1:30–3:00	**PANEL 3: Discussion of Deployment Thresholds** Ingo Kallina, Mercedes-Benz Dainius Dalmotas, Transport Canada David Breed, Automotive Technologies Int’l. Mitchel Sherba, General Motors Corporation John Werner, State Farm Insurance Company

3:00–3:30	**Break**
3:30–5:00	**PANEL 4: Advanced Air Bag Technology—What is Available Now? What Will Be Available in the Future?** Thomas Vos, TRW Patrick Jarboe, Autoliv Vann Wilber, American Automobile Manufacturers Association Christopher Tinto, Toyota Technical Center, USA Dr. Thomas Hollowell, National Highway Traffic Safety Administration

Wednesday, March 19, 1997

9:00–10:30	**PANEL 1: What is the Experience With Air Bags in Other Countries?** Australia: Peter Makeham, Federal Office of Road Safety Australia: Laurie Sparke, General Motors Holden Europe: Ingo Kallina, Mercedes-Benz Canada: Dainius Dalmotas, Transport Canada
10:30–10:45	**Break**
10:45–12:45	**PANEL 2: The Effectiveness of Air Bags** Dr. John Graham, Harvard Center for Risk Analysis Dr. Leonard Evans, General Motors Corporation Dr. Lindsey Griffin, Texas Transportation Institute Dr. Susan Ferguson, Insurance Institute for Highway Safety Dr. Charles Kahane, National Highway Traffic Safety Administration
12:45–2:15	**Lunch**
2:15–4:15	**PANEL 3: Enforcement of Restraint Laws and Need for Primary Laws** John Cullerton, Illinois State Senate Maj. W.R. Price, North Carolina State Highway Patrol Charles Hurley, National Safety Council Janet Dewey, Air Bag Safety Campaign Timothy Hoyt, Nationwide Insurance

<u>Thursday, March 20, 1997</u>

9:00–10:30	**PANEL 1: Design of Child-Friendly Back Seats** Artie Martin, General Motors Corporation Howard Willson, Chrysler Corporation William Shapiro, Volvo Cars of North America Tom Baloga, Britax Child Safety, Inc.
10:30–10:45	**Break**
10:45–12:15	**PANEL 2: Design of Child Restraints** Cheryl Neverman, National Highway Traffic Safety Administration Dr. Richard Stalnaker, Ohio State University Dr. Phyllis Agran, University of California, Irvine David Campbell, Century Products, Inc. Tom Baloga, Britax Child Safety Inc
12:15	**Closing Remarks** Jim Hall, Chairman, National Transportation Safety Board
12:30	**Adjourn**

Parties to the Public Forum on Air Bags and Child Passenger Safety

Each table elected spokespersons to question the witnesses on each panel.

Table 1
National Highway Traffic Safety Administration

Table 2
Automotive Occupant Restraints Council
National Association of Governors' Highway Safety Representatives
National Center for Injury Prevention and Control
National Automobile Dealers Association

Table 3
American Automobile Manufacturers Association

Table 4
Association of International Automobile Manufacturers

Table 5
Association for the Advancement of Automotive Medicine
Blue Ribbon Panel on Child Restraint and Vehicle Compatibility
Insurance Institute for Highway Safety
National Safety Council

Table 6
Advocates for Highway and Auto Safety
American Automobile Association
Center for Auto Safety
Parents Coalition for Air Bag Warnings

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PART 7

TRANSCRIPT OF THE 1997 PUBLIC FORUM ON AIR BAGS AND CHILD PASSENGER SAFETY

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Transcript of the Forum

In the matter of:

AIR BAGS AND CHILD PASSENGER SAFETY
PUBLIC FORUM[1]

Renaissance Mayflower
Grand Ballroom
1127 Connecticut Avenue, N.W.
Washington, D.C.

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

Monday, March 17, 1997

The above-entitled matter came on for hearing pursuant to notice, at 9:00 a.m.

Board of Inquiry, National Transportation Safety Board:

Jim Hall, Chairman

James A. Arena, Director
Office of Surface Transportation Safety

Barry M. Sweedler, Director
Office of Safety Recommendations

Vernon Ellingstad, Ph.D., Director
Office of Research & Engineering

Joseph G. Osterman, Chief
Highway Division
Hearing Officer
Office of Surface Transportation Safety

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[1] The hearing was transcribed by court reporters from the tape recordings made of all sessions. Inconsistencies in word usage, punctuation, capitalization, and use of numerals have not been corrected.

Technical Panel, National Transportation Safety Board:

Elaine Weinstein
Mitchell Garber, M.D.
Richard Downs
Margaret Sweeney, Ph.D.
J. Vernon Roberts
Frank Ghiorsi
David Rayburn

Staff, National Transportation Safety Board:

Paul Schlamm
Office of Government and Public Affairs

Bob Barlett
Office of Surface Transportation Safety

Joe Kris
Office of Research & Engineering

Mary Jones
Office of Research & Engineering

Purpose of the Hearing and History of the Problem

(Time Noted: 9:00 a.m.)

CHAIRMAN JIM HALL: On the record. If everyone can take their seats, we will begin here in 28 seconds at the top of the hour. Before I formally begin, let me apologize to everyone for my voice. I was at Charlotte, North Carolina, yesterday cheering the Chattanooga Mocs, which is my hometown, to victory over Illinois. And I had to stop cheering at the end of the first half or I knew I wouldn't have a voice at all for today, but I know you all are as excited as I am about the Chattanooga Moccasin's victory.

There's a color picture on the front of USA Today, if you haven't noticed, so I'm sure you'll want to get that at the break.

Let me convene this public forum of the National Transportation Safety Board and welcome all of you all here this morning. My name is Jim Hall. I presently serve as Chairman of the National Transportation Safety Board and will serve as Chairman of this public forum.

We have convened this meeting today to discuss concerns related to the design and performance of automobile air bags and ways to improve restraint use by adults and children. We know that seat belts are the most effective safety devices in automobiles.

Almost half of all the unrestrained people killed in car crashes would be alive today if they had buckled their seat belts, but too many Americans still do not buckle up.

(Slide 1 shown.)

CHAIRMAN HALL: The slide on the screen shows where the United States ranks compared to other countries. While 92 percent of Canadians and 95 percent of Australians wear their seat belts in their automobiles, in the United States, only 68 percent of front seat occupants wear seat belts.

Further, the rate of seat belt use in this country for people involved in the most serious crashes, those in which there were one or more fatalities, is even lower.

(Slide 2 shown.)

CHAIRMAN HALL: This slide shows that about 47 percent of adults and 40 percent of children under five years old—let me re-emphasize 40 percent of children under five years old who were involved in serious crashes were unrestrained. The restraint use for older children is even worse. Almost half of all the children five to nine years old and almost two-thirds of the children ten to 14 were unrestrained.

We should be concerned about the lives and safety of our children; certainly, more concerned than these statistics reflect.

In the early 1970s when seat belt usage in the United States was estimated to be about 15 percent, air bags were developed as a way of reducing the number of deaths and injuries resulting from highway crashes. Estimates at that time were that each year, they would save anywhere from 9,000 to 13,500 lives and prevent about 100,000 moderate or worse injuries, but the estimates have changed.

Today, air bags are promoted as a supplemental restraint system to the seat belt, and the current estimates are that air bags will save about 3,000 lives each year when all cars have air bags. This is an issue we will want to explore in this forum.

Since their introduction about a year—about a decade ago, air bags are estimated by the National Highway Traffic Safety Administration to have saved over 1,600 lives; 1,481 on the driver's side, 164 on the passenger side. In severe frontal crashes, air bags clearly increase the chances of survival.

However, the protection afforded by air bags is not extended equally to all vehicle occupants. For example, since 1993, 38 children have died because they were struck by the air bag in what would have otherwise been a survivable crash. Twenty-four adults have also been killed by their air bags in crashes where they should have survived. Both adults and children have sustained serious air bag induced injuries.

Given these circumstances, there is increasing concern about air bags and urgent questions regarding both the effectiveness of air bags and the potential dangers of these devices. I know this, because my agency hears from concerned citizens every week and almost every day.

For example, a woman in California wrote and I quote, "We have a station-wagon. Since we have four children, one must ride in the front seat. The car is equipped with a passenger side air bag. We understand that it is not safe for our children to ride in the front seat. Are our children safer in the center of the front seat instead of the passenger seat? Is there a way to have a passenger side air bag disabled? Is that advisable? We are deeply concerned for our children's safety, that is why we paid extra for the passenger side air bag in the first place. Please let us know how we can work with what we have most safely."

And we received this letter from Indiana and I quote, "I am a 74 year old female slightly under 5' tall and weighing between 100 and 102 pounds. Because I must sit so close to the steering wheel when driving, I have always been concerned about my safety despite always wearing my seat belt. We are happy with our car, but I would appreciate any assurance you could give me that the Government required safety feature will not result in my death or serious injury."

These letters present a clear picture of the scope and depth of the public's concern. The Safety Board has long been concerned about vehicle occupant protection and has issued a number of recommendations in its 30-year history regarding the design of seat belts and child restraint systems.

The enactment of mandatory restraint use laws and the need to increase public education about the importance of restraint use more than a year ago, the Board issued urgent recommendations to Government and industry aimed at ensuring that the public be made aware of the dangers that air bags pose for children.

This past September with the completion of our safety study on child passenger protection, the Board issued further recommendations for improving the design of air bags, restraint systems, and vehicle back seats.

In addition, we asked the states to improve their child restraint laws to cover all children in all seat positions. In response, a Government industry air bag safety campaign was initiated to increase public awareness regarding air bags. Also, letters and labels that warned of the dangers that air bags posed to children have been sent to owners of vehicles with passenger side air bags.

NHTSA initiated rulemaking to improve the design of air bags for new cars—technological design solutions—to make the air bags in cars on the road safe for all occupants and to simplify installation of child restraint systems in cars.

However, more needs to be done. And we hope this public forum will be an important part of that process. We intend to have an open and full discussion that will put before the American people the facts regarding the role air bags have played in saving lives, what the potential of these devices are, and what can be done to eliminate these dangers. We also hope that the next few days will provide both Government and industry with the information they need as they contemplate future air bag and child restraint design performance.

I ask all of us that are participating in this forum to keep one simple fact in mind. Regrettably, the National Transportation Safety Board is in the media when there are major aviation accidents in this country. Last year, there was a lot of attention and continued attention focused on our investigations of aviation accidents, such as the ValuJet crash in the Everglades and TWA-800. A lot of press attention. But do you realize—and I'm sure many of you in this room do know—that each day on our country's highways, we lose the equivalent of one ValuJet accident a day; that is, some 110 to 112 people will be killed on our highways today while we are sitting here in this public forum.

So, I can't stress the importance that I believe this forum has and can mean in terms of contributing important information for the American people, and hopefully providing some directions to reverse this significant number of lives that we lose every day.

The National Transportation Safety Board is an independent Federal agency that was created by Congress to oversee and promote transportation safety. The Safety Board accomplishes this through the investigation of crashes and the conduct of safety studies and ultimately, through the formulation of safety improvement recommendations.

We serve as the eyes and ears of the American people at crash sites and during occasions like these. We have convened this public forum as part of our responsibility to foster transportation safety and will be seeking to collect information to determine if additional safety recommendations are needed to enhance air bags in child passenger safety.

At this point, I would like to introduce the other members of the Board of Inquiry, who are all employees of the National Transportation Safety Board. They are to my far right, Mr. Jim Arena, Director of the Office of Surface Transportation Safety. To my right, Mr. Barry Sweedler, the Director of the Office of Safety Recommendations. To my left, Dr. Vernon Ellingstad, Director of the Office of Research & Engineering. And to his left, Mr. Joe Osterman, Chief of the Highway Division and the Hearing Officer for today's hearing.

The Board of Inquiry will be assisted by a Technical Panel from the Safety Board's Offices of Research & Engineering and Surface Transportation Safety. They are located, again, at this table to my right. And I would like to introduce that panel. First, Ms. Elaine Weinstein, the Chief of the Safety Studies Division, Office of Research & Engineering. Next to Elaine, if you might raise your hand, even though there's a name tag there to identify yourself, Mr. Vern Roberts, our National Resource Specialist, Office of Surface Transportation Safety. And Dr. Mitchell Garber, our Medical Officer, who is with the Office of Research & Engineering. Mr. Richard Downs—and where is Richard seated? In the back—a Mechanical Engineer with the Office of Surface Transportation Safety, and Mr. Frank Ghiorsi, our Highway Regional Director of our Northeast Region, Office of Surface Transportation. Frank, if you would identify yourself. They will be seated at the table for later testimony.

Also at the table, Mr. Dave Rayburn, our Highway Accident Investigator, Office of Surface Transportation Safety, and Dr. Margaret Sweeney, Transportation Research Analyst, Office of Research & Engineering.

Also here to assist are Mr. Paul Schlamm of the Safety Board's Office of Public Affairs, Mr. Bob Barlett of the Office of Surface Transportation Safety, and Mr. Joe Kris and Ms. Mary Jones from the Office of Research & Engineering.

Also we have in the audience today, one of the Board members, Mr. George Black. George is our newest Board member and has just convened a public hearing on a marine accident up in Maine, and I'm pleased to have George here. And I believe a former member, Mr. Lee Dickinson, is in the audience, as well, I was told. And finally, Mr. Jamie Finch, my assistant, is here.

Any of the individuals that I've identified that are here with the National Transportation Safety Board are paid by the American taxpayer and if you have any questions or assistance we can provide for any of you during the course of this three- or four-day conference, please don't hesitate to let us know.

I would like to remind the public and the parties to this public forum that this is not being held to determine the rights and liabilities of private parties and efforts directed at determining such rights or liabilities will not be permitted in these proceedings.

There's been a lot of discussion recently about when the automobile industry and the Federal Government became aware that air bags could seriously injure certain occupants and what action they took. Rather than spend our brief time here on that issue, we intend to dedicate this public forum to pursuing what the current problems are and what solutions may exist.

Let me again stress that 41,000 men, women, and children died last year in highway crashes. That translates into, as I mentioned before, 112 people a day dying on our Nation's highways or the equivalent of a tragedy like last year's ValuJet crash in the Everglades occurring each and every day.

We need to take whatever action is necessary to reduce this tragic highway death toll. Properly designed and used air bags can play a significant role in that endeavor. To address these issues, this public forum will focus on what we have learned so far from our experience with air bags, who is vulnerable to air bag injuries, and what we can do to improve air bag design. We will also discuss what needs to be done to increase seat belt and child restraint use in this country, how to make the back seat of the car more accommodating for children, and how to make the child restraints themselves easier to use.

Let me re-emphasize that a Safety Board public forum is a fact-gathering exercise. There will be no attempts to analyze the facts or announce any conclusions at the end of this public forum.

We will publish the proceedings to this forum and have provided a box at the door for anyone who would like to receive a copy. Please place your business card in the box or fill out your name on a separate card or use the proceeding request form that you received with the agenda when you came in the room. You may place your name in the box at any time over the next four days and you will receive a copy of these proceedings.

The Safety Board's rules provide for the designation of parties to a public forum. Pursuant to the rules, these Government agencies, companies, and associations whose participation in the public forum is deemed necessary in the public interest and whose special knowledge will contribute to the development of pertinent evidence are designated as parties.

I would like to now introduce the parties to this public forum. And as we go through, if you would please identify yourself and any individuals that are here with you at the table. I appreciate very much the participation of the parties that I am now going to present to you.

First, table 1, the National Highway Traffic Safety Administration.

MR. BISCHOFF: Mr. Chairman, my name is Don Bischoff, the spokesperson for NHTSA. I have several of the other senior staff members from NHTSA here with me, and we will rotate as judged appropriate throughout the public forum.

CHAIRMAN HALL: Thank you very much for your participation. At table 2, we have the Automotive Occupant Restraints Council, the National Association of Governor's Highway Safety representatives, the National Center for Injury Prevention and Control, and the National Automobile Dealers Association. Does that cover everyone at Table 2? Could you, please, just briefly introduce who the spokesperson will be and identify yourself and your organization?

MR. VOS: I'm Tom Vos from TRW and I will be the spokesperson for the AORC, Automotive Occupant Restraints Council.

CHAIRMAN HALL: And as we go around, what you might want to do is just pass the microphone around the table, so we can start doing that at table 3 and table 4 and table 5.

MR. DAHLE: Dave Dahle, Morton International, AORC representative.

MR. JARBOE: Pat Jarboe, Autoliv International with the AORC.

MR. GREENHAUS: Douglas Greenhaus with the National Automobile Dealers Associations.

DR. BRANCHE: Dr. Christine Branche with the National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

CHAIRMAN HALL: Thank you very much. Table 3, the American Automobile Manufacturers Association.

MR. FELRICE: Mr. Chairman, I'm Barry Felrice with AAMA and we will be rotating who will be the spokesperson. To my right is Al Slechter from Chrysler, Tom Terry, General Motors, Bill King from Ford, and Bob Lange from General Motors.

CHAIRMAN HALL: Thank you for your presence here. Table 4, the Association of International Automobile Manufacturers.

MR. HUTCHINSON: Mr. Chairman, my name is Phil Hutchinson. I am the President of the Association of International Automobile Manufacturers. I have at our table with us today, a number of representatives of not only our association, but international companies. Mr. Chris Tinto of Toyota, Mike Love of Porsche, Dietmar Haenchen of Volkswagon of America, and Don Bearden of Subaru. In addition, we have George Parker who is our Vice President of Engineering, and we will share the questioning activity amongst our representatives.

CHAIRMAN HALL: Thank you very much and we appreciate your participation. Table 5, the Association for the Advancement of Automotive Medicine, the Blue Ribbon Panel on Child Restraint and Vehicle Compatibility, the Insurance Institute for Highway Safety, and the National Safety Council.

MR. HASELTINE: Mr. Chairman, I'm Phil Haseltine representing the Blue Ribbon Panel on Child Restraint and Vehicle Compatibility. I'll let the others introduce themselves. There's nobody here from AAAM yet, I don't believe.

MR. LUND: Mr. Chairman, I'm Adrian Lund with the Insurance Institute for Highway Safety. I'm going to be the representative for the Insurance Institute. Also at the table this morning is Brian O'Neill, President of the Institute.

MR. HURLEY: Chuck Hurley with the National Safety Council.

MS. ROEMER: Jane Roemer, also with the National Safety Council.

CHAIRMAN HALL: Thank you very much. And finally, table 6, the Advocates for Highway and Auto Safety, the American Automobile Association, the Center for Auto Safety, and the Parents Coalition for Air Bag Warnings.

MR. DITLOW: Mr. Chairman, I'm Clarence Ditlow with the Center for Auto Safety.

MR. SANDERS: Mr. Chairman, I am Robert Sanders of the Parents Coalition for Air Bag Warnings. We have two other Board members present in the room. They are Lynn Oliver of Salt Lake City, Utah, and Bet Sanders of Silver Spring, Maryland. They may at some point join us at the table. Additionally, Byron Bloch has provided us with certain engineering counseling and he is with us, as well.

MR. VAN SICKLE: Dave Van Sickle, with the American Automobile Association.

MS. STONE: And I'm Judie Stone with Advocates for Highway and Auto Safety. And with me today is Henry Jasny, who is our General Counsel.

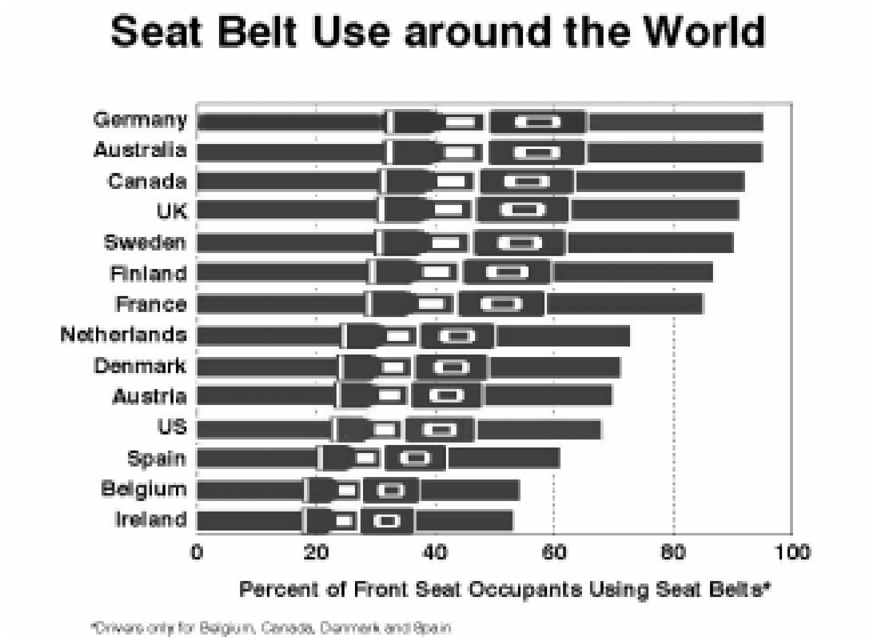
CHAIRMAN HALL: Again, let me thank each one of the participants for the participation of their organization, as well as their personal participation in this forum. For this public forum, we will rotate the spokesperson at the various party tables. Prior to the start of each panel, I will ask each table to give the name, title, and affiliation for the record of the spokesperson designed to ask questions for that panel. That's in order to facilitate our forum.

Last week, the Board of Inquiry held a prehearing conference at the Safety Board's Offices in Washington, D.C. It was attended by the Safety Board's staff and a representative from each of the parties to the public forum. During that conference, the areas of inquiry were delineated. The scope of the issues to be explored at this public forum were defined. The exhibits were reviewed, and the panel participants were identified. Copies of the list of panel participants are available at the press table.

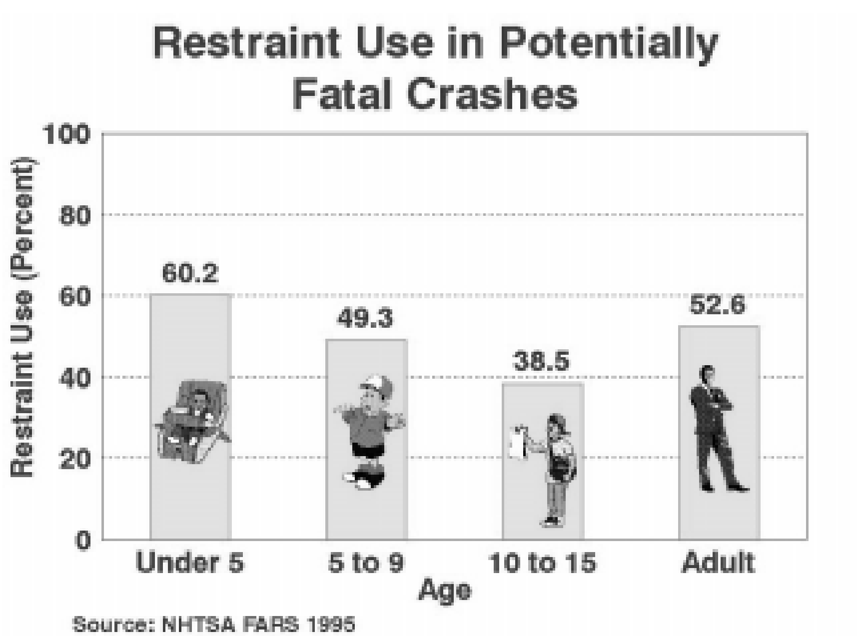
The panel participants speaking at this public forum have been selected, because of their ability to provide the best information available on the issues we are considering. Pursuant to the Safety Board's procedural rules and the panel participants will be questioned first by the Board's Technical Panel, seated to my right, then by each of the table's designated spokesperson, and then by the Board of Inquiry. If necessary to clarify previous comments, I may allow a second round of questions.

As Chairman of the Board of Inquiry, I will be responsible for the conduct of the public forum. I will make all rulings on the admissibility of evidence and all such rulings will be final. The transcript of the public forum and all exhibits subsequently entered into the record will become part of the public record in the Safety Board's Washington, D.C. office. Anyone desiring to purchase a transcript, should contact the Court Reporter, because the Safety Board does not provide copies of the transcript.

Before I begin the formal part of these proceedings and at the close of introductions, let me also thank the media in attendance. The main purpose of this public forum is to provide factual information for the American people about air bags and restraint systems. And the most effective way for us to do that is through the media. I appreciate the coverage that is indicated here this morning and I appreciate your attendance.



Slide 1. Seat belt use. (From Chairman Hall's opening remarks, March 17, 1997.)



Slide 2. Restraint use in potentially fatal crashes. (From Chairman Hall's opening remarks, March 17, 1997.)

Demographics of the Driving Population: Past, Present, Future

CHAIRMAN HALL: We will now proceed with the public forum. Before calling the first panel, I would ask that Ms. Elaine Weinstein, Chief of the Board's Safety Studies Division, provide some background on the demographics of the driving population and summarize research data to date on the effectiveness of air bags. Elaine.

MS. WEINSTEIN: Thank you, Chairman Hall. In 1965, when the Federal Motor Vehicle Safety Standards were being designed, men made up the largest proportion of drivers.

(Slide 1 shown.)

MS. WEINSTEIN: But as the slide shows today, about half of all drivers are female. The air bag, however, is still being designed for the average size male. We will examine the reasons for this over the course of the next few days.

Individuals over age 64 made up about 10 percent of the population in 1970.

(Slide 2 shown.)

MS. WEINSTEIN: But as you can see on the slide, the population is aging. According to the U.S. Census Bureau, in 1990, about 14 percent of the population was over 64. And this percent will increase to almost one quarter of the population by the year 2030. Two years ago, there were about 25 million licensed drivers over the age of 64, about 14 percent of all licensed drivers. And, again, half of these older drivers are female.

(Slide 3 shown.)

MS. WEINSTEIN: An estimated 4 million drivers are short statured women. That is, they are less than 5' tall. These short-statured women are referred to as fifth percentile females, because they're in the lowest 5 percent of height and weight. Of critical importance is the size of the fifth percentile female relative to the 50th percentile male, since the crash test requirements for air bag certification are dependent on the 50th percentile male.

The fifth percentile female, as you can see, is about 9 inches shorter and 70 pounds lighter. You can also see the minimal difference in height between a ten year old child, whose safety advocates recommend be seated in the back seat away from the air bag, and a fifth percentile female who may be driving an air bag equipped car.

The height of a six year old child is about one-third of the average size male. Children of this age and height need to use a booster seat to improve the fit of the lap and shoulder belt. How does the air bag protect these various populations? According to a 1996 evaluation by the National Highway Traffic Safety Administration, air bags reduce the chance of a fatality more for men than for women.

Air bags are less effective for older drivers than younger drivers, according to the same evaluation.

(Slide 4 shown.)

MS. WEINSTEIN: They reduce the chance of fatalities by about 17 percent for drivers between 30 and 55, but only by about 10 percent for drivers over 55 and by 1-1/2 percent for drivers over 70.

Air bags are also less effective for belted occupants than unbelted occupants. This low level of effectiveness for belted occupants is evident in the estimates of the numbers of lives that will be saved when all cars have air bags.

Two-thirds of the occupants saved by air bags will be unbelted. These estimates assume there are no increases in seat belt use and no design changes to air bags.

We also know that air bags, as they are currently designed, are not effective for children. While NHTSA has concluded that air bags will reduce the chance of a fatality by about 13-1/2 percent for passengers over the age of 13, they've also determined that there is a negative effect for those under 13. And as we've heard, about 38 children have been killed by air bags in the last four years.

NHTSA's finding is consistent with the Safety Board's conclusion in September 1996, that air bags as they are currently designed are not acceptable as a protective device for children.

(Slide 5 shown.)

MS. WEINSTEIN: The current message to parents is to have children under the age of 12 ride in the back seat of the car. Most children already do this. About two-thirds of children under the age of 11 ride in the back seat according to National Highway Traffic Safety Administration data. They comprise about one-third of all riders in the back seat. So, should the back seat be designed for children? We will examine this issue again over the next few days.

The federal government and automobile industry designed and promoted air bags, seat belts, and child restraint systems to help reduce the number of fatalities and injuries that result from highway crashes every year. But restraint systems will only reduce injuries and fatalities if they are used.

The video that we're about to show indicates how an occupant receives increasing levels of protection as restraint systems are provided. The video will also show some of the problems that air bags present to short statured adults and children.

I would like to thank the Insurance Institute for Highway Safety for their assistance with film footage for this video.

Mr. Chairman, the video will conclude my presentation.

(Video shown and transcribed.)

"Recent National Transportation Safety Board Accident Investigations have focused on the benefits and potential hazards concerning automobile air bags. Many of today's passenger cars are equipped with air bags for both the driver and passenger front seat. During a frontal collision, these air bags are activated through sensors installed in the vehicle. Air bags are intended to supplement the vehicle's seat belt system providing additional protection to vehicle occupants. Air bags deploy when a charge of sodium azide fills the bag with nitrogen gas. The nitrogen then escapes through vents in the rear of the bag. Inflation occurs within approximately 20 thousands of a second.

"Drivers and passengers who fail to wear the available seat belt put themselves and others at risk. During a frontal collision, an unrestrained driver will often collide with the steering column, windshield, instrument panel, and windshield header causing serious or even fatal injuries.

"The use of seat belts combined with supplemental air bags can provide drivers and passengers additional protection. In a direct frontal collision when the occupant is seated away from the air bag allowing the air bag to inflate properly, injury risks are greatly reduced.

"Passenger side air bags operate similarly to those provided for the drivers. The larger passenger side air bags deploy from the instrument panel. Laboratory crash tests reveal that small statured drivers when seated close to the steering wheel can receive severe injuries during direct frontal collisions, whether restrained by seat belts or seat belts and air bags.

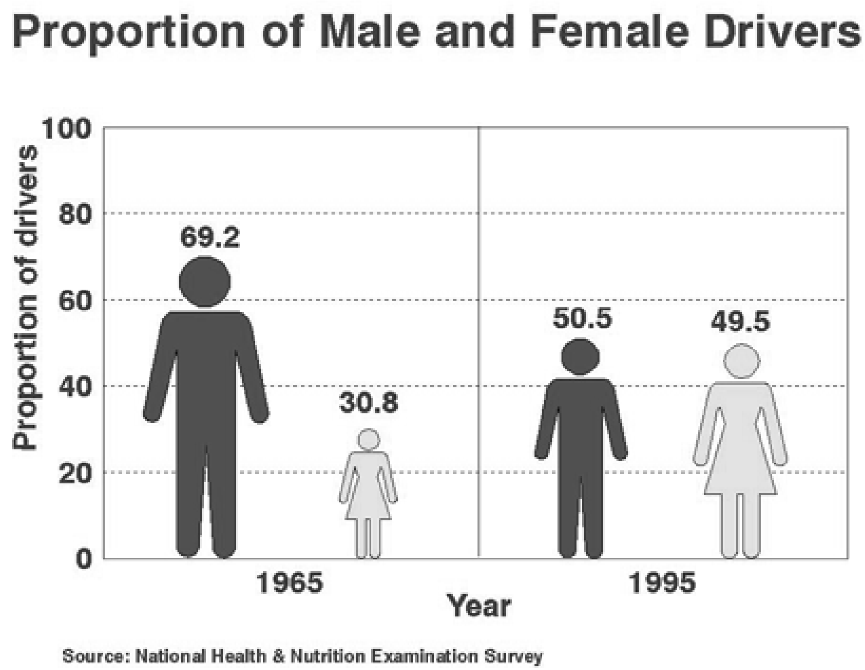
"Passenger side air bags and rear facing child seats don't mix. During a collision, the deploying air bag can strike the child seat with enough force to be fatal.

"The unrestrained child or adult passenger who is out of position can receive serious or fatal injuries from a deploying air bag. Even the restrained child or adult who is simply leaning forward or moves forward during a pre-crash breaking event can receive serious or fatal injuries from a deploying air bag.

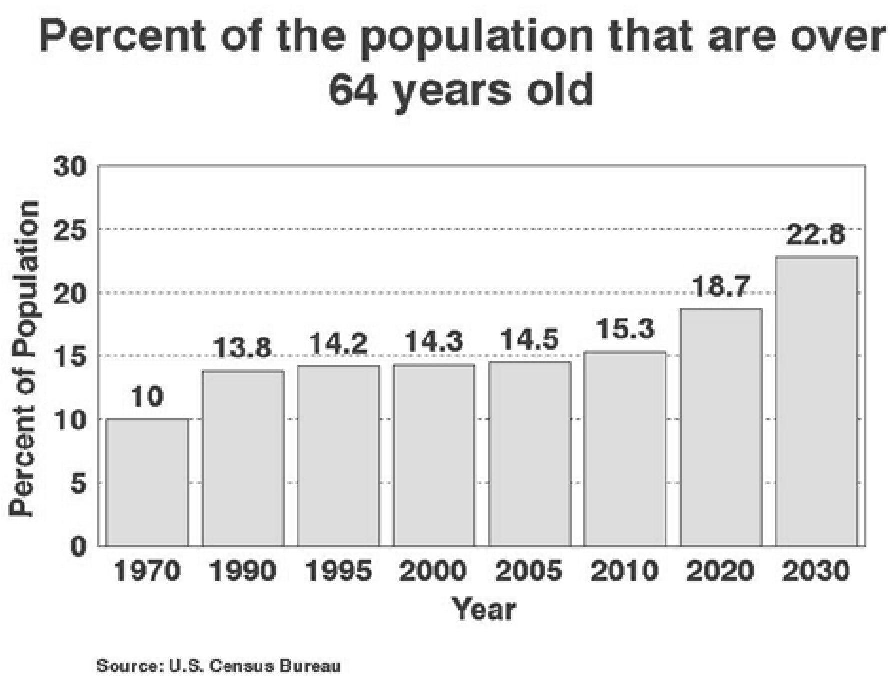
"Tests have also indicated that smaller stature drivers may be more susceptible to severe neck injuries caused by deploying air bags. Seat belts and an air bag saved this driver's life. Safety Board accident investigations have shown both the benefits and potential hazards of air bags.

"However, the vehicles in this footage represent other crashes investigated by the Board that resulted in serious and fatal injuries, even though they involve low speeds and little damage to the vehicles."

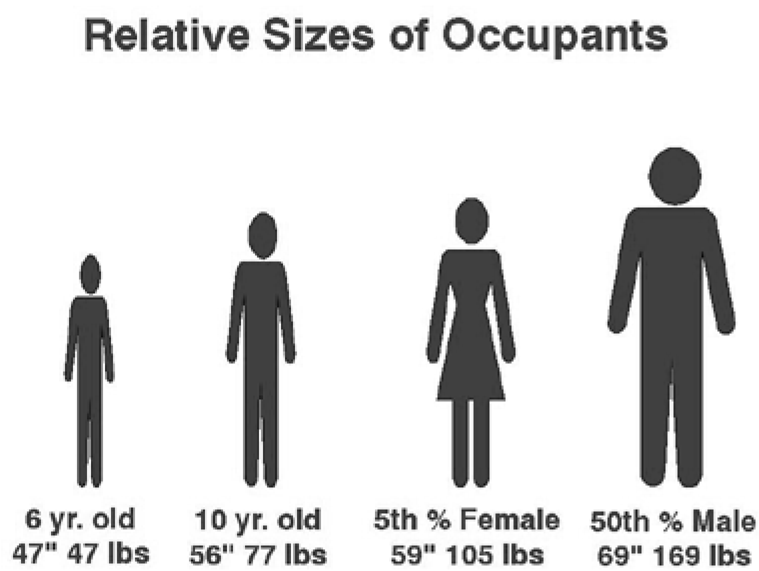
(End of video.)



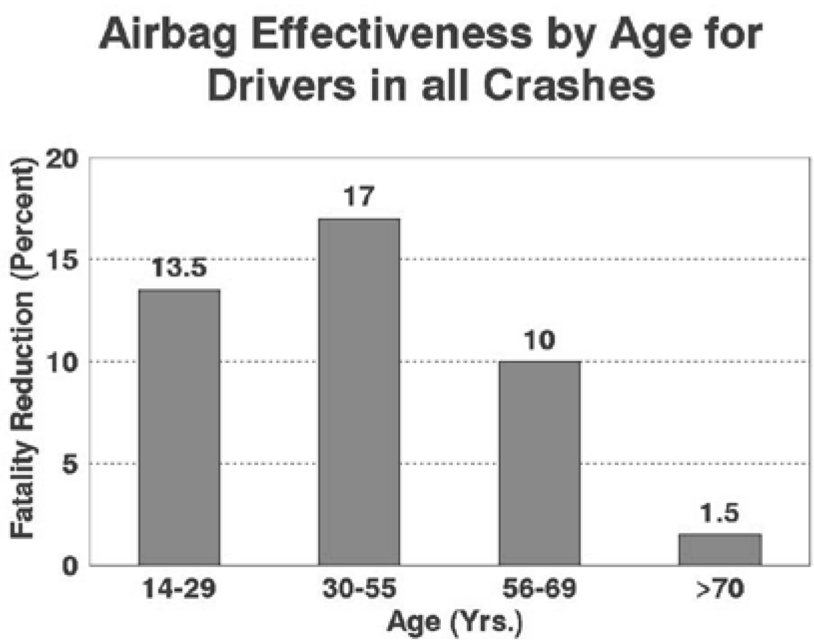
Slide 1. Proportion of male and female drivers. (From Ms. Weinstein's presentation, March 17, 1997.)



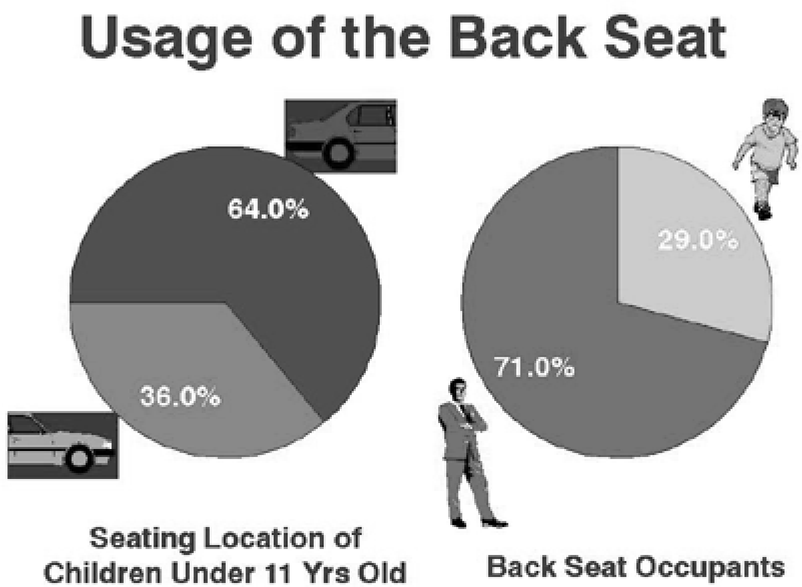
Slide 2. Aging population. (From Ms. Weinstein's presentation, March 17, 1997.)



Slide 3. Sizes of vehicle occupants. (From Ms. Weinstein's presentation, March 17, 1997.)



Slide 4. Air bag effectiveness by driver age. (From Ms. Weinstein's presentation, March 17, 1997.)



Slide 5. Usage of the back seat. (From Ms. Weinstein's presentation, March 17, 1997.)

Crash Experiences

CHAIRMAN HALL: All right. Thank you. I will now ask our Hearing Officer, Mr. Osterman, to call our first panel.

MR. OSTERMAN: Mr. Albert Ambrose, Ms. Susan Hayes, and Mr. Mark Lechtenberg, if you could please come up to the witness table.

CHAIRMAN HALL: We appreciate very much the presence this morning of Mr. Ambrose, Ms. Hayes, and Mr. Lechtenberg. Mr. Ambrose is from Nashville, Tennessee. Ms. Hayes is from Baltimore, Maryland, and Mr. Lechtenberg is from Longview, Texas.

Again, welcome, and we appreciate you all taking the time to travel here to participate in this important hearing this morning.

MR. OSTERMAN: Before we begin with Mr. Rayburn, I would like for each of you to introduce yourself for the record, please. Mr. Ambrose.

MR. AMBROSE: My name is Albert Ambrose. I'm from Nashville, Tennessee, and my daughter, Frances, was killed in an automobile accident last September the 12th or the 11th.

MR. OSTERMAN: Ms. Hayes.

CHAIRMAN HALL: I would ask each of you, if you would, to please pull those microphones close so that we can be sure everyone has an opportunity to share with your remarks. Thank you.

MR. OSTERMAN: Okay. Ms. Hayes.

MS. HAYES: I'm Susan Hayes. I'm from Baltimore, Maryland. I had an incident/accident June 22, 1996.

MR. OSTERMAN: Mr. Lechtenberg.

MR. LECHTENBERG: I'm Mark Lechtenberg from Longview, Texas. I had a head-on accident on a back woods highway in May of '94.

MR. OSTERMAN: Thank you. Mr. Rayburn.

CHAIRMAN HALL: Ms. Hayes, before we get started could you move your chair in just a bit, and I don't know whether—Bob, is there anything we can do with that cord to get that microphone closer? There we go. Thank you very much. Very good.

MR. OSTERMAN: Okay.

MR. RAYBURN: Good morning, ladies and gentlemen. As stated earlier, the reason we chose these three witnesses is they represent both the success and the failures of air bags. Mr. Ambrose will tell about how his daughter was killed by a passenger air bag. Ms. Hayes was in a vehicle when the driver bag deployed and seriously injured her. Mr. Lechtenberg was in a vehicle in a high speed crash and the seat belt and the air bag saved his life.

This morning, we're going to begin with Mr. Ambrose, but before we do, I want to show some diagrams and pictures on the board, so that the public will get a better picture of how this accident occurred.

(Slide 1 shown.)

MR. RAYBURN: This is a diagram showing Mrs. Ambrose's vehicle. This is in a residential neighborhood and she was doing around 30 miles an hour. Another vehicle came from the stop sign pulling out in front of her. They collided at the corners and then rotated into one another and then the vehicles went off. And Mrs. Ambrose's vehicle collided into a dirt embankment.

At some point in this collision sequence, the passenger and the driver air bag deployed. As you can see from the position of Mrs. Ambrose's vehicle, she was swerving quite a bit over to the left trying to avoid the accident. And she did indicate that she was applying the brake shortly before the accident.

I'll give you a few details from the medical examiner before Mr. Ambrose begins speaking. He indicated that the marks on the child's shoulder indicated that she was wearing a shoulder strap. There was some evidence in the vehicle that indicated this also. And there were witnesses that saw the child wearing a shoulder strap after the accident.

Could we see the picture of Mrs. Ambrose's vehicle, please?

MR. RAYBURN: This is a picture of the minivan as it came to rest against a dirt embankment in a ditch. Can we see the frontal picture, please?

(Slide 2 shown.)

MR. RAYBURN: As you can see, there's only minor to moderate damage to the vehicle. That concludes the overhead views.

Mr. Ambrose, you and I have talked several times. Would you just in your own words describe this accident?

MR. AMBROSE: Yes. I appreciate—first off, I appreciate Chairman Hall asking me to be here today, and I appreciate everything that he's done to help us and Parents Coalition to get as many of the—I guess to come to the point where we are today, which is better than where we were before Frances's accident.

I've got a few little things, and I think that it might be easier if I just kind of read them and give you an idea about where we are and where we're coming from. But this accident did happen on September 11th about 2:15 in the afternoon. And our middle daughter, Frances, who was age five was killed, and this was an accident that she should have walked away from, had it not been for the deployment of the passenger side air bag.

My wife, Frannie, our youngest daughter, Anna, and Frances were on their way home from Frances's day at kindergarten. She was—she had just started school with her older sister and it's a private school where we have to transport them back and forth, and we do hook up quite often. And because Frances wasn't in an afternoon hook up, Frannie would go get her like an hour earlier, because their school let out an hour earlier.

It also happened to be about the same time that the local high school let out. And a car driven by a local high school student, from the picture, obviously came from the right. Frannie was traveling down a road on which she had the right of way. The car coming from the right slowed perhaps, and then never really made a full stop at the stop sign. And before anybody knew what had happened, the two of the vehicles had collided.

Neither car was traveling an excessive rate of speed. And the impact was most likely between 15 and 18 miles an hour. I don't know. I think maybe Dave could help us with that. At some point during the accident, both the air bags deployed. And when Frannie looked over at Frances, she was unconscious and not responding.

When I reached them at Vanderbilt Hospital, the news was not good. And before long, the devastating news came that if Frances survived, she would most likely be a vegetable. But because she was a child, they would admit her and try to get the swelling in her head down enough to perhaps prolong her life. I don't think I'll ever forget that night of prayer, horror, sadness, suffering, nor the look on Frances's face as she lay helpless and lifeless with a giant tube in her skull to monitor the pressure, and I'll carry that vision with me for the rest of my life.

There's nothing that can be done for our Frances. This vivacious, happy, sometimes mischievous five year old was pronounced dead the next morning and our nightmare had only begun. Grief for the loss of a child is the most devastating circumstance which I found myself in during my lifetime. Not only has it devastated our lives and the lives of our large extended family, but also the life of a teenage driver of the other vehicle. And why?

We are now up to 38 child deaths attributed to passenger side air bags and two adults. How many more families will be randomly selected by circumstance for this heinous experience?

When I began to research the data which most of you probably take for granted or perhaps helped compile, I was amazed at one figure which really shocked me. That was the number of lives saved versus children's lives lost on the passenger side. I intend to say this more than once today, because I believe that this is the only piece of evidence which needs to be considered today, tomorrow or the next day. The estimated number of lives saved in the passenger seat by air bags is 164. The actual documented number of lives lost is now at 40, 38 of which were children.

This equates to one child killed for every four adult lives saved. It's like having a revolver with five bullets in the chamber and every fifth time you pulled the trigger, you kill a child.

For the adult, it doesn't matter if they're buckled or not. But when a child has been killed, we immediately ask, was the child properly buckled? Air bags were to design and protect unbelted passengers, weren't they?

Why did we ever allow a device marketed as a safety device to be placed in an automobile if it were going to take a child's life for every four adults saved? In my business, this would be considered a very poor track record. The industry has known of the dangers and yet they continue to place these bags in every new car manufactured.

We don't need to spend three days deciding what to do about design. That should be left up to the auto industry. We need to spend three days figuring out how to have 27 million passenger bags disconnected at once and how to stop having them put into every new automobile rolling off the assembly line to the tune of one million each month.

Until such time as a bag can be designed which will not be dangerous to any passenger regardless of age or size, they should be disconnected.

I commend Robert Sanders for all of his efforts to have labeling of new vehicles include warnings of possible death to children. And for the automobile manufacturers' written notices to all vehicle owners about air bag dangers to children. But we've set our sights woefully low, even if we're able to get 30 percent to listen and keep their children in the back seat, there will still be 30 or more children's deaths next year. I think what we showed up here a minute ago said 124. Somehow to me, that just doesn't seem acceptable.

Once again, 164 adult lives saved, 38 children killed, one in four. I believe that we've attempted to apply the what's good for the goose is good for the gander approach to passenger side air bags. And because of our rush to the marketplace, we have a very expensive dilemma on our hands. There are 27 million cars already on the road equipped with unintelligent air bags. We're adding to this number by about a million of new cars each month.

And after all the talk, the Senate, the Congress, our meeting with NHTSA, we still haven't been able to agree on what design is acceptable to all passengers. We've got quite a think tank in this room, and I think there have been some pretty intelligent people who have spoken in these panels before. And yet, we're still manufacturing cars with a dumb bag.

If a passenger side air bag costs the manufacturers approximately $120, which is something that I just kind of pulled out of the air, we've already spent $3 billion 240 million on equipping the current fleet with passenger air bags. That's $19 million per life saved. Are we driven only by economics?

Once again, we don't need to spend three days deciding what to do about design. I'm not a designer. These people are designers. Somebody out there is a designer. My wife had a pretty simple statement she keeps using during all of this. "Why would they have ever put anything in an automobile that would harm a child?"

(Pause.)

MR. AMBROSE: Let me tell you that there's nothing more valuable than a child's life. I certainly would have given mine and three others to allow Frances to have lived to my current age. We've deprived 38 children of the right to life and saved only 164 adults—one in four. Have we created a monster which can't be put down?

Thank you.

MR. RAYBURN: Just a couple of follow-up questions, Mr. Ambrose. You have an older daughter.

MR. AMBROSE: Yes.

MR. RAYBURN: And how old is she?

MR. AMBROSE: She's nine.

MR. RAYBURN: I believe on the day that the accident happened, we examined the vehicle. And your older daughter had adjusted the upper adjustable shoulder strap anchorage and it was in a down position, full down at the time of the accident. Is that correct?

MR. AMBROSE: I'm not sure of that, to be honest with you.

MR. RAYBURN: It was—

MR. AMBROSE: She was not in the automobile. Kathleen was still at school. Our two year old was in a child seat in the second seat of the van sitting behind my wife who was driving.

MR. RAYBURN: I believe your wife had told me earlier that that was true, that the upper adjustable anchorage was in a full down position.

MR. AMBROSE: We were—you know, six months ago, I had a two year old, a five year old, and a nine year old, and we certainly had need for an automobile as big as the one we had. And we're certainly pleased to have it, because it was a vehicle which we felt like was one of the safest on the road. And that by having dual air bags, it was a positive thing.

And yet, we're—I'm not sure that these people realize—I think I was telling you last night, that I was talking with some friends before I left South Florida earlier and people don't—they're not informed yet. We have all of these avenues to inform people about the fact that this front seat is dangerous to children. Automobile manufacturers inundate us with advertising.

As a matter of fact, I was laying in the bed at home on the night of the 7th of February and saw one of the big three had an advertisement showing an under ten year old child getting in the front seat of a minivan. I'm not so sure that's good posturing at this point in time. But so many people—you know, the mother says, "I've got to have my child in this car seat next to me. That's not going to happen to me."

And I think the reason why we're all here is to help protect those 128 "that can never happen to me" people that are going to be here a year from now speaking, because their children are going to be the ones that are going to have been killed. And we can't stop that. Labels can't stop it. Letter writing can't stop it. The only way you can stop it is do the same thing for every vehicle. If you're going to take the vehicle, you need to either have them disconnect the passenger side bag disconnected or you need to take every one of those vehicles and, at minimum, put an on/off switch in it, so that the parent can make an informed decision about what to do.

We have the same kind of situation Jim Hall referred to, because we do drive a hook up, and that seat has to be used by a child. And now after the fact, after 40 children have been killed, now it comes out where you can't use that front seat for children. Then why did I buy a minivan that would seat seven people?

MR. RAYBURN: Thank you, Mr. Ambrose.

MR. AMBROSE: Thank you.

MR. RAYBURN: Mr. Chairman, do you have any questions?

CHAIRMAN HALL: No, I just want to thank Mr. Ambrose for coming here. I know it's got to be difficult to recount and relive your family's experience, but I appreciate very much your willingness to leave a family vacation and to come and share with us.

Mr. Osterman.

MR. OSTERMAN: If I may proceed with the next witness.

CHAIRMAN HALL: Okay.

MR. OSTERMAN: Our next witness will be Ms. Hayes from Baltimore. Before we begin, can I see a picture of Ms. Hayes's vehicle?

(Slide 3 shown.)

MR. RAYBURN: This accident occurred in June of 1996 when Ms. Hayes's vehicle went off the road into a shallow drainage ditch and struck a drainage culvert. The passenger air bag deployed and struck Ms. Hayes in the face and head and she was critically injured from this accident.

Good morning, Ms. Hayes.

MS. HAYES: Good morning.

MR. RAYBURN: Just in your own words, could you please describe what you remember happening and telling you about the accident?

MS. HAYES: Right. First thing, I honestly do not remember anything about that day, and I was unconscious for about four and a half weeks. And when I became conscious, I didn't even really remember anything. I just had a lot to learn about what happened to me. That day, I—my son needed shorts and we were out shopping for some summer shorts.

And on the way home, my car went off to the right into a drainage ditch and the air bag deployed and I was very—less than a mile from home, and the police officer and—my son took the police officer to my house to get my husband. And when my husband arrived, he was hearing that I was en route to the helicopter to be flown to shock trauma. So he was quite surprised, too.

MR. RAYBURN: Could you tell the public about how tall you are?

MS. HAYES: I'm 5'2."

MR. RAYBURN: And how do you normally adjust the seat in your car?

MR. RAYBURN: For me to comfortably reach the pedals in my car, I have to be all the way up on the last notch of the forward and backward tread. And I did have my seat belt on. I always wear it. My four year old—at the time, he was four—was right next to me in his safety seat. And when I arrived at shock trauma, they did see my shoulder strap from my seat belt bruised my upper shoulder.

My son, he did walk away from it. He had a very hoarse—my husband tells me he had a very hoarse voice for quite a few days from the fumes from the air bag. And he had a little mark on his chest somewhere from his car seat.

MR. RAYBURN: Now, on your son's side of the car, he didn't have a passenger air bag, did he?

MS. HAYES: No, he did not. It was just my side, the driver side.

MR. RAYBURN: And how old is he?

MS. HAYES: He at the time was four. He is now five.

MR. RAYBURN: Okay. Now, was he in a seat belt or a car seat?

MS. HAYES: He was in a car seat.

MR. RAYBURN: Okay. Your vehicle was a—1990 model car; is that correct?

MS. HAYES: Yes.

MR. RAYBURN: Now, you were telling me that you had some concerns—you and your husband were telling me you all had some concerns about the safety of the vehicle when you first bought it. Can you tell me what the salesman told you as a selling point for the car when you first bought it?

MS. HAYES: Well, my husband and I were shopping for it. My husband had heard in the news about with it being such a compact car, the—I don't know if my terminology is correct—the drive under, the car literally going underneath large trucks on the road. And the car salesman basically blew all of the concerns away because it had a driver's side air bag and there wasn't anything to worry about. So that was—it was just, there's an air bag, so you're safe. Nothing else was said to us.

MR. RAYBURN: Okay. I know this is a personal item, but can you describe your injuries? Tell me what all kind of damage your body suffered from the air bag impact?

MS. HAYES: It broke my neck at C-2 and I had a neck fusion done. Reconstruction of my C-2. They took some of my hip and fixed that. I evidently had respiratory troubles and they did some cricoid surgeries and some tracheal surgeries. A lot of it due to swelling edema. And when I came to, I had a tracheostomy.

My face evidently—I never saw this, because I was not with myself, but the whole left side of my face was very bruised and my husband said it looked like somebody dragged me by my feet across the road. It was just very chewed up. And my left eye was swollen and had—I had no muscular movement of it whatsoever. I come to learn over the next two months when I could start to use my eye, that it had third nerve damage.

There were a lot of issues that I wasn't involved with my care. I'm a registered nurse and it's just kind of different and unusual me hearing about all of these that happened to me, and I truly wasn't involved, but I had—I never heard an actual diagnosis, but they were monitoring essentially my head for swelling and had many different monitors in me. And when I woke up, a majority of my hair was shaved off. That was a whole other upsetting issue for me.

MR. RAYBURN: Have you ever—this accident occurred in June. When did you finally get out of the hospital?

MS. HAYES: Right from shock trauma, I went to Kernans Rehab Hospital. And I went home in the middle of August. I'm not sure of the exact date, but in the teens in August.

MR. RAYBURN: You said you earned your living as a registered nurse. Have you ever been able to go back to work yet?

MS. HAYES: No. With the trauma done to my eye with the third nerve, it—I have constant double vision. And I haven't been able to return to work, no.

MR. RAYBURN: Well, thank you very much for your testimony. Mr. Chairman, do you have any questions?

CHAIRMAN HALL: No. Again, I appreciate very much your presence here and your willingness to share your experiences with us.

MR. RAYBURN: Our next witness will be Mr. Mark Lechtenberg from Longview, Texas. Could we please have the viewgraph of the Lechtenberg accident?

(Slide 4 shown.)

MR. RAYBURN: This is a sketch of the accident. This is a head-on collision on a rural highway. The vehicles came together. There was a pretty severe offset, and they rotated apart after impact. The approximately impact speeds were around 55 miles an hour for both vehicles. One vehicle was apparently on Mr. Lechtenberg's side of the road. And he was trying to swerve and miss it, and then they collided.

Can we have the first view of his car, please?

(Slide 5 shown.)

MR. RAYBURN: This shows the severe impact on the left front corner of the vehicle. Can we have the next photograph?

(Slide 6 shown.)

MR. RAYBURN: This is a side view of Mr. Lechtenberg's vehicle. There was a severe amount of intrusion. The wheel base was pushed back about 25 inches on his side of the vehicle. Mr. Lechtenberg's son, Tanner, was in the back seat and his two year old daughter, Shelby, was in the right front seat.

Mr. Lechtenberg, could you just in your own words describe the accident that day?

MR. LECHTENBERG: What you said was pretty well true. I don't remember all of it, but a lot of this is from my son, who was 12 years old, but was very tall. He's about 5'6" or 5'7" at that age. And so he could see very well. And the other driver was swerving back and forth on the highway. And I went to where I thought he wasn't, and I just ended up not being able to avoid him.

I was, of course, knocked unconscious. The odd thing was my daughter always rode in the back seat—in the middle back seat always. And this one time, she was just really fussing to go into the front seat. That was the big thing, was to be able to—she couldn't do it. So that was the big thing, to go ride in Bubba's seat. And we needed to get to school. I was on my way to work and drop my children off at school on the way. And her babysitter was going to pick her up at Tanner's school. So, I said, okay, let's do it and go.

She was in her car seat. She was buckled up. It ended up being a blessing that she was that way, because if Tanner would have been in the front seat, they said at minimum, he would have lost his legs. So, the way it ended up, the seat belt in the back seat—my son was sitting behind my daughter in the passenger back seat. It broke his collar bone where the strap came across. That was the only injury that he received.

My daughter, the rear-view mirror, the glass from it, cut her head pretty severely. And that was the only injury that she got. As far as my injuries, I had two skull fractures. I had 18 breaks in my—the right—in my forearm. I've got a couple of plates holding that together. I broke a rib. I lost my spleen. I had a punctured lung. I crushed my left femur.

They found out later that I also had torn up my knee, my left knee. I broke my right humorous and got some substantial nerve damage going from the shoulder to the hand. I've got a plate holding that together. A rod holding my leg together. I have an Achilles tendon holding my knee together. I'll always have those.

I lost this ear. It was cut off. And luckily, they could put it back on. I had some facial and sinus damage from my air bag. I had the same eye damage that she had.

Luckily, I can see fairly normally now. My double vision went away with time, except on the perimeter. I still have double vision on periphery.

I had a lot of head swelling. I was in the hospital for about six or seven weeks. I was allowed to go home about a month early, because my wife is a critical care nurse, a registered nurse. So, they allowed me to go home early from that. They had just finished care on me, I think January of '96 was my last surgery. There will be no other surgeries.

There so much scar tissue and they can't take any of the metal out. That's why I'm a little shaky. I get cold now. So, it's best—hopefully that is it. I was off of work for nine months. I'm a pharmaceutical rep, so I was able—I was on crutches for a while, but I was still able to work. That was important to me to be able to get back to work, to be productive.

I went back about six months early, but it was worth it. I was very lucky. My company worked with me very well, to enable me to do that. So, I did—was able to go back to work in about nine months.

One of the main reasons I chose the car I was driving, a '93, I believe it was, Dodge Dynasty, was for the air bag and for the size of the car. We had several choices. We could choose the Chevrolet, which did not have air bags, and the Ford Taurus, which was a smaller car than my Dynasty. I chose the Dynasty for the size of the car and for the air bag.

I put about 40,000 miles a year on a car, and so safety is a prime concern to me. So that is the reason I chose the car. And I would like to thank the people at Chrysler. They did a good job engineering that vehicle. It was a stiff accident and it held up well.

I do believe that the two things that saved me was—one was God and the other was the air bag. Without it, I don't—they don't know how I survived in the first thing. No one can explain it. But I know that it had a lot to do—even though I did receive some facial damage, which still affects my speech, but I think that was worth it when you compare the alternative.

MR. RAYBURN: Thank you very much, Mr. Lechtenberg. Mr. Chairman, do you have any questions?

CHAIRMAN HALL: No, these are—I think the words that each one of you all have spoken and speak is much more powerful than anything that I can add in any type of question and answers, and clearly demonstrates the dilemma that we're trying to deal with in this hearing.

And all I can say to Mr. Ambrose and Ms. Hayes, and Mr. Lechtenberg, is how much I appreciate you all being here and sharing your personal experiences with us. This conference and this hearing's bottom line is about people, and what we as a society and the Government and industry are going to try to do in the safety arena. And your testimony, I think, has given us certainly an appropriate setting for this.

MR. LECHTENBERG: One more thing, Mr. Chairman?

CHAIRMAN HALL: Yes, sir.

MR. LECHTENBERG: This to the manufacturers. The prime concern of a parent is their child. So, I would just ask you that you keep that in mind when you design vehicles, when you do the safety of the vehicles, that that is our number one concern. It is not ourselves, it's our children. And when you design a vehicle, keep in mind everything that a parent must deal with and consider in keeping that child safe. And if you will do that, then I believe you're doing your intended job.

CHAIRMAN HALL: Ms. Hayes, would you like to add anything before we close?

MS. HAYES: Just through all of my tragedy and what I've been through in the last nine months, I—at my worst, I just say to myself, my Benjamin, my little boy is 100 percent, and that is so true about the children. And I just—truly, it boils down to say, I am very thankful there was not a passenger air bag, because I don't know what this—I'm scared of what this situation would be.

CHAIRMAN HALL: Well, I think that both of your testimonies at least point out the fact that even parents with the very best intentions, at times, our kids can get us to do things sometimes, such as having the children in the front seat, that even with all the publicity and everything, it presents a dilemma. I remember with my Molly and Katie, there was nothing more important than being able to sit up front.

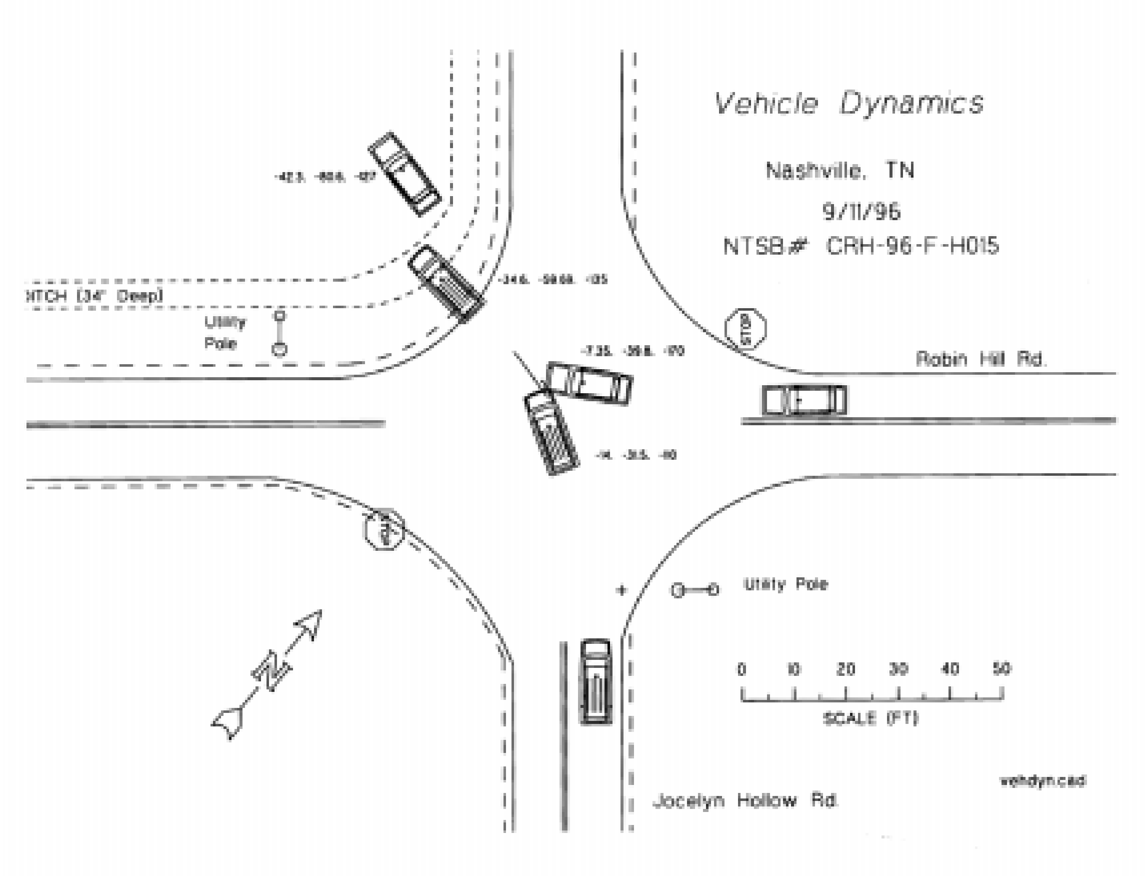
Mr. Ambrose?

MR. AMBROSE: I think I'm good.

CHAIRMAN HALL: Well, again, I thank you all very much for your testimony. If you wouldn't mind, remain seated just a moment while I make a brief announcement for everyone. We're going to take a break now.

We are operating pretty much on schedule. We'll take a 20 minute break and try to be back here close to 10:30 in your seats. Thank you.

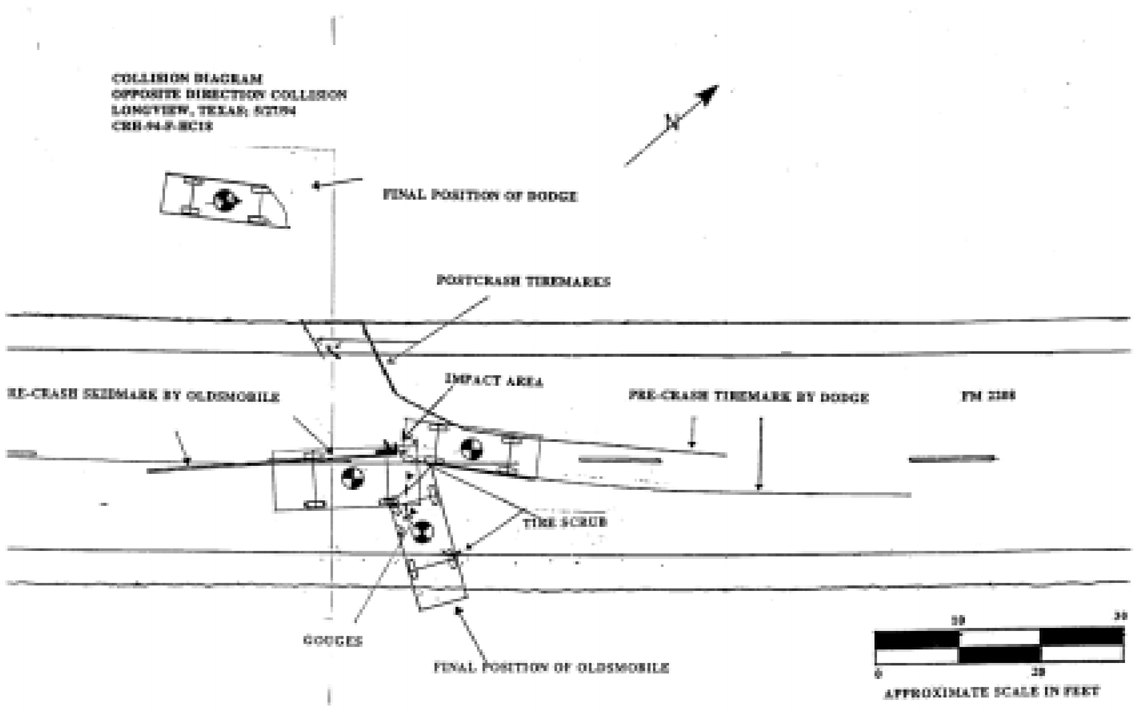
(Whereupon, a short recess was taken.)



Slide 1. Diagram of Mrs. Ambrose's collision. (From Mr. Rayburn's presentation, March 17, 1997.)

Slide 2. Mrs. Ambrose's minivan. (From Mr. Rayburn's presentation, March 17, 1997.)

Slide 3. Ms. Hayes's vehicle. (From Mr. Rayburn's presentation, March 17, 1997.)



Slide 4. Diagram of Mr. Lechtenberg's collision. (From Mr. Rayburn's presentation, March 17, 1997.)

Slide 5. Mr. Lechtenberg's vehicle, front view. (From Mr. Rayburn's presentation, March 17, 1997.)

Slide 6. Mr. Lechtenberg's vehicle, side view. (From Mr. Rayburn's presentation, March 17, 1997.)

NHTSA Findings and Strategies With Respect to the Air Bag Issue

CHAIRMAN HALL: On the record. If I could ask everyone to please take their seats, we will reconvene this public forum. I would like to take this opportunity to welcome Administrator Dr. Ric Martinez to the podium, who is here with a panel from NHTSA. And, Mr. Administrator, we very much appreciate your presence and look forward to your presentation. And if you would be kind enough to introduce the individuals with you, and then we'll be glad to sit back and listen to your presentation, sir.

DR. MARTINEZ: Thank you, Mr. Chairman and members of the Board. With me today is Robert Shelton, Associate Administrator for Safety Performance Standards. To my left is NHTSA Deputy Philip Recht. To my right is Executive Director of NHTSA Donald Bischoff. And to my far right is Associate Administrator for Traffic Safety Programs, Dr. Jim Hedlund.

Thank you, Mr. Chairman, and thank you, members of the Board for the invitation to appear before you here today to testify on the safety and effectiveness of air bags.

I want to begin by thanking you for providing a forum in which everyone with an interest in air bags can discuss the promise and the problems of air bag safety. This is unquestionably the central issue of motor vehicle safety today, and one that deserves the utmost attention. It is NHTSA's number one priority.

Hearing the personal stories related this morning, just makes all mindful that the statistics we discuss are not just numbers, but are real people and real stories. Let us never forget that. And I thank you for making that point so clearly earlier.

You've given us a generous amount of time at the beginning of your forum. And this gives us a chance to lay the basic facts on the table and to describe our comprehensive strategy to address the issues of air bags.

I will begin our presentation with the overview of the motor vehicle injury problem. The role of air bags and their effectiveness, the adverse effects of air bags, our comprehensive strategy, and our activities to date.

My colleagues will then provide more detailed discussion on key issues that you will address over the next four days.

As I begin, I urge you to keep in mind that just as the safety—of highway safety is complex, so is the issue of air bag safety. There is no single or simple solution. All of us who are concerned about highway safety have a role to play in resolving issues of air bag safety.

Under this Administration, we have made collaboration and cooperation a central approach to addressing the motor vehicle injury problem. We believe the problems we face today are so important that we must all focus on issues of injury prevention if we are to make timely progress.

Mr. Chairman, the problem of motor vehicle safety must be seen for what it is. It is a public health problem. Motor vehicle crashes take the lives of over 41,400 Americans every year. That's about 113 lives every day or just 450 deaths during the short time of this four day hearing.

Crashes are the leading cause of all deaths under age 44 and for each age between five and 27. They are the leading cause of head injuries for all age groups. Head injuries, in turn, are the leading cause of fatalities in motor vehicle crashes.

(Slide 1 shown.)

DR. MARTINEZ: Nearly two-thirds of fatal and serious crash injuries occur in frontal crashes, the crashes for which air bags are designed. Now, these injuries occur as the result of violent forces that occur in what has been called the "second collision."

When a vehicle crashes, it stops suddenly. The occupants move at the original speed of the vehicle until they, too, crash into something. If they hit the steering wheel or the windshield or the dashboard at high speed, the result can be serious or fatal. Alternatively, if they are restrained, the chance of such injury is significantly reduced. Safety belts help to prevent or reduce the effects of this second collision.

(Slides 2–11 shown during statements.)

DR. MARTINEZ: This slide and it's going to be difficult—I may just not use slides, Mr. Chairman, but I wanted to show some slides of dummies in the impact of a frontal crash. Instead, I think what I will do is use the slides just as an overview background to show some of the numbers that I will come to in a minute.

The air bag also prevents or reduces the effects of this second collision. The air bag is designed to inflate fully before an occupant first impacts it. As the occupant's body moves into it, the bag deflates, slowing the occupant gradually over a longer distance, while it distributes the crash forces over the occupant's body. The air bag provides supplemental protection to belt wearers in severe crashes and substantial protection to those who do not wear their safety belts.

Current motor vehicle safety standards require frontal crash testing both with and without seat belts. This reflects real world experience. Today, seat belt use for occupants in potentially fatal crashes is still about 50 percent. While some note that that seat belt use in the general population is reported at 68, and observational studies show it to be lower, that number is still pathetically low when compared to other countries.

Those that are unbelted are also more likely to be young, without health insurance, and more likely to be involved in a serious crash.

Air bags are effective in frontal crashes. I want to point out that it's frontal crashes that we're talking about. They do not work in side impacts or in rollovers or rear impacts. The effect of the study show that an air bag reduces the chance of fatalities in a potentially fatal crash by 34 percent for unbelted drivers, 21 percent for belted drivers, and 27 percent for passengers.

In all crashes, that includes crashes in which the air bag cannot provide benefit, the overall effective numbers are 13, 9 and 13 percent respectively. We note negative benefits for children under 13 years old, and that age demarcation is arbitrary since we have too few cases to be more precise, and no benefits for elderly individuals.

To date, air bags have saved over 1,810 lives. A number which increases every day and prevented thousands of serious head and chest injuries. We have identified 21 adult drivers, 38 children—9 of which were in rear facing seats—and three adult passengers killed by the air bag. Of these adult drivers, the majority were unbelted and most all of the children were unbelted or improperly belted.

Many of these deaths occurred in relatively low speed crashes. We've also identified cases of serious head injury and patterns of injury, for example, forearm injuries. We find these deaths and serious injuries unacceptable. And the point to make on this is that the effects we're seeing are cumulative, because the fleet continues to change, that there's more and more of the air bags in the fleet.

Right now the number we have as of March 1 is 1,810. And you see the number grows greater and greater every year. We believe we're early in this curve and we wanted to make our changes early, so we can maximize the benefits of the air bags and rid ourselves of these adverse effects.

And we recognize three groups of individuals and families to protect; those with the vehicles already on the road, those purchasing new vehicles in the next few years, and those buying vehicles in the future. Now, this meant there was no single or simple solution, but a comprehensive strategy that incorporated a series of behavioral and technological solutions, both immediate and long-term.

Our strategy is predicated on moving quickly to resolve the issues. As Administrator, our strategy to address this problem is three fundamental principles; number one, preserve the benefits of air bags while eliminating the risk; number two, placing a priority on children's safety; number three, speeding solutions wherever possible by working together with others.

To protect families with cars on the road already, the immediate challenge was to make people aware of the risks and steps they could do immediately to reduce those risks. We wanted to prevent every death or every serious injury that we could. We have created an unprecedented public/private partnership and unprecedented public information effort involving Government at all levels. Virtually every national safety organization, scores of professional and civic organizations, law enforcement, teachers, medical professionals, students, businesses, and many more.

The message is very simple—buckle up, children under 12 in back, sit back from the air bag, and never place a rear-facing child safety seat in front of a passenger side air bag. The survey show a fairly good success. The message has high penetration in a short period of time. Dr. Hedlund will tell you more about these efforts that include a growing coalition, as well as every modal agency and field office in the Department of Transportation.

We appreciate the Board's participation in this effort also. And, Mr. Chairman, thank you when we called the coalition together for being there and being a leader in that.

The NTSB has requested that vehicle owners be notified directly by letter. After meeting with the families of children killed by the air bag, I went to Detroit and requested that this be done. It was the right thing to do and today, millions of letters with warning labels have been sent.

We wanted to quickly improve the safety of cars being built today and for the next few years. Last week, we released a final rule that expands the flexibility that manufacturers have to depower air bags, so that they will be less risky to children and some adults.

We moved at record pace, finalizing this rule in only nine weeks, so that the manufacturers could move quickly, too. We expect to see depowered air bags in cars in model year 1998 or sooner.

We also wanted better warning labels for drivers and families. We used focus groups of parents when we proposed new enhanced warning labels for vehicles in August of last year and brought that into a final rule in only three and a half months. Cars today have those new warning labels. We also extended the sue of cut-off switches for those vehicles without a rear seat.

Technological solutions are complex. When the agency initiated a search for solutions, we asked commenters to tell us what was the cause of injuries and how to prevent them. The actual cause of injuries was not well known. Through an emergency research program, we discovered that there were two distinct mechanisms for children's injuries; the direct impact of the air bag in some cases and the membrane effect in others.

Solutions such as two-stage air bags, increased deployment thresholds, and sensor technology all have merit—all have merit and are currently allowed under the existing standard. However, today's problems stem in part from the "one-size-fits-all" technology used and major changes to designs require several years lead time before it is introduced into new cars.

We felt that depowering could be done quickly, but how to do it and what were its effects was identified through a NHTSA research program in conjunction with many others and is the foundation upon which most all current air bag safety research is based. We completed that research in only ten months.

We continue to move ahead. We are now in rulemaking on deactivation and precluded from discussing it in detail. Suffice to say that we have proposed to allow deactivation in those situations in which the risk of air bag cannot be avoided by the simple ABCs of air bag safety. We continue to note that disconnecting an air bag itself carries risks as one loses its life-saving benefits.

To give families greater safety in the cars of the future, NHTSA is working to deploy advanced air bag technology or smart air bag systems as quickly as possible. And this is a task that Government cannot do alone. It takes all of us working together and we are committed to bringing these resources to bear on the issue of people.

This Administration and this Administrator strongly believes that the solutions of today's problems lie in working together, focusing on the issues. To do so, we are bringing the experts together from around the world and across the disciplines. We've done this with the Air Bag Safety Campaign and the Blue Ribbon Panel on child safety seats, which led to a proposed global standard to improve child safety.

We are building bridges between old adversaries and current competitors, so that we can all focus on making people safer.

Let me say this. As a physician, my primary focus is on real people, not statistics, not dummies. And this is as it should be. Dummies are just poor imitations of people. In order to keep that utmost in our minds, I bring my staff and engineers to spend evenings in trauma centers and see the reality of their work. We continue to bring engineering researchers and medical professionals together. We now have seven trauma centers and dozens of emergency departments providing us with crash investigations and medical information and are taking steps to expand that dialogue with vehicle safety engineers in Detroit and worldwide.

I firmly believe that if this dialogue had been the way of doing business five years ago, many of the problems we have today may have been avoided.

Others are taking this message to heart. Recently, the AAMA has created a proposal to fulfill this desire and bring about a coordinated research plan that will lead rulemaking on smart air bags by the end of this year. I have asked them to include the foreign manufacturers, insurance, and safety groups, medical researchers, and others into these discussions.

NHTSA will continue to facilitate these meetings to examine technical details, as well as determine roles for all interested parties. We want to find the right way to do the research needed by leveraging all of our resources. This means working together for the good of the people.

We also continue to move aggressively in the longer-term behavioral issue of increasing seat belt use through good laws and strong enforcement. The NTSB and its members have been strong allies in this mission. As a matter of fact, I had the pleasure of testifying with Mr. James Arena in New Jersey. And we will continue to work hard as an agency and member of countless coalitions on this important issue.

Mr. Chairman, that concludes my overview and I will now ask my colleagues to give you and members present greater detail on these actions. Again, my thanks to you for providing this opportunity.

Thank you.

MR. RECHT: Thank you, Ric. As Dr. Martinez indicated, NHTSA has taken a comprehensive approach to improve the performance of air bags, that is involve both technological and behavioral actions that addresses cars on the road today, those cars which will be built in the next few years, and cars which will be built further down the line, which will have advanced performance air bags.

As Dr. Martinez also indicated, none of these actions constitute a silver bullet. They all are necessary. They're all designed to work together. Many of our action items have required regulatory action, particular, the technological items.

(Slide 12 shown.)

MR. RECHT: I'm going to take a few minutes to review our regulatory actions to date. After that, I'm going to ask Don Bischoff to discuss for a few minutes some issues concerning smart air bags. And then Jim Hedlund is going to talk about our behavioral activities.

On November 22, 1996, we announced our complete package of regulatory activities. They're listed on the board behind you. There are five actions which we were either underway with or going to propose. The first one involved improved warning labels. The second one extending the permission of cut-off switches for vehicles with inadequate rear seats. The third one was to allow depowered air bags. The fourth was to allow air bag deactivation by owners. And the fifth was to mandate smart bags.

Let me take a minute to review these one by one. Turn the next slide, please.

(Slide 13 shown.)

MR. RECHT: As you're aware, warning labels have been required in vehicles and child safety seats since 1994. I think it's fair to say that there was limited consumer awareness and, therefore, limited effectiveness of the existing labels.

Accordingly last August 1996, we issued a rulemaking proposal, an NPRM, which proposed new, more eye-catching, colorful, and, hopefully, effective labels. On November 27th, about four months later, we issued a final rule, which, in fact, mandated these labels. As you can see, they were mandated within 90 days for new cars and light trucks by February 25, 1997. Child safety seats had 180 days to put these new labels on.

Next slide, please.

(Slide 14 shown.)

MR. RECHT: The requirements of the rule were as follows: Permanent new or new permanent labels would be required on sun visors, but the up and the down side of new vehicles. Also, permanent new labels would be required on child restraints, as well for the first time, we were requiring a temporary label on the instrument panel and the steering wheel, a label that can be removed by the purchasers after they purchase the car.

We based the language of these labels on extensive focus group testing. I can tell you we conducted six focus groups before we put out our proposal and another six focus groups after we received the comments to make sure we had the best possible wording. And, in fact, the wording we chose emphasized child safety, but we were careful to include additional messages applicable to all occupants.

Next slide, please,

(Slide 15 shown.)

MR. RECHT: We think the changes between the old and new labels are quite dramatic. Here is a copy of the old label. As you can see, no pictures. We had no color requirements. Any colors could be used. The language, which gave important messages, nonetheless, was quite dense.

If we can go to the next slide.

(Slide 16 shown.)

MR. RECHT: You can see the new labels. These are the labels required on the visor, one in the up and one in the down position. As you can see, we have gone to a pictogram. We use warning signals. We use the traditional warning colors. And quite clear and concise language that get the messages out about where to place children and the importance of everybody buckling up and sitting back from the bags.

(Slide 17 shown.)

MR. RECHT: These are the labels for the child safety seat at the top. And I would note that we are requiring the child safety seat label to be placed in a different place, to be placed near where the child's head goes, so that the parents in every instance when they put the child in the seat will have an opportunity to see it. The bottom label is the removable label on the dashboard.

As I indicated, the labels have to be on new vehicles by February 25th. And as Dr. Martinez indicated, we understand they are. We have taken two actions to help get labels out to owners of existing vehicles. We have urged the car companies and they, in fact, went ahead and agreed to mail the labels out and we believe that is by and large completed, was completed in the last two months.

Also, Mr. Hedlund will tell you about other activities we have underway to get labels out and available at DMVs and other places where motorists go.

(Slide 18 shown.)

MR. RECHT: The second rulemaking item involved extending the permission for passenger air bag cut-off switches to be placed in certain vehicles. We first allowed that in May of 1995. We set sunset dates of 1997, 1998 at that point in time, believing that new technology would make manual cut-off switches obsolete and unnecessary.

Next slide, please.

(Slide 19 shown.)

MR. RECHT: After we issued the rule, in fact, at least two manufacturers have gone ahead and put these cut-off switches in their vehicles; first Ford, then GM. In our information, I will tell you it's been—the experience has been positive. The consumers who purchased the vehicles, we understand, were quite pleased to have the device in the vehicle. We're not aware of any reports of misuse or abuse.

This past August, it became quite obvious to us that the advanced technology—advanced suppression technology was not yet available. We proposed to extend this permission until the year 2000. On January 6, in fact, we issued that final rule. And I will tell you that since the final rule, Chrysler has now indicated that it, too, will make cut-off switches available on some of its vehicles.

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(Slide 20 shown.)

MR. RECHT: The third regulatory item involves depowering. In 1995 and 1996, we looked at a number of technological alternatives that could reduce air bag risks in new cars on an interim basis. That is until smart bags were available. And these alternatives included not only depowering, but raising deployment thresholds—I know something the Board has been deeply interested in—dual stage inflation and the like.

Based on the information we received, depowering had the most near term promise. It was the one item that could be—depowered air bags was the one item that could be placed into cars in a matter of months as opposed to years, as well, the other alternatives that I mentioned were at the time and remain permissible under our standard.

We proceeded to conduct the research that Dr. Martinez described. However, research showed that depowering and the range of 20 to 35 percent significantly reduced the entry measures for out of position children without significantly decreasing protection for adults.

Beyond 20 to 35 percent, however, we found very few additional benefits for children and a dramatic drop off in benefits for adults. So, this past January 5th, we issued a proposal, in fact, to allow depowering in the 20 to 35 percent range. Next slide, please.

(Slide 21 shown.)

MR. RECHT: And as you know, this past Friday, March 14th, we issued a final rule. We will allow depowering by way of changing our unbelted crash test to allow a sled pulse test instead. We have also added to that sled pulse neck injury criteria to ensure that depowering—excessive depowering does not occur. We set an immediate effective date under that rule, and we also set a sunset date of September 1, 2001, a point in time where we believe that smart air bags will be probably available in the fleet.

The information we have is that the depowered systems certainly will be available in model year—by the beginning of model year 1998 and perhaps earlier. Let me mention also that in our rulemaking, we granted a petition to include a fifth percentile female dummy in our standard. We're working on that and it will be included at an appropriate time.

Before we go on, let me just emphasize two points. First, that this rule is intended to provide additional flexibility to manufacturers, so, in fact, they can put depowered bags in, but it is not meant to hinder or prohibit any other technology, any other changes, which would be beneficial. For example, dual stage inflator, higher performance thresholds, and the like remain permissible. And to the extent there are appropriate solutions, we don't mean to hinder that kind of—those kind of solutions.

I also want to emphasize a point Dr. Martinez made, which was with all three of these rulemakings that are now all final rules, we moved in record time. The average time between a rulemaking proposal and a final rule at NHTSA—which, by the way, is one of the most prolific rulemaking agencies in the entire Government—is about ten months.

The label rule issued from the date of proposal to the date of final rule in less than four months. The cut-off rule issued from proposal to final rule in less than five months. And the depowering rule issued in nine weeks, which is just a little more than two months. We've asked around the agency and nobody is aware of any rule issuing in quite such a rapid speed before.

Next slide, please.

(Slide 22 shown.)

MR. RECHT: The fourth regulatory action, which we're proposing involves de-activation. This is part of our approach to reducing risk in existing vehicles. And, in fact, on January 6th of this year, we issued a proposal to allow vehicle owners to have their air bags deactivated by dealers or repair businesses. The reason we issued this is because currently under the law it is illegal for dealers and repair businesses to render inoperative any safety device and it makes it illegal for them to do that.

Next slide, please.

(Slide 23 shown.)

MR. RECHT: For NHTSA, however, it is permissible under our discretion to grant permission on a case-by-case basis to allow deactivations, and we have been doing that for a number of years, and we continue to do that. We are allowing deactivation on the driver, and actually, I should say passenger side, as well, for medical justifications. And on the passenger side, if somebody indicates that they need to carry an infant seat in the front, be it because the vehicle doesn't have a rear seat or for a medical justification, we've been granting approvals, as well.

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(Slide 24 shown.)

MR. RECHT: We propose to allow deactivation on a temporary basis only until smart air bags are introduced and in issuing the rulemaking, we proposed or, excuse me, emphasized a number of points. First, the deactivation was appropriate only for a limited number of vehicle owners. Secondly, it was important for consumers to make informed decisions. And, third, a point that's not up there, but we felt it was desirable to eliminate the need for consumers to petition the Government for permission to obtain deactivation.

The comment period closed on February 5th. I can tell you that we've received about 500 comments. I think it's fair to say there's a consensus that there needs to be some mechanism to allow deactivation in appropriate cases. Suffice as to say there are many different views as to what the best means are on what appropriate cases are.

At present, we're reviewing the comments. We intend to move as quickly as we possibly can to make final decisions. As Dr. Martinez indicated, and as you well know while we are in rulemaking, we can't comment further on our deliberations or the likely outcome. I can tell you one thing, though, in the meantime, we are continuing to consider individual requests. As of today, we have received about 4,000 of those requests. We continue to receive them at the rate of about 50 per day and we have granted about 1,000.

Next slide, please.

(Slide 25 shown.)

MR. RECHT: The fifth and last of our package of rulemakings involves smart air bags, smart air bags or advanced performance air bags. We will tailor the deployment of the bag to the size and position of the occupant. I think it's fair to say there's universal agreement that smart air bags are the ultimate solution here. They will supersede all the other interim and short-term solutions, which we have proffered.

Next slide, please.

(Slide 26 shown.)

MR. RECHT: We envision requiring smart air bags for both the driver and the passenger side. And, of course, the challenge is to select the right performance requirements that both spur the marketplace, spur the development of these devices without being design restrictive. As Dr. Martinez indicated, our goal is to work as quickly and cooperatively as possible, with all interested parties to reach this common goal.

In a minute, I'm going to ask Don Bischoff, our Executive Director, to talk about some of the many issues that surround smart air bags, but I want to add mention of one additional rulemaking, which while not part of our November 22 package, nonetheless is very important and I know a matter of significant interest to the poor, and that involved our rulemaking on uniform attachment of child safety seats. As you know, on February 20th, that rulemaking was announced by the President himself.

It involved a rulemaking proposal to require uniform attachments. In two years, the proposal would require soft anchorages to be fitted onto all child safety seats, as well as a tether on the top. It would allow rigid attachments as an additional alternative—as an additional option, I mean.

The rule would also require there be two attachments points in the rear seats that would allow one attachment point in the front seats if the vehicle had some cut-off switch or air bag suppression device. The rule would require all these technologies and new devices to be in place two years after final.

These requirements, if and when they do become final, will facilitate proper child safety seat use. Particularly, the placement of child safety seats in the back. And as such, they will significantly help reduce the air bag risks to children.

The rulemaking has a 90 day comment period, which will end May 21st. And, again, we intend to move swiftly in considering the comments in reaching final decision.

With that, let me turn the program over to Don Bischoff.

MR. BISCHOFF: Thanks, Bill. Advanced air bags is the proverbial good news/bad news story. The good news is that everyone agrees that we need to improve the performance of current air bags. Advanced air bag systems need to be designed to optimize performance for a wide range of occupant sizes and ages at both the driver and passenger position under a variety of crash conditions.

Manufacturers agree, restraint system suppliers agree, highway safety advocates agree, and probably most importantly, the American public agrees. The Center for Risk Analysis at Harvard today released a survey which shows that Americans overwhelmingly favor the use of air bags. And when asked if they would be willing to pay an additional $150 for a special air bag that would not deploy when someone is too close to the air bag, more than half of them said they would. This is particularly good news, because since most of the suppression technology that we're looking at today is well under $150.

(Slide 27 shown.)

The bad news is that we have a lot of hard work ahead of us. The design of advanced systems that offer truly optimized protection under a wide range of crash conditions involves a host of complex issues. Some of which I'll go through for you in a moment.

If we are to bring these improvements on line quickly and reliably, as Dr. Martinez said, then we must leverage our own resources and expertise to accelerate these time tables. NHTSA expects to play a leadership role, as we did in the depowering by moving quickly and comprehensively to define the issues, define the tests criteria, and to set performance levels.

(Slide 28 shown.)

It will be industry's responsibility to specify the design and technology to achieve these performance levels. So what are we doing? In August of '96, we published a definition of smart air bags as a part of our rulemaking to require bold, new enhanced warning labels.

Part of the rulemaking strategy was to encourage development of advanced air bag systems by offering to sunset the requirement for labels when the advanced systems were installed. We thus needed to define smart systems as the criteria for not having to put a label on.

There has been a lot of debate recently over what constitutes a smart system. And many have said that what is smart today will be dumb tomorrow. So, in retrospect, it was probably a poor choice of words. What is really desired is consistent improvement in air bag performance, as more advanced production capable technology becomes available.

It is the goal of NHTSA to upgrade the performance specified in Federal Motor Vehicle Safety Standard 208 to optimize protection for a range of occupants under the broadest set of tests conditions when the technology becomes available.

(Slide 29 shown.)

To get started with the difficult task of specifying advanced air bag performance, we convened a two-day public workshop to discuss the status of air bag technology and development, possible performance envelopes, and test procedures.

There were about 200 attendees at the public workshop. Presentations were made by NHTSA suppliers and others during the first day. And the second day was comprised of brainstorming sessions primarily centering on performance parameters and attempting to answer the question of what technologies were available and specifically at what time frames.

(Slide 30 shown.)

Let's now take a little more detailed look at some of the issues which help define the performance envelope for advanced air bags for passengers. Even though we've heard that a major thrust so far, the public information campaign has been put children in the back, surveys still indicate that while 90 or so percent of the people understand the children should be in the back, 30 percent or so still desire to have the children in the front. And, of course, then there are special medical monitoring needs in certain cases.

Out of position adults and children has been the leading cause of problems with existing air bags so far. We've seen adults sitting with their feet on the dashboard. We need to define what is a safe and an unsafe zone, so that we can design sensors and deploy—have deployment algorithms that will deploy or not deploy, depending on whether occupants are in the unsafe zone.

Properly positioned children, we believe, need to be considered, but generally from the tests that we've done so far seems to be okay. Misuse or non-use of safety belts is, of course, an issue and lap belt use in the center seated position; generally, since three point belts are not available there.

We have to be concerned about low-speed deployments. This is a threshold issue. Seventy-five percent of the special crash investigation fatalities that we've done so far with children occurred at less than 18 miles per hour. So by raising deployment threshold, we could eliminate a lot of those deployment-related injuries, but we also know the head and face injury threshold is somewhere in the 13 to 15 mile an hour range. So if we raised deployment threshold, we'll be trading off for head and facial injuries.

We also know that in soft versus hard crashes, if we deployed the air bag later in the crash, then we might make it even more aggressive for occupants that have moved—since they then can move further forward during the initial stages of the crash.

We've seen objects and devices in front of the air bags. There's medical devices, packaging. The center seat position, no shoulder belt, as I've mentioned before. In higher speed crashes, we would like to preserve or even enhance the benefits that we have seen with today's air bag. Pregnant women, an unknown effect on the fetus. We've seen some good results and we've seen some not so good results.

Hyperacusis and tinnitus, hearing effects is largely unknown right now. We expect even further increases in noise as side air bags come on board. I think you'll hear a presentation later this afternoon about some of the hearing issues.

(Slide 31 shown.)

MR. BISCHOFF: On the driver's side, arm injuries is an additional concern. We've had about 6,000 additional AIS 2 to 3 injuries to the upper extremities in an all—that's what we predict in an all air bag fleet compared to no air bag. Short statured drivers is a problem. It's an issue that's probably been blown a little out of proportion. The effectiveness analysis shows that air bags have been quite effective for short statured people, but we do know that they sit closer to the air bag and that puts them closer to the unsafe zone.

Frail drivers, the air bag theoretically can distribute forces on the chest and head, much better than a shoulder belt or the steering wheel rim. So, we think it's largely an issue of keeping drivers out of the unsafe zone and let the air bag work to best benefit.

Larger drivers, of course, would require a larger, firmer, faster air bag. We have to be concerned about steering wheel adjustments up and down from tilt, in and out from telescope. And, of course, pedal reach and visibility effects where the short statured drivers are sitting. Again, we have the pregnant women problem on the driver's side.

We additionally have adaptive devices. We've actually seen cars equipped for handicap people, where they've put a spanner bar right over the top of the air bag. We have an educational problem. Burns and abrasions were a problem in a lot of the initial air bag deployments, but seem to have been largely solved.

(Slide 32 shown.)

MR. BISCHOFF: Test dummies, to address these issues for a range of occupants, we need test devices with intended injury criteria. Currently, of course, we only have the 50 percentile male dummy, which has been certified for complying with FMVSS 208. There are fifth percentile female and 95th three year old and six year old hybrid three versions, but these have only been available for research purposes to date. They are not Federally standardized. They must be added to FMVSS Part 572 and 208 and injury criteria must be decided for each one. And then other key issues, such as reliability and reproducibility must be determined.

(Slide 33 shown.)

MR. BISCHOFF: We've got a number of test issues for air bags. What should go into FMVSS 208, there have been two types of tests that we've been using so far; static and dynamic. We're using static tests for measuring forces on how to position dummies. And it's currently being used to egress inflator aggressiveness. Of course, the dynamic test would provide opportunity to be more realistic to the real world. And actually see how dummies move in to the unsafe zone during the collision. We've got the belted, unbelted issue in and out of position, a lot of different combinations. Pre-crash braking.

Again, going back to the static test, we can simulate that by placing the dummy very close to the air bag for a static test or we could do a dynamic test and let the dummy move forward during the test. That hard and soft crashes, which is the threshold issue that I mentioned before, sled test versus vehicle test. And, of course, the injury measures attended to each of the new dummies that we propose to add.

(Slide 34 shown.)

MR. BISCHOFF: We have a number of lead time issues, how much improvement, how good is good enough, how fast. For example, restraint system suppliers have said that they see some of the smart technology coming on line in two years. Vehicle manufacturers have talked more in a three to five year time frame. It would be an issue of whether we need a phase-in schedule if and when we decide to modify 208 and, of course, we can decide whether to treat the driver and passenger together or separately.

(Slide 35 shown.)

MR. BISCHOFF: So let's look now at some of the technologies that are available to address these issues. The ideal system would be one that deployed optimally for all occupants in all situations, and ultimately, no warning labels would be required. To do that, we've got to upgrade crash sensors. I think everyone is moving towards electronic sensors. It will make it easier to design multiple deployment levels.

Also, electronic sensors have a narrower band between the no fire and must fire. So, I think just because of the tighter tolerances, you'll see some raising in the threshold, the deployment level. And I think everyone agrees that we can deploy at higher thresholds if the occupants are belted, so I would expect to see some of the early smart systems incorporate sensors to read belt use and possibly incorporate multiple threshold levels.

And finally, in the sensor area, there's a number of proximity or anticipatory sensors are being developed as part of ITS type technologies. So, ultimately, to think even that you'll be able to deploy, to sense a severe crash is imminent and actually even make decisions about deploying the air bag before the actual crash even starts to take place.

We've got occupant weight sensors are now available. And there are prototypes of occupant position proximity sensors. We've seen combinations of infrared and ultra sonic and each used alone. This will allow you to—I think in the early stages, decide prior to the crash whether someone is in the unsafe zone and ultimately, you'll be able to make dynamic decisions during the crash, whether someone has moved into the unsafe zone.

Variable rate inflator are now available. The first manifestation will be two level. And then eventually multi-level and continuously variable. Variable venting systems are now available that will open or close, depending on occupant position and whether they're out of position. And many of these are actually being incorporated in vehicles today.

And, of course, you'll need a computer to optimize the benefits by looking at the sensor inputs and making the decision rules. And, of course, we have to strike a balance between all of this complexity and reliability.

(Slide 36 shown.)

MR. BISCHOFF: So with all these complex issues and parameters and decision that need to be made timely, how will NHTSA keep itself in a leadership role and continue to be the honest broker?

First and foremost, we have undertaken our own aggressive research and testing program. This began in January of 1996 with our test program at our research facility at VRTC in cooperation with the vehicle manufacturers and restraint system suppliers. We defined what air bag—base line air bag system performance was and we tested the first depowered air bags.

We have requested an additional $6 million in our FY ’98 budget request to Congress to now look at advanced systems, advanced occupant sensors, inflator, and concepts. We’re looking at new folding patterns, bending, combinations of technology. We’re going to spend hopefully about half of that money, about $3 million doing the necessary by a mechanical research to specify the tolerance of a range of occupants to forces excerpted by air bags. And then go on and develop the dummies necessary to measure those forces.

(Slides 37–38 shown.)

MR. BISCHOFF: Finally, we need to assess what other advanced technology is available from other areas, such as the defense—in that regard, we have recently signed a Memorandum of Understanding with NASA. It’s a key component of our comprehensive strategy. We believe that this cooperation will expedite technology advancements in air bags. We want to leverage NHTSA’s expertise in bio-mechanics and restraint systems with NASA’s leadership in advanced technology, such as sensors, micro-electronics, and propulsion technologies.

The purpose of the effort will be to understand and divide critical parameters of air bag performance, systematically assess the air bag state of the art and future potential, and identify new concepts. NASA has designated the jet propulsion lab to conduct an air bag technology assessment. They will identify and characterize air bag system technology, look at those technologies that are applicable to adverse effects of deployment, and recommend development needs.

(Slide 39 shown.)

MR. BISCHOFF: They will begin by visiting air bag and vehicle manufacturers and work with NHTSA and feed off the test program that NHTSA’s doing. But we think that JPL will be an independent voice and expertise. They are an objective organization. They’re not involved in the air bag business, and they can sign non-disclosure agreements. And it is expected that the technology developer, such as the vehicle manufacturer and suppliers will be able to provide detailed information to JPL.

(Slide 40 shown.)

MR. BISCHOFF: We have also signed a joint research agreement with Transport Canada. This agreement was also signed December ’96. We’re cooperating with them to develop test procedures for smart air bag and make improvements in dummies and associated injury criterion. Transport Canada has been working heavily with the fifth percentile female. And, of course, they’re primarily interested in doing belted testing, since belt use is in the 90 percent level in Canada right now.

So, in summary, all stakeholders are in agreement that air bag performance needs to be improved. NHTSA’s playing a leadership role and has put together a comprehensive approach to address the complex issues in a timely fashion. We have embarked on an aggressive research program and supplemented by leveraging the resources and expertise of others where appropriate.

And now I would like to turn it over to Dr. Hedlund and talk about some of the behavioral things that we've been doing.

DR. HEDLUND: Thank you very much, Don, and thank you, Mr. Chairman, for being here. I would like to talk about the behavioral issues very quickly, which in on sense are the easiest to understand and the easiest to describe, but the most difficult to accomplish.

The behavioral issues are how do we deal with the over 27 million vehicles that are out there on the road right now with passenger side air bags and approximately another 27 million with driver side only? The issues that we want to address are the fact that most of the casualties, the fatalities we have seen in air bag cars have been caused—have been promoted or have been extenuated by people not doing the right thing, not buckling up, not putting the kids in back, not sitting appropriately back.

So the behavioral issues are how can we change this behavior in people riding in existing vehicles? It's through education. It's through legislation. It's through enforcement and it's done with all the partners that we have worked with, with your Board, with everybody in this room.

The history of this goes back a fair ways. And early in the 1990s, in fact, NHTSA was putting forth advice, never put a rear-facing child safety seat in front of an bag. Kids are safest in back. But these issues really escalated during 1995 when we and you first saw examples of child fatalities in air bag cars and when you called your conference a year and a half ago and put out your recommendations at that time.

In that time, late in 1995, we embarked on a public education and information bliss concentrating on children, but not ignoring adults, involving all of the partners that we could possibly do. Dr. Martinez began by sending a letter to over 200 different organizations to help participate in this campaign, in this blitz. And those organizations, those partners responded in unprecedented fashion.

I have a short list that runs to ten pages, line by line of individual things that people in this room have done to help bring the messages to people of this country. I'm not going to be able to talk about all of those here today. I will give you a few examples on the board, but there are many, many more.

And the overheads and so forth that I have, there are copies of them available to you. You should have them in front of you. Let me give you a few examples.

(Slide 41 shown.)

DR. HEDLUND: In November 1995, the Center for Disease Control, one of our partners, during the time in which the Government was shut down, put their mortality and morbidity weekly report out highlighting the dangers of air bags in child safety seats.

The Food and Drug Administration sent an alert to 1.2 million physicians. Many, many more organizations did the same. NHTSA helped those by providing information, messages, appropriate advice—this is a child safety, passenger safety tips, that everyone has available to them.

We followed that initial blitz during November and December with a call to action in January of 1996, in which 50 organizations—probably everyone in this room—met here in D.C. to try to figure out a cooperative plan of action.

They came away from that with a coherent strategy that everyone agreed on, but the immediate term issue was to continue the education and awareness that had begun during this blitz. The longer term strategy, though, was to increase proper occupant behavior through increased belt and child safety seat use. And, indeed, the strategies to do that were through appropriate laws for adult belts and child safety seats and appropriate enforcement of these laws.

I think it's absolutely unprecedented that 50 groups managed to get together and agree on not only overall strategies, but also methods to accomplish these strategies.

Throughout the spring of 1996, the educational activities continued through all of the organizations here.

(Slide 42 shown.)

DR. HEDLUND: NHTSA, of course, did its part through things such as its safe and sober materials, through brochures distributed very widely, are you using it right, how to use child safety seats properly. And through extensive outreach, through NHTSA's regions and through them to the states and through many organizations and through extensive participation.

The partnership aspect of this whole educational and behavioral change activity really came into focus in May of 1996, when the air bag safety campaign was formally kicked off. This is a truly unprecedented campaign in which all of the automobile manufacturers, all of the air bag, and safety belt suppliers, many of the major insurers, and virtually all of the safety groups are participating.

That campaign has contributed over $14 million of private sector funding over a two year period. That campaign agreed on the same fundamental strategies that had come out of the January call to action meeting; education, legislation, and enforcement. Education to buckle everyone up, put the children in back. Legislation to strengthen adult and child passenger safety laws. And enforcement to make sure that those laws are, indeed, obeyed.

(Slide 43 shown.)

DR. HEDLUND: The campaign has taken on an extensive array of public education activities in the Labor Day period, in the most recent Thanksgiving period.

(Slide 44 shown.)

DR. HEDLUND: The campaign has over 70 individual partners and this is a list on the right-hand side, the first page of a several page listing of those. And on the left-hand side, examples of the specific sorts of things that the corporate partners are doing.

(Slide 45 shown.)

DR. HEDLUND: NHTSA, of course, continued our own activities, something which shows up absolutely not at all from the back of the room, but this is our air bag alert. This is our hang tag. The back seat is the safest place for children of any age. Never put an infant—and so forth and so on.

(Slide 46 shown.)

DR. HEDLUND: And as you have heard before, NHTSA has come out with both labels and a video. This is a video that we have now produced. Thanks, in part, to the urging of Chairman Frank Wolf. It's being distributed very widely on protecting children and protecting newborns, in particular.

(Slide 47 shown.)

DR. HEDLUND: Phil Recht pointed out that labels are now available. We thank very much the manufacturers for distributing these labels through letters to individual owners. We at NHTSA are attempting to get these labels available more broadly to folks that may not have seen it through that first letter, to places like motor vehicle offices, grocery stores, hitting pockets of populations that may be missed by initial letters to initial owners.

And in addition, our regional activities increased, additional sorts of information—a sampling of which is shown here, information on child safety.

(Slide 48 shown.)

DR. HEDLUND: This spring, additional partners are joining in, and I give you a couple of additional examples of these. One from General Motors, their own campaign here.

(Slide 49 shown.)

DR. HEDLUND: A second from the Chrysler Corporation, put kids in back.

(Slide 50 shown.)

DR. HEDLUND: I think you will see announcements of two additional major activities by corporate partners within the next couple of weeks or so.

(Slide 51 shown.)

DR. HEDLUND: What are the results of all of these activities over the past year? First, there has been extensive media coverage during this past year of these activities.

And I would like to point out this particular sheet a little bit. These are from press clips. And these are from press clips that show that the media has, indeed, gotten the message.

What should one do about the air bag issue, and notice the headlines. Put kids in rear seats, if it's at all possible. That's the message. Safety belts called key in crashes. That's the message. The poll shows adults know the danger of air bags. That's the message.

So just awareness and action to follow up those.

(Slide 52 shown.)

DR. HEDLUND: Polling has shown that, indeed, the awareness of the public has changed markedly. From August to December of 1996, the portion of the public aware of the dangers of air bags has risen from 56 percent to 85 percent. The ones who know about the risk to children has gone up to 84 percent. Those who know about rear facing child seats has gone to 90 percent. This is a poll taken of adults who transport children. The awareness is by and large there. The public education campaign has largely succeeded.

Where are we now, though? We must concentrate on the next portion of the strategy, not just awareness, but action. To do something about what we view as an intolerably low level of adult belt use, only 68 percent, we must do this through the two strategies that we've talked about previously, through good legislation and through good enforcement of those laws.

Legislation, you are well aware, that the primary safety belt use laws are in place in only 11 states in this country.

(Slide 53 shown.)

DR. HEDLUND: Those are laws that say if you fail to wear your safety belt, you may be cited for that. These are the 11. I am very pleased to report that Maryland has passed through both houses of its legislature, a primary seat belt law that going to the Governor for signature, that we fully expect to be signed. The District of Columbia, indeed, has enacted a primary seat belt law that will be put out very shortly.

Those laws are due to the support of virtually everyone, again, in this room. And things like letters from the Secretary of Transportation Rodney Slater, contributions from the Air Bag Safety Campaign, and from many partners are the things that have helped those laws get enacted, and that will help the additional many states considering those laws right now enact them, as well.

I might point out also that Virginia has a law upgrading the child safety seat, current legislation on the Governor's desk, that we are, again, hopeful that the Governor will sign.

Enforcement, though, is the next leg. NHTSA has offered grants to a number of states of the Air Bag Safety Campaign. In addition, is supplying direct funding to a number of states. There is a mobilization coming up in May that will have safety belt and child safety seat enforcement activities in every state in this country.

At NHTSA also, we have been directed by the President to offer a plan on how to increase belt in child safety use. That plan is under final review right now. We hope to submit it to the President very shortly. And that will—I think I can safely say, continue the basic strategies that we have talked about today with an emphasis on partnerships, an emphasis on legislation enforcement, and education.

In addition, our proposal through the DOT reauthorization offers incentive grants to states, both to improve their legislation and to demonstrate that they can achieve higher belt use rates.

In conclusion, on the behavioral side, we have seen unprecedented cooperation, unprecedented agreement on the goals, a very clear message put out by everyone in this room on all sides, and we have seen demonstrated results that awareness has increased. But there is still very, very much to do before we all can assure that everyone is buckled up on every trip, that the kids are in back, that rear facing child seats do not sit in front of an air bag, and adults sit appropriately far back.

Thank you very much, Mr. Chairman.

DR. MARTINEZ: Mr. Chairman, thank you. And thank you and the Board for the opportunity to present today. That completes our presentation. As you can see, it's a complex problem with multiple approaches. So, we use the diversity of our staff in order to attack as many areas as we can. So, thank you very much.

CHAIRMAN HALL: Thank you very much, Mr. Administrator. And that was a full and complete presentation, and I appreciate it very much. Let me just make one observation, Mr. Hedlund, before we get into this and it's been a pleasure working with you on the public awareness, trying to deal with the behavioral aspects and see what we can do to increase enforcement.

And I complement everybody in this room that's worked so hard on this issue. But I think to put it in perspective, in Tennessee, we say, "If you don't want to work, don't hire out." And all of us have hired out at NHTSA and the Safety Board. We're paid by the taxpayers to protect the public safety. And it is certainly appropriate, given the circumstances that we found together with NHTSA, that the injuries and deaths that have occurred as a result of air bags, that we move swiftly and promptly to address the issue.

And I think that—I appreciate that being documented, but I think that's also what the public expects us to do.

What I would like to do is, if I could, we had a number of questions and in the interest of time, Mr. Administrator, there were a number of questions that we put together for the panel, and I'm not going to try and get into all of them. And the Board of Inquiry and the Technical Panel, we've sort of consolidated our questions. But I'm going to take two or three that I think that are important—and try and just ask about ten or 15 minutes of questions, so we'll have time to pass through the tables one time. But, again, I appreciate the detail that you went into with your presentation.

I think it would be important—and, again, Mr. Administrator, obviously, anybody on your panel that you would like to have address the question, I'll address the questions to you, but anyone that you think might be the most appropriate person to respond.

I think it would be important since this is a public meeting and since we will have some discussion of the belted, unbelted test, that we could maybe get a brief overview of the fact that NHTSA recently issued a legal opinion on whether or not it can eliminate the unbelted compliance test. And I think it would be important if someone could briefly give us NHTSA's legal opinion that was issued in regard to the unbelted test.

DR. MARTINEZ: Certainly, sir. We looked at that issue early on to decide what possible solutions did we have in order to make modifications to the current air bags as they are deployed right now in the fleet. When we started looking at that, we had two tests on the books for standard two way; a belted and an unbelted test.

The unbelted test was a test cited by Congress as to be standard for the air bag, when they put the air bags into productions, or as a mandate—from Congressional mandate, that air bag was to satisfy the unbelted test.

Having looked at that, we felt that what we could do was to interpret how that test was done and then have the authority to delete that test.

MR. RECHT: Yes. If I could just add, the legal reasoning, if that's what you're interested in, is that as of 1991 when the Congress enacted the so-called air bag mandate in IT, we had on our books rule 208, the same standard we're dealing with today, the final crash rule, which required both protection of dummies when they're belted, and also what was called automatic protection, which was protection that did not require any affirmative action on behalf of the occupant.

And what Congress did, the actual language was to say that air bags shall be required for the sake of providing the automatic protection that, in turn, is required by the standard. And those aren't the exact words, but that's the gist. And it is our view that were we to eliminate the unbelted test in its entirety, there would be no way to guarantee that air bags would provide this automatic protection as required by the standard.

The reason is that the belted test alone can be met without air bags. So, for that reason, we feel that we cannot do it. We are not allowed as a regulatory agency or administrative agency to violate or eviscerate as some have said, a clear Congressional mandate, and that's our legal reason.

CHAIRMAN HALL: I want to clarify one thing I think I heard said, which was that the present unbelted test does not prevent or prohibit either a higher threshold or a dual stage air bag, even under the present 208 standard. Is that correct?

DR. MARTINEZ: That is correct. Remember that our standard is a minimal. It is simply one test. In looking at the recommendations of the Board, what you have recommended in the past, was that we add to that test. So, rather than having just one test, belted or unbelted, that you have also out of position, unbelted children. And we may even want to look at larger individuals, too. Basically, the standard right now is a simple you pass that test, one minimum standard.

It does not preclude thresholds being made higher. It does not preclude two-stage air bags. It does not preclude deployment patterns that are different, vents that are different to the bag. As a matter of fact, there's an Australian bag known as the Holden bag that people talk about. We actually purchased two of those cars and crashed them in Australia and they met—so there is a lot of leeway with inside the current standard.

CHAIRMAN HALL: Well, you mentioned the Holden bag. Are there other manufacturers, either domestic or international, that have a two-stage air bag currently on the market?

DR. MARTINEZ: I'm not aware of them on the market right now.

CHAIRMAN HALL: Okay. Well, let me ask, I guess, a hypothetical question, but for the purpose of discussion, what level of seat belt use would justify elimination of the unbelted test?

DR. MARTINEZ: That's a very good question, because we looked at that. And I think you've made the point before, that for some reason in this country, we are far below that of other industrialized countries. And other industrialized countries have a national law. They don't have the secondary laws we have. They don't have a lot of things. When we look at it, we look at it as—and this is not policy. This is just from earlier discussions—somewhere above 85 percent.

And the reason why we start looking at that is because we know that that's doable in this country today. But really another issue, which we haven't explored fully, is the separate issue of what about use in potentially fatal crashes? Right now, that's about 50 percent. And that really is where—at the moment of truth, as it were, and that's a different issue.

Would you look at the number and the population and would you look at it in those crashes that are potentially fatal? And that's still an area of discussion for us.

CHAIRMAN HALL: Let me ask you, did I hear you say in your initial presentation that your analysis and look at the current use of the off/on switch on pickup trucks, you hadn't seen any misuse of that?

DR. MARTINEZ: That's right. We, in the course of doing our cut-off switch rulemaking, asked Ford Motor Company for information about their experience. So, what I'm relating is really just the information they provided us, but that was that the customers by and large were pleased to find this device in their vehicles, number one, and, number two, they were not aware of any cases of either misuse or abuse with those cut-off switches.

CHAIRMAN HALL: Well, that's interesting. We've got a lot of pickup trucks in Tennessee, and sometimes people think you're not as smart in a pickup truck as you are in a car.

(General laughter.)

CHAIRMAN HALL: Let me ask, do you think that the depowering of the air bags will positively or negatively effect the effectiveness results, what problems will depowering solve, and what problems will it not solve? And then let me ask one final question. With the depowering rule in the 1998 model year, how will you know whether you are purchasing a vehicle with a depowered bag or one that has a bag that is not depowered?

DR. MARTINEZ: Let me try to answer those questions and remind me if I forget one. First off, we have not made any particular recommendations on how people are told whether the bag meets that rule or not. And we are at the same time looking at ways to improve consumer information and will take that under advisement, number one. Number two, the issue of depowering—let me be clear about that. There is room for depowering currently in the fleet without this rule. The average manufacturer, Chest Gs, for example, are significant low. It had criteria low that there is room for some depowering.

However, perhaps in many cases or in some cases, not enough depower for them to decrease the risks as they would like to, because of the design of the vehicle or the type of bag that they're using. The current problem we have right now in the fleet is that we have one-size-fits-all technology. That is, the focus had been in the past to get the bag out in time for this crash. And now we're looking at what happens during that period of time. And so we now have this kind of uniform approach out there. Given that, it was—many of those decisions were made for this 160 pound male.

You now have a situation where the dose is too big, as it were, if I use a medical terminology. The dose is too big. So now you say it's too big for some of the smaller children, but it works for adults. But what we've done through depowering is allow them to depower, lower that level down to decrease risk to children. What that means that you still have one size fits all; therefore, there may be some gains foregone at the higher end. It will either be higher speeds or larger individuals.

We have been very open about that. That this is a policy decision, because we place a priority on children. That it won't solve all the problems, but it's a temporary measure to move into the smart technology. I think that as people have recognized the issues today, you are seeing tremendous movement towards advance technology, simply because we are now focused on those issues.

With regards to the effectiveness of depowering, it's somewhat of a mixed bag. We have the concerns about the higher speed, large individual, however, we think it will be less hazardous for—or less—decrease those risks dramatically for small statured adults and children, as well as for belted individuals.

So, we think overall, it may be a wash. It may be that there is improved benefits when one looks at, for example, the Holden bag experience. But remember that they're in a different country where they have 95 percent seat belt use. It's hard to take that experience and bring it to the United States. They also have a higher threshold speed, as you know, and they also have internal tethers that we don't have right now.

So, in looking at that, we are determined to do our linkage between real world crashes and the engineers early on, rather than later on, and we are talking about evaluating the effectiveness of depower as quickly as can as they come into the marketplace.

I mean, our view on this is that we want to continuously improve the technology.

CHAIRMAN HALL: Well, talking about deployment, you know, the Board has recommended that NHTSA evaluate the effect of higher deployment thresholds for passenger side air bags, in addition to the performance certification, changes recommended. I was wondering what response you all might have taken to that recommendation to date?

DR. MARTINEZ: Well, I think Mr. Bischoff ran across some of those points earlier in his presentation. We began to do several things. One is to look at the deployment thresholds and how they come about. We began to look at some of the tradeoffs there. And also, the movement of simulated crashes of occupants.

We've done computer simulations on that. What I would like to do is let Mr. Bischoff highlight some of those comments.

MR. BISCHOFF: We're planning to look at that extensively in the test program that I detailed. So far, we've done computer simulations and led us do document the tradeoffs that I talked about before that we can certainly comprehend that a large amount of the out of position fatalities that we saw would not have taken place if there had been higher deployment thresholds. But on the other hand, computer modeling shows that if you wait to make that discrimination of when you have a severe crash, that you may be bringing the bag out later in the crash event and make it more aggressively at the higher speed crashes. And you're also trading off with facial injuries and bone fractures in the face, which generally occur in the 14 to 15 mile range.

We will be able to, hopefully, once we complete our test program to say in much greater detail exactly what those tradeoffs are.

DR. MARTINEZ: Mr. Chairman, I just might add to that. Remember that nothing is set by us as to what the threshold should be. There is a lot of flexibility in our standard. One of reasons we've not moved forward with thresholds is two reasons. Well, I'll say two reasons. Number one is that since we need our mechanical sensors and go into electric sensors would require a lot of crash testing and time that we did not think we had. That's why depowering has moved to the top of our list as a temporary solution. However, we hope manufacturers are still looking very hard at these thresholds and will learn more as we go on.

Number two is that if you suddenly set what the threshold should be and what you do is you can stop two stage air bags from coming into the fleet, because we—those are two different thresholds for that. We did not want to inhibit, but to set a performance standard. And a lot of them have flexibility to do so.

CHAIRMAN HALL: Let me ask one more question, then I'll alert the tables here. We'll move for a round of questioning to the tables. You mentioned, Mr. Administrator, or someone did that you had some 4,000 requests for deactivating, I guess, is the right word of the air bag. That you granted about 1,000 of those.

Do you have enough staff and enough people to facilitate getting those acted on in a timely fashion? The reason I ask that is we receive a number of letters. As you know, there's a lot of confusion some times between the National Highway Traffic Safety Administration and the NTS—we're usually the NTBS to most people, but—

(General laugher.)

DR. MARTINEZ: We've been called a lot of things.

CHAIRMAN HALL: Yeah. And what—do you have enough so that a person right now that has a concern can move quickly to get that resolved through your agency?

DR. MARTINEZ: Let me point out that I think your concern is one we have. We have actually begun to bring our team together to look at ways to speed up the process through continuous improvements to make sure the process is quick and fast.

On the other side of the coin, we found that a lot of people are confused and have a lot of misinformation. And once we give them proper information, that a lot of that request to disconnect tends to go away.

We get several thousand hits a week on our Internet.

MR. RECHT: Six thousand.

DR. MARTINEZ: Six thousand, excuse me, on information for air bags. We find—we have fax back machines and we also have our operators that walk many people through the air bag. We talk about the rules of ABCs, the air bag safety, and then we find a lot of those people regain their comfort with air bags. Our whole goal is to be able to tell you what you can do today to minimize the risk.

Having said that, we still get a certain number of letters. We throw those in two categories. Those that we have current exemptions for, we can move forward with, and others we want to address through the disconnect rule.

Our turn-around time is—

MR. RECHT: About two weeks maximum at this point.

DR. MARTINEZ: Two weeks. But remember just because you send a letter to someone, it does not guarantee someone's going to disconnect your air bag right now. So, we are really trying to come up with a win-win solution, as has been our approach, to make sure that those who need that have that opportunity. But we do want to underscore the concern said by many. And that is that the benefits—when that crash occurs and there's no scheduling your crashes—no one schedules these crashes on the GW Parkway. When that crash occurs, that air bag, if you're belted, it can decrease your fatality risk by 21 percent, and unbelted of about 34 percent. So, it's quite a significant benefit, and we want to make sure people are aware of that, that there is a risk to disconnect an air bag also.

CHAIRMAN HALL: Okay. Well, let's move to the tables, if we could, and we'll try to move on through the round of questions. Table 6, who is our spokesperson? Do we have any questions from table 6? Is any other table prepared to move here? Well, we'll move to table 2 while table 6 is—I have a question from table 2.

DR. BRANCHE: Yes, we have two questions.

CHAIRMAN HALL: And please identify yourself, if you would, for the record.

DR. BRANCHE: Dr. Christine Branche, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. Many people have asked NHTSA to provide guidelines using size and weight criteria rather than age for determining when to allow children to sit in the front seat of a car with or without a passenger side air bag. This is because if you have an air bag, some children will never reach adult size before age 12 years.

In your opinion, is it appropriate or realistic to eliminate age as a criterion, particularly where the small child may never reach that size or weight for which the air bag was designed and will conceivably never be able to sit in the front seat?

DR. MARTINEZ: We are looking at that from both perspectives, both size and weight and age, in order to give people clear direction as to make easy decisions as to when a child should or should not be in front of the passenger side air bag. I will tell you that we really have had no child over nine years old in our fatals.

The vast majority have been the four to six years old, four to seven years old, except for the rear facing seats. We use the number 12 years old, because we felt that was an additional measure of conservative thinking in order to give parents some clear direction.

As we learn more, I think we will be able to give better advice on that front seat. Right now, we have said, 12 and under in the back seat.

I will also mention, by the way, that one of the problems that we faced, as does everyone else in this room, is really the lack of good dummies for children—fairly young children. I mean, as much as we all hate to see injuries occur to children, there's very little work in the biomechanics area or the injury area that really looks at thresholds for injuries to children.

So, as we started last year with improved dummies, we're working internationally on that and with Canada and with NASA as we talked about, but Canada for the dummies. But I would also mention that we are working closer with the medical communities. And right now, we're developing a criteria that can help us understand what age groups are at risk, if at all.

CHAIRMAN HALL: And, I guess, in retrospect that what would have probably been the best thing to do is develop a child dummy first. Another question.

MR. VOS: Yes, we had a second question. Tom Vos, from the AORC. I believe Chairman Hall asked a question just a while ago regarding what threshold might NHTSA consider as appropriate for belt use to start looking at other provisions to our test procedures and it was found that 85 percent. If you could expound a little further on your experience in working with the various state governments to bring about primary laws. You mentioned that we have 11 now. I believe it was four in process.

What is the current projection or do you project the likelihood of others coming on in a time frame associated with approaching anywhere near 85 percent?

DR. MARTINEZ: Are you talking to me or the Chairman? I'm sorry.

MR. VOS: You.

DR. MARTINEZ: Okay. Just by the way—I wanted to point out, this note was just handed to me—that for children—for the protection of children, we go by size and weight for rear facing seats, forward facing seats. And I think we need to do a better job of letting people know, the biggest concern we have is when people—children are removed from a child seat too early and are tried to be placed into a lap shoulder belt, which clearly is not designed for them. It's really not well designed for holding child safety seats in either, but we do get some particular ages for that and size and weights. Excuse me.

With regards to seat belt use statewide, I heard a very eloquent discussion about that this morning on NBC with the Today show. I think the Chairman got it right. Is that with the state's rights, it becomes state's responsibility. And we have a problem in this country that we have too many differences in state laws, as to not be uniform or given a single message.

We have seen, however, with focus on motor vehicle safety that has occurred, because of the coalition building we had, with the focus more on health-care cost, believe it or not, with the focus on tax dollars. We've seen several things exciting happen lately. The National Conference of Mayors passed resolutions for the seat belt and enforcement seat belt laws. The National Governors Association did the same thing this year.

We now see that many states that we thought would not have an opportunity to improve their seat belt use have now got legislation in process. I think the Board has been vigilant on this. Many of the partners we have here and also Secretary Slater himself have been interested in this. I think that there is momentum. Exactly where it goes and how it goes, I don't know. But, for example, in Arkansas, they're trying to get the bill brought back to the floor of the Senate.

So my hope is that you will see a greater focus on the consequences of not having a primary seat belt law, the cost of it, and that the Governors will be—since they are now embracing it themselves, that they will be a significant change.

My hope is that the goal stated by I want to say Secretary Slater and also putting together a President's report of high seat belt use, I believe 85 percent is doable by the turn of the century.

CHAIRMAN HALL: And let me just make a brief comment, and I don't want to hold things up, but the Administrator put an emphasis here on public health and the cost. And I think that's the message we've got to get to these state legislatures and to the governors, to get the states to take the responsibility through primary enforcement to take the action to protect their own citizens.

Now, I worked six years in the Governor's office in Tennessee, and I'm familiar with all of the arguments about infringement of individual freedom, but, you know, we wouldn't think any more of letting people drive in Tennessee in a driving rain storm without their windshield wipers on or drive at night without their lights turned on. And it's a matter of common sense, but we've got to continue to work to get the enforcement, because the issue here, of course, is the seat belt is the primary tool.

Table 6? All I'll do is try to ask folks if you can be—ask the questions as quick and we can good responses, so we won't hold everybody up. But I've rattled on so much, that I can't be much of a disciplinarian here.

MR. DITLOW: Following up on your question, Chairman Hall, about providing information to owners about depowered bags, NHTSA's test program shows that some present models have results as good as 30 percent depowered bags. What role would that provide, what role would that such information play in providing to consumers, who want to purchase cars, who have cars, or who want to make decisions about cut-off switches?

DR. MARTINEZ: Well, that's a good question. I'm not sure. You know, we have a Federal Register notice that will be put out soon on increasing consumer information, because I think that's an important aspect.

The second question to me, I guess, coming back to that is what exactly does that mean with a 30 percent powered air bag, because we've raised a lot of questions about, well, does this mean less performance and higher speeds or to larger individuals. So, I don't want to—I'm going to be sure that we don't go out and say , here's a 30 percent depowered air bag, but not be able to give better information than that.

Again, clearly, our intent is to as manufacturers include this in their flexibility for design choices, we are going to work with and others to look at the effectiveness in real world crashes. I worry myself about the limitations of dummies, which is why I made the point about real people today.

The other thing is that the NCAP test results will be available, which will continue to look at the effectiveness of those air bags in the 35 mile per hour crash.

MR. DITLOW: Does the 68 percent figure on seat belt use represent all vehicle types or are there differences?

DR. MARTINEZ: That's an excellent question and I'm glad you raised that. That 68 percent is basically self-reported by the states. It covers what they tend to cover by law. So, when they report it, if they don't include trucks, if they don't include sport utility vehicles, that sort of thing. It's not included in that number.

We do a separate study. Unfortunately, it's expensive, so we only do it every few years. And that study generally shows a lower number of seat belt use, but that study looks at pickup trucks and sport utility vehicles and passenger cars. I think one of the points you're probably alluding to, too, is that the higher risk individuals also tend to buy some of those sport utility vehicles and trucks that are not included in the surveys. So, we need to make sure we include that when you look at overall use, since that's one of the groups we're trying to protect.

MR. DITLOW: And then since the issue of air bag caused injuries affect children and short statured adults, why don't the sled test include a fifth percentile female driver and child dummies?

DR. MARTINEZ: Well, actually, we have included neck criteria in the—(conferring)—the second one is those two dummies aren't certified at this point in time.

CHAIRMAN HALL: Can I just follow up and ask, do you know when you think you will have the certification on a child size dummy and a fifth percent female dummy? Do you know when that will be accomplished?

MR. BISCHOFF: We're moving as fast as we can. Like I said, we have asked for about $3 million more of additional monies this year to do the bio-mechanical work necessary to set the injury tolerance parameters for those dummies. And just as soon as we're comfortable with the injury reference values, we'll move quickly to get the dummies certified.

CHAIRMAN HALL: Now, is that dummy included in your budget?

DR. MARTINEZ: Yes, it has been, and it started last year, because we went to this—we went to Congress last year for this. Let me point out that the dummies currently measure things like head injury and chest injury and femur loads. We are looking to add criteria to it, because as I pointed out, there's two mechanisms here.

One is the direct blow from the air bag, but the other one is this neck injury criteria. And that really is, I think, a much more difficult criteria to develop. And you certainly have to try to get it at least fairly close, because if you don't know what it takes to protect a child, then you can't make the criteria work. And so that's been a priority issue for us. We actually have created some reference values that most people have been working on, but now we just have to move that into a repeatable test.

CHAIRMAN HALL: Okay. Any more questions, table 6? If not, we'll move to table 5.

MR. HASELTINE: Mr. Chairman, Phil Haseltine, representing the Blue Ribbon Panel, reading three questions for this panel.

First, safety experts in Australia and Canada, which have belt use rates of 90 and 95 percent respectively, tell us the only way to achieve usage levels above the low to mid 80s is the combination of belt use laws, prescribing primary enforcement, driver license penalty points, and significant fines, along with enforcement in public education of those laws.

Yet, in the U.S. Government and private sector alike, aside from current efforts in the District and in North Carolina, totally ignore the important aspects of penalty points and fines, which would make violating belt use laws comparable to those for other traffic infractions like running a red light.

Given that belt use rates in the U.S. are not increasing, actually went down in 18 states last year, do you plan to direct your staff and your program to begin encouraging states to adopt penalty point provisions and higher fines? And do you recommend that the National Transportation Safety Board, whose current recommendation only addresses primary enforcement, modify its recommendations to include these other two critical criteria?

DR. MARTINEZ: First off, let me make an interesting point to you. I think that one can take the—they have the same air bags in Canada, and, yet, they don't have this child problem like we do and part of it is because of their seat belt use. And I think that's an important point to make, which underscores why we think that's such a critical aspect of moving forward with this. They are able to avoid that simply by having the children not in that front seat or unbelted.

The second thing is that I think there's growing support for having laws that are real laws that work. And the primary seat belt laws with appropriate fines and penalty points have been, I think underscored by the success of programs, such as that of North Carolina. What we have done in the past few years is try to make more and more people aware of that.

I think the biggest political barrier that we have is in the states themselves, which point out we still see this often as a freedom's issue and not an important issue. But as we continue on, I think you're going to see more and more states adopt the fact that there must be consequences in order to get true compliance to a seat belt law.

MR. RECHT: Let me just add to that. Also, that the Administration recently issued its NEXTEA proposal, and I'm sure you saw in there a first time ever program, incentive program for seat belt use. It's going to be authorized at $20 million a year. And this year, we request $9 million to get it off the ground to encourage states to, in fact, improve or upgrade their laws to primary and to vigorously enforce them.

DR. MARTINEZ: Right. And there are penalty points, one of the basic criteria in there.

MR. HASELTINE: Thank you. Air bags were predicted in 1984 to reduce fatality risk by 20 to 40 percent for unbelted occupants, 9 to 10 percent for belted. Belted statistics have been confirmed, but effectiveness for unbelted is only about 13 percent. Doesn't this suggest that the out of position, unbelted occupant is a problem even in moderate to high speed crashes? And if so, that air bags will become more effective for unbelted occupants as they are depowered? If that is so, why should there be a sunset provision on test procedures that permit depowered air bags?

DR. MARTINEZ: I'm not sure I understood your question.

MR. RECHT: I think I understood it, but if you looked at our regulatory analysis, I think you would see that according to our traditional way of projecting these matters, we believe that depowered bags, in fact, will provide less benefit for unbelted occupants, particularly in high speed crashes. Now, there's been a lot of talk here about the Holden bags, the depowered bag, which is in place, in use in Australia. There are a number of differences.

We mentioned this in our regulations analysis that we certainly hope that some of this real world activity and indications that the effectiveness might be better, in fact, proves to be the case. But we intend to monitor this effectiveness of the depowered bags to see what, in fact, they prove to be.

Based on our current analysis, however, and based on our statements from the start that we've viewed this as an interim step, we decided to go ahead and set a sunset date.

MR. HASELTINE: The sampling system for NASS is based on geography and population and represents the average size adult male. The air bag crisis has involved not the average size adult male, but rather, children, the elderly, and short women. What new sampling scheme can be developed to look at the non-standard occupant? Much like NIH ensures that research efforts represent all citizens, how will NHTSA ensure that their efforts represent all occupants?

DR. MARTINEZ: There are two things, and I think you make a good point. It's a sampling system. That means some things are over represented and some things are under represented. Children's injuries, children involved in crashes is relatively rare compared to the 41,000 deaths we see every year on the highway.

We have two programs that we've put in place to help us augment NASS. One is a special crash investigations, which is focused on—every one of these fatalities that we've seen and serious injuries, we're notified. So we've investigated those. We go and get the cases themselves.

The second one is that we have this CIREN, which is the crash injury research and engineering network at the seven trauma centers that I pointed out. They have—one of those is a pediatric trauma hospital itself. We have a second pediatric trauma hospital that we're looking at, plus those cases come through the trauma centers.

And lastly what we've done is we've started a contract with a center—I'm sorry. What is it, CPSC, Consumer Product Safety Commission. And what they do is they have 93 emergency departments around the country that collect cases for us and notify us also.

So, we've used those as mechanisms to augment our current cases.

CHAIRMAN HALL: And let me just comment that Wednesday morning, we'll have testimony from representatives I appreciate coming here from Australia, from Europe, and from Canada, including someone from General Motors Holden, to talk about the experience with air bags in Australia.

Table 4?

MR. HUTCHINSON: Phil Hutchinson, Association of International Automobile Manufacturers. The first question concerns the deactivation issue. And the question is this, what is the proper role of the Government in air bag deactivation? Now, deactivation requires Government approval. Should this central role of Government be preserved when determining future deactivations?

DR. MARTINEZ: Obviously, we are in the middle of rulemaking and I cannot give you any official position on that. I say that that is one of the central questions that has been raised through the docket. We've received over 500 comments. There are other aspects, other questions that should be raised, too, and that is, if a risk—if there is a group that is at risk, what is the mechanism to make sure that it's available easily to those who need that? And that's—what we're trying to do is create a balance here.

MR. HUTCHINSON: I think this will be an easier question and it concerns the President's plan on increased seat belt usage. Will you seek public comment on the plan?

DR. MARTINEZ: We actually did that in developing the plan. We actually had one presentation, an open meeting up on the Hill on the Senate side, one on the House side. We had a round table luncheon with the Administrator. I think that George Parker was present for your organization.

Do you want to mention some more?

DR. HEDLUND: We've talked to a number of people. We had a couple of additional meetings with anybody that was interested. And we have solicited people to give us their views on the plan. We do not plan and intend at this point to put the plan out for formal public comment before sending it to the President.

DR. MARTINEZ: However, having said that, I think that what we are building on is the work of the coalition and others, and all of that is incorporated in basically, I think, bringing to the President the successes to date, and then that can be rolled out with a larger coalition.

MR. HUTCHINSON: Thank you. And then the final question, it concerns advanced technology. Dr. Martinez, how will you factor in the effects of air bag depowering, continuous improvement in air bags, and greater safety belt usage, plus children being placed in rear seats in deciding on what level of advanced technology to require?

DR. MARTINEZ: Well, you hit upon a good point, and that is, what is the role of the air bag in a changing environment? It's unfortunate right now, I think, that it hasn't changed as much as we would all like, but certainly we can get there. What we have done is proposed and what we're looking at in talking to others is not a one size or putting in the technology that doesn't move, but really phasing in technology.

So our discussions to date have been to take the low hanging—the solutions that we need to attack right now, which is the disparity of one size fits all, and then move towards increasing sophistication over time. I think one of the points I would like to make is that I think the public has to be—has to recognize that there is value in standards changing and there is value in designs changing over a period of time, so that we can continually improve.

MR. RECHT: Let me just add to that, that we at NHTSA seek typically to set performance standards, not equipment standards, and that will be the case here, as well. And we find with performance standards, of course, that they allow for innovation and for the type of development that I think you're alluding to occur without inhibiting technological development.

DR. MARTINEZ: Yes, I think we're looking at it as a performance envelope and not a specific equipment standard. And I think the Board itself has made some excellent recommendations in how you begin to box out that envelope as opposed to make it smaller. We need to make sure that it accounts for these variable factors.

MR. HUTCHINSON: Thank you, Dr. Martinez. Thank you, Mr. Chairman.

CHAIRMAN HALL: Thank you. Table 3.

MR. SLECHTER: I'm Al Slechter of Chrysler Corporation. I'm speaking for the AAMA. Virtually all the manufacturers, both foreign and domestic, I think are of one mind and that is, to retain pretty restrictive limitations on deactivation of air bags.

As you deliberate in developing a new policy on deactivation, I'm sure from your earlier comments, you realize the delicate balance that is needed to be established when you establish that new policy.

Can you share with us your rational in going through those deliberations, recognizing it's in rulemaking, that will give you some comfort and give us some comfort that mixed messages won't begin to develop in the marketplace and among consumers' minds, so that what we end up with is a broad deactivation and perhaps deactivation on demand as it has become known?

DR. MARTINEZ: Yeah, I don't really want to go into all the details in that, but I think that what you've done is help elucidate that there is not a resistance to allowing deactivation in those cases in which it would be a benefit to those who need it, but that there has been a very strong indication by the industry and some others, that they do not want broad based deactivation.

We certainly have been very public about sharing that concern. We have said we don't want panicked decisions, but informed decisions. And our focus is to find a balance that allows those in selected cases to make those decisions or to have that done and without undermining the benefits of the air bag system.

MR. SLECHTER: Second, and maybe more of a comment than a question, I think Don Bischoff did a tremendous job of identifying the incredible complexity of the issues involved in moving forward with smart air bags or advanced technology air bags. I was somewhat struck by the reference to the way the auto industry would be solicited for data and input to the process that you're receiving with JPL. It sounded fairly passive from the standpoint of our involvement.

I would urge that you see us. I know we've already been to you to make a presentation here with our own ideas of how we might involve ourselves more actively, proactively in that process with all the facilities and resources we have available. But my question, I guess, would be am I correct in interpreting what I heard as you seeing us still in a passive role or can we expect that perhaps we would might be able to play a more active role in the next six to 12 months as you work with JPL on this issue?

DR. MARTINEZ: Clearly, NHTSA does not believe that on an issue this complex that we have all the answers, but that our job is to find the answers that are required to move forward.

Therefore, we have tried to leverage our resources by working cooperatively with those who have research and experience to bring to bear. That includes the industry. That includes the insurance industry. That includes medical researchers and other engineering labs. That includes, as you know, our outreach internationally so that people would have a focus on biomechanics research program internationally around the world.

I am very concerned that doing things separately as opposed to in parallel leads to delays and that's something that we don't want to do. We want to always move forward. Having said that, I think that we are searching for and look at the proposal given by AAMA, looking for ways to a cooperative working relationship that allows the appropriate relationship to exist between Government and industry and others.

MR. SLECHTER: Thank you. One last concerning data. I think we all share the same the same view that as we move forward, we're going to need more and more accurate data, more precise data on all the various factors involved and the differences in one crash versus another, the size of occupant, and so forth.

Do you plan to make other data system improvements within the NHTSA existing data system? And second, do you feel like you could use—would more research, more money appropriated to the agency allow you to do a better job in data collection?

DR. MARTINEZ: Well, our 1998 budget actually has allowed us to put in a lot of the monies that we need in order to move forward. I think getting data in a format that is usable, that it means that everyone does the data collection the same way. It's something we're willing to look at. We, for example, with our seven trauma centers, a big focus of that has been that when cases are investigated, they are ones that we can use interchangeably. I would be happy to look at ways that we can do private partnerships that allow us to get full evaluation of crashes, not only the fatal crashes, but of serious injury crashes, and crashes that are complete successes.

I mean, it used to be if you were saved by the air bag, that was on TV. There's 1800. There's a person being saved by an air bag today; you will never hear about it. The focus now is purely on any sort of problem with the system. I think we need to look at both in order to have prospective and truly understand what real world crash worthiness is all about.

So with that, we are certainly willing to talk to others about ways we can get a lot of data as quickly as possible in a usable format.

MR. RECHT: Let me add also there with respect to NEXTEA. Once again, we are creating a new incentive program for states, sort of another slice of that issue, Al. And this would encourage states, provide them some funds to go about collective data on the state level. As you know, the collection of data on the state level has been quite helpful, particularly, in moving forward to improve seat belt laws and the like. And we certainly look forward to that program being enacted.

MR. SLECHTER: Thank you.

CHAIRMAN HALL: I appreciate good questions from the tables. I appreciate your participation. I have just one or two last questions, Mr. Administrator.

DR. MARTINEZ: Yes, sir.

CHAIRMAN HALL: Do you expect that all the manufacturers will depower their air bags?

DR. MARTINEZ: No, we don't. We don't expect that they will all depower. There are different designs out there. There is different levels of power in the bags right now. So we don't expect them all to depower. However, we think that they will use this added flexibility in order to help optimize the bags that they have now.

CHAIRMAN HALL: And I assume and I know it's too early to develop it, but there will be some sort of consumer information available on exactly what that depowered air bag means, both good and bad?

DR. MARTINEZ: Well, I think that that is something that we are going to look at very strongly; how we use both our existing system such as NCAP, as well as additional information systems.

CHAIRMAN HALL: Okay. Well, let me encourage our friends on table 3. I believe we have some panels tomorrow with representatives from all the major automobile manufacturers domestically and internationally. If there's information that you all think needs to be in part of the public discussion, I would encourage you to please bring it forward. And that's, I think, the most important thing that we can do in this forum is to provide a full discussion of all these issues.

Saying that in closing, Mr. Administrator, do you have any final comments and could you maybe give us an idea of where you think we should be or what our goals should be five years from now, both in terms of air bag technology and in terms of restraint use in the United States?

DR. MARTINEZ: Well, I would like to take the—I appreciate the opportunity. I'll be very brief. I think I would like to see as one of my primary goals, is that restraint use is realistic in this country at about 85 to 95 percent. I see no reason why we cannot do that, except for the lack of political will.

It's, to me, silly that we continue to have discussions from years ago about my freedoms when, in fact, you expect me to pay for it. It's not your freedom when I've got to take care of it, and I think it's a responsibility. Driving is a privilege. And with that comes responsibilities. So that is something I think I would like to see, number one.

Number two is that we will continue to improve the safety of vehicles, not only in frontal crash protection, but in offset crash protection. I think we are in a very important time here. Safety has become a major consumer issue. They're much more knowledgeable about it. There is much more competition for it in the field.

There is more car companies now than before. We've had movements of the defense industry into transportation, and are very much involved in restraint systems, as well as passive protection in crashes. I think that you will see a much improved 208 standards, as well as additional standards that will lead to safer cars by the turn of the century. And I think that what we've done now with the depowering rule is to help decrease the risk dramatically while we can work together—together to put in the first phase of improved technology.

I expect to see that by the turn of the century.

CHAIRMAN HALL: Well, let me thank the entire panel for your participation. If you wouldn't mind remaining seated just a second while we get through an administrative announcement or two. But I really, Mr. Administrator, appreciate you and all your panel's participants. As I say, we're all paid by the same folks. We have slightly different responsibilities, but I always appreciate the cooperation and assistance that we have and the working relationship between our two agencies.

This afternoon, we have two very important panels. Panel 1 is the role of air bags and seat belts a primary or supplemental restraint system? And then Panel 2 is air bag induced injuries. Who is vulnerable and how do we know it? And we have a number of outstanding people who have come a long distance.

Now, Elaine, if we start at 1:30, would that give us—you said some people were on a time frame, and then we'll maybe shorten the break to 15 minutes and see if we can't stay on schedule, but it is now roughly 12:25. This forum will stand in recess and I would ask the panel members and everyone, if you could be in your chairs ready to go at 1:30.

Thank you.

(Whereupon, a luncheon recess was taken.)

MAGNITUDE OF MOTOR VEHICLE INJURY PROBLEM

- Leading cause
  - All deaths combined under age 44 years
  - All deaths for each age 5-27 years old
  - All occupational death
  - Of serious head injuries
  - Of serious spinal injury
- For each death, large number of injuries/hospitalizations

Slide 1. (From Dr. Martinez's presentation, March 17, 1997.)

HUGE COST TO SOCIETY

- $17 billion health care cost
- $1.7 billion Emergency Medical Services
- Public burden high (Medicaid/Medicare)
- Huge burden of long term injuries
  - More severe injuries, more likely paid by public
  - Disability/long term care cost

Slide 2. (From Dr. Martinez's presentation, March 17, 1997.)

FRONTAL CRASHES

- Primary cause of death and injuries
  - Account for 64% of deaths
- Federal crash standard testing done with belted and unbelted dummies
- Real world seat belt use low for fatal crashes/teenagers, youth, young adults

NHTSA
People Saving People

Slide 3. (From Dr. Martinez's presentation, March 17, 1997.)

AIR BAG EFFECTIVENESS STUDY

- Frontal crashes
  - Drivers (unbelted) – 34% reduction
  - Drivers (belted) – 21% reduction
  - Passengers – 27% reduction
- All crashes – 11% reduction for drivers
- No benefit for elderly
- Increased risk for those under 13 years old

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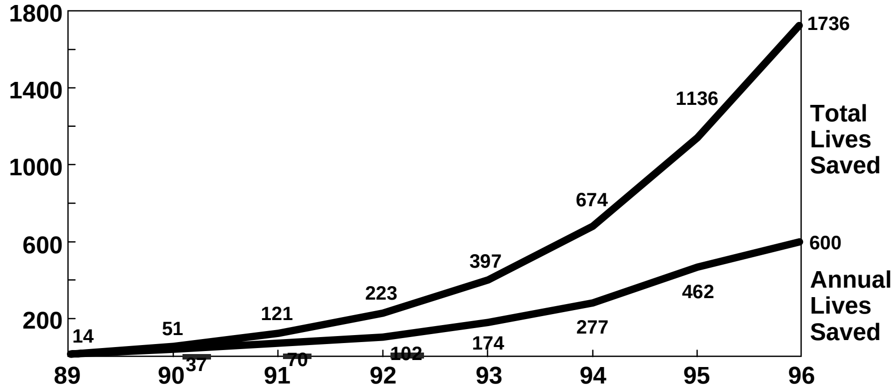
Slide 4. (From Dr. Martinez's presentation, March 17, 1997.)

CUMULATIVE EFFECTS OF AIR BAGS



Slide 5. (From Dr. Martinez's presentation, March 17, 1997.)

ADVERSE EFFECTS

- **Drivers deaths (56 million vehicles)**
  - **21 adults to date. Mostly unbelted. Many short-statured.**
- **Passenger deaths (29 million vehicles)**
  - **38 children to date**
    - **9 rear-facing seats**
    - **29 children unbelted or incorrectly belted**
  - **3 adults**

Slide 6. (From Dr. Martinez's presentation, March 17, 1997.)

UNDERSTANDING THE PROBLEM

- Shift in research from getting bag out to how it comes out
- Needed to identify cause of injuries so that solutions could be developed
- Existing research sparse or proprietary
- Limitations on children/small female dummies

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Slide 7. (From Dr. Martinez's presentation, March 17, 1997.)

NHTSA RESPONSE

- Early warnings 1991 – labels
  - Cut-off switches – 1994
- June 1991 – We learned of first fatality
- Summer 1995 – Task Force to identify real world events
- October 1995 – Issued child warning
- November 1995 – Opened dialog (RFC)
- January 1996 – Call to Action Conference
- January 1996 – Accelerated research program started
- March 1996 – Air bag safety hearing
- May 1996 – Air bag Safety Coalition

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Slide 8. (From Dr. Martinez's presentation, March 17, 1997.)

NHTSA RESPONSE *(continued)*

- June 1996 – Moving Kids Safely conference in D.C. followed by 10 regional meetings around country thru October
- August 1996 – Proposals for labels, cut-offs, “Smart” technology.
- August 1996 – NHTSA requests funding to improve children/small female dummies
- September 1996 – First phase fast-track research done
- November 1996 – Air bag action plan released. Final rule improving labels.
- January 1997 – Release of final rule extending cut-offs, proposals for depowering and deactivation; granted petition to include 5th percentile female dummy in future testing
- March 1997 – Release of final rule to permit manufacturers to use lower powered air bags

Slide 9. (From Dr. Martinez’s presentation, March 17, 1997.)

AIR BAG ACTION PLAN

- Future vehicles
  - Smart air bags
- Near-term vehicles
  - Enhanced warning labels
  - Extending cut-off switches for certain vehicles
  - Depowers air bag
- Existing vehicles
  - Letters/labels to owners
  - Disconnect policy
  - Extensive media outreach
  - Coalition efforts – labels/public information

Slide 10. (From Dr. Martinez’s presentation, March 17, 1997.)

AIR BAG CONCEPTS ALLOWED IN CURRENT FMVSS NO. 208

- Air Bag Deployment Impact
  - Speed Threshold
- Air Bag Flow Rates
  - Low On-Set Rate Inflators
  - Multi-stage Inflators
  - Aspirated Air Bag Systems
- Air Bag Design
  - Size/Shape of Air Bag
  - Deployment Path
  - Fold Pattern
  - Tethering
  - Venting
  - Mass/Material of Air Bag
  - Module Cover Design
- Air Bag Location
  - Recessed in Steering Wheel
  - Optimized Location on Instrument Panel
- Safety Belt Design
  - Pre-Tensioners
  - Webbing Grabbers
- Adjustable Pedals
- Tilt Steering Wheel
- Telescoping Steering Column

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Slide 11. (From Dr. Martinez's presentation, March 17, 1997.)

NHTSA REGULATORY ACTIONS ON AIR BAGS

- Improved warning labels
- Cut-off switches for vehicles with inadequate rear seats
- Allow "depowered" air bags
- Allow air bag "deactivation" by owners of existing vehicles
- Mandate "smart" air bags

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Slide 12. (From Mr. Recht's presentation, March 17, 1997.)

IMPROVED WARNING LABELS

- Limited consumer awareness of existing labels
- November 27, 1996, final rule requiring colorful, highly-visible warning labels
  - New cars and light trucks by February 25, 1997
  - New convertible or rear-facing child seat by May 27, 1997

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Slide 13. (From Mr. Recht's presentation, March 17, 1997.)

IMPROVED WARNING LABELS

(continued)

- Permanent labels required on sun visors and child restraints
- Temporary label on instrument panel or steering wheel
- Extensive focus group testing
- Labels emphasize child safety, but also provide safety information for other occupants

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Slide 14. (From Mr. Recht's presentation, March 17, 1997.)

WARNING LABELS (OLD)

CAUTION TO AVOID SERIOUS INJURY:

For maximum safety protection in all types of crashes, you must always wear your safety belt.
Do not install rearward-facing child seats in any front passenger seat position. Do not sit or lean unnecessarily close to the air bag.
Do not place any objects over the air bag or between the air bag and yourself.

See the owner's manual for further information and explanations.

PRINTED IN U.S.A. WLC 10260925

Slide 15. (From Mr. Recht's presentation, March 17, 1997.)

IMPROVED WARNING LABELS

- Visor in Up Position

- Visor in Down Position

Slide 16. (From Mr. Recht's presentation, March 17, 1997.)

IMPROVED WARNING LABELS

(continued)

- **Label on Child Seat Where Child's Head Rests**

- **Removable Label on Dash**

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Slide 17. (From Mr. Recht's presentation, March 17, 1997.)

CUT-OFF SWITCHES

- **In May 1995, NHTSA published a final rule allowing passenger-side air bag cut-off switches for certain vehicles**
  - **Option would expire for cars on September 1, 1997**
  - **Option would expire for light trucks on September 1, 1998**

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Slide 18. (From Mr. Recht's presentation, March 17, 1997.)

CUT-OFF SWITCHES

(continued)

- **Manufacturers are beginning to install these switches in pick-up trucks**
- **January 6, 1997, final rule extending expiration date for both vehicle types until September 1, 2000**

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Slide 19. (From Mr. Recht's presentation, March 17, 1997.)

DEPOWERED AIR BAGS

- **Goal is to achieve <u>average</u> depowering of 20-35 percent**
- **20-35 percent depowering would reduce risk of fatalities in low-speed crashes, while substantially preserving benefits in high speed crashes**

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Slide 20. (From Mr. Recht's presentation, March 17, 1997.)

DEPOWERED AIR BAGS

(continued)

- Final rule issued on March 14, 1997
  - 125 millisecond sled pulse
  - Sled pulse option proposal also included addition of neck injury measures to ensure that air bags are not depowered excessively
  - Immediate effective date
  - Expires September 1, 2001
- Depowered systems expected by beginning of model year 1998
- NHTSA also granted petition to include 5th percentile female dummy in standard

Slide 21. (From Mr. Recht's presentation, March 17, 1997.)

AIR BAG DEACTIVATION

- January 6, 1997, NPRM to allow vehicle owners to have their air bags deactivated by dealers or repair businesses
- Currently, dealers and repair businesses are statutorily prohibited from making Federally required safety equipment "inoperative"

Slide 22. (From Mr. Recht's presentation, March 17, 1997.)

AIR BAG DEACTIVATION

(continued)

- **NHTSA now permits air bag deactivation only on a case-by-case basis**
  - **Driver side only for medical reasons**
  - **Passenger side for people who must carry infants in front seat because back seat is nonexistent or inadequate, or must carry child in front seat for medical reasons**

Slide 23. (From Mr. Recht's presentation, March 17, 1997.)

AIR BAG DEACTIVATION

(continued)

- **NHTSA proposed that deactivation be allowed only until introduction of smart air bags.**
- **NHTSA views air bag deactivation as appropriate for a limited population of vehicle owners.**
- **Need for consumers to make informed decisions.**
- **Comment period closed February 5, 1997.**

Slide 24. (From Mr. Recht's presentation, March 17, 1997.)

SMART AIR BAGS

- **Smart air bags will tailor deployment to size of occupant and crash circumstances**
- **Ultimately, smart air bags will solve problems being addressed temporarily by labeling, cut-off switches, depowering and deactivation**

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Slide 25. (From Mr. Recht's presentation, March 17, 1997.)

SMART AIR BAGS

(continued)

- **NHTSA envisions requiring smart air bags for both driver and right-front passenger**
- **Challenge to select performance requirements that promote rapid development of these technologies without being design restrictive**

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Slide 26. (From Mr. Recht's presentation, March 17, 1997.)

ADVANCED AIR BAGS
MARCH 17, 1997

- Continuous Improvement
- Complexity of Issues
- Need to Involve Everyone
- Timing is Critical
- NHTSA to Play a Leadership Role
- Comprehensive Approach

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Slide 27. (From Mr. Bischoff's presentation, March 17, 1997.)

DEFINITION OF SMART AIR BAGS

- Label Rulemaking
- NPRM – August 1996
- Final Rule – November 1996
  - Type 1 Smart System
    - Suppression if less than 30 kg
  - Type 2 Smart System
    - Suppression by whatever means
  - Type 3 Smart System
    - Suppression or Modulation

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Slide 28. (From Mr. Bischoff's presentation, March 17, 1997.)

NHTSA HEARING
FEBRUARY 11-12, 1997

- Purpose – To Discuss Advanced Airbags
- About 200 Attendees
- Presentations by NHTSA
- Presentations by Manufacturers
- Presentations by Suppliers
- Presentations by Others
- Brainstorming Session with Audience

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Slide 29. (From Mr. Bischoff's presentation, March 17, 1997.)

PASSENGER AIR BAG ISSUES

- Rear Facing Infant Carriers
- Out of position children & adults
- Properly positioned children
- Misuse or non-use of safety belts
- Low speed deployments
- Pre-crash braking effects
- Objects/devices in front of air bags
- Center seat position
- Higher speed crashes
- Pregnant women
- Hyperacusis

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Slide 30. (From Mr. Bischoff's presentation, March 17, 1997.)

DRIVER AIR BAG ISSUES

- Driver's arm injuries
- Short statured drivers
- Frail drivers
- Larger drivers
- Steering wheel adjustments
- Pedal & control reach & visibility
- Pregnant women
- Adaptive devices
- Late deployments
- Burns & abrasions

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Slide 31. (From Mr. Bischoff's presentation, March 17, 1997.)

TEST DUMMIES FOR AIR BAGS

- Currently only 50th percentile male
- Other possibilities
  - 5th percentile female
  - 95th percentile male
  - 3 year old
  - 6 year old

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Slide 32. (From Mr. Bischoff's presentation, March 17, 1997.)

TEST ISSUES FOR AIR BAGS

- Static
- Dynamic
  - Low/Moderate/High speed
- Belted/Unbelted/"Partially" Belted
- Various infant/child restraints
- In/Out of position
- Pre-crash braking
- Hard/Soft crashes
- Vehicle/Sled tests
- Injury measures
- Repeatability and Reproductability

Slide 33. (From Mr. Bischoff's presentation, March 17, 1997.)

LEAD TIME ISSUES

- How smart?
- How fast?
- Phase-in schedule?
- Driver and/or passenger?

Slide 34. (From Mr. Bischoff's presentation, March 17, 1997.)

ADVANCED TECHNOLOGIES

- System deploys optimally for all occupants in all situations
- Ultimately no warning labels required
- Crash and/or pre-crash sensors
- Occupant weight and/or size sensors
- Occupant position/proximity sensors
- Variable rate inflators
- Variable venting systems
- Decision computer for total system
- Complexity versus reliability/liability

Slide 35. (From Mr. Bischoff's presentation, March 17, 1997.)

NHTSA TESTING AND RESEARCH

- VRTC and Contractors and Partners
- Baseline air bag system testing
- Testing depowered air bags
- Testing advanced air bag inflators
- Testing occupant sensors
- Testing advanced system components
- Testing advanced system concepts
- Biomechanical testing and research
- Dummy research and improvement
- Technology transfer

Slide 36. (From Mr. Bischoff's presentation, March 17, 1997.)

NASA MOU – RATIONALE

- Signed in December 1996
- Cooperation can expedite technology advancements in air bags
- Leverage NHTSA expertise in restraints and biomechanics with NASA leadership in advanced technologies and systems analysis

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Slide 37. (From Mr. Bischoff's presentation, March 17, 1997.)

NASA MOU – PURPOSE

- Understand and define critical parameters of air bag performance
- Systematically assess air bag state-of-art and future potential
- Identify new concepts for air bag systems

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Slide 38. (From Mr. Bischoff's presentation, March 17, 1997.)

NASA MOU – JPL ROLE

- Identify and characterize air bag system technology for effective occupant protection and
- Applicable to elimination of adverse effects of deployment, particularly on children, small adults and/or the elderly
- Recommend technology development needs
- Interim Report in July 1997
- Final Report in October 1997

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Slide 39. (From Mr. Bischoff's presentation, March 17, 1997.)

TRANSPORT CANADA JOINT R&D

- Agreement signed in December 1996
- Cooperation in test procedure development for "Smart Air Bags"
- Development of improvements in dummies and injury criteria

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Slide 40. (From Mr. Bischoff's presentation, March 17, 1997.)

CDC

November 17, 1995 / Vol. 44 / No. 45

MMWR

MORBIDITY AND MORTALITY WEEKLY REPORT

Notice to Readers

Because of the furlough of U.S. government employees, CDC has restricted its activities to responses to emergencies and other public health matters of extreme urgency. Therefore, this issue of *MMWR* contains only one report with immediate public health implications. This report includes measures for preventing serious injuries and death in children as the result of deployment of air bags in vehicles in which children have been improperly restrained or seated; these measures should be implemented immediately to decrease the risk for children, particularly during the holiday period of increased travel. Other reports of public health importance and findings from the ongoing National Notifiable Disease Surveillance System will be published at a later date. Printed versions of this issue also will be available to CDC's subscribers at a later date.

David Satcher, M.D., Ph.D.
Director, CDC

Air-Bag-Associated Fatal Injuries to Infants and Children Riding in Front Passenger Seats — United States

Air bags, when used as a supplement to safety belts, effectively prevent deaths and serious injuries in frontal motor-vehicle crashes. Air bags are standard equipment in most new cars; federal safety standards require that all new passenger cars and light trucks be equipped with both driver- and passenger-side air bags by 1999. The safety of air bags is well documented, and air bags have saved an estimated 900 lives since the late 1980s (*1*); however, special precautions are needed to safely transport children in vehicles equipped with air bags. Reports of eight deaths of child passengers in crashes involving air-bag deployment are of special concern because they involved low-speed crashes that the children otherwise might have survived. This report summarizes three of these eight cases (*2*).

Case 1. In October 1995, in Utah, a 5-year-old child sitting in the front passenger seat of a 1994-model automobile was killed when the passenger-side air bag deployed

Slide 41. First page of the CDC report. (From Dr. Hedlund's presentation, March 17, 1997.)

AIR BAG SAFETY CAMPAIGN

AIR BAG SAFETY: BUCKLE EVERYONE! CHILDREN IN BACK!

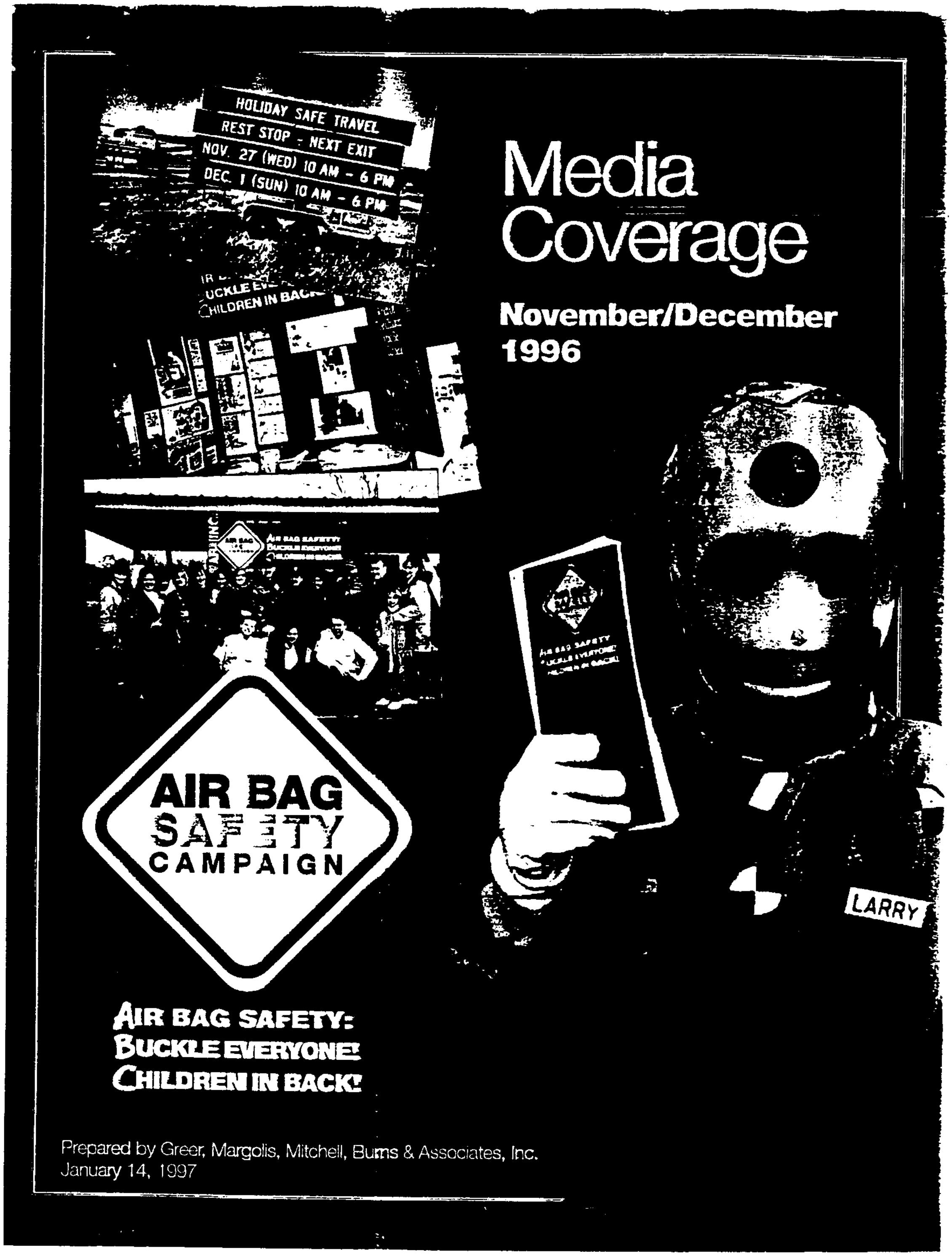
CAMPAIGN PARTICIPANTS

Act Radio
Advocates for Highway & Automobile Safety
Alliance of American Insurers
AlliedSignal Automotive Safety Restraints Systems*
Allstate Insurance Company*
American Academy of Family Physicians
American Automobile Association
American Automobile Manufacturers Association
American Air Bag Corporation
American Coalition for Traffic Safety
American College of Emergency Physicians
American Insurance Association
American Suzuki Motor Corporation*
American Trucking Association
Amoco
Association of International Automobile Manufacturers
Association of State and Territorial Health Officials
AUTOLIV, N.A., Inc.*
Automotive Occupant Restraints Council
BMW of North America, Inc.*
Brain Injury Association
Breed Technologies, Inc.*
California Children's Lobby
Centers for Disease Control and Prevention,
  National Center for Injury Prevention and Control
Century Products
Chrylser Corporation*
Coalition for Consumer Health and Safety
Coalition for Vehicle Choice
Cosco
DANA Foundation
Department of Health and Human Services Maternal and Child Health Bureau
800-REPAIR
Emergency Medical Services for Children

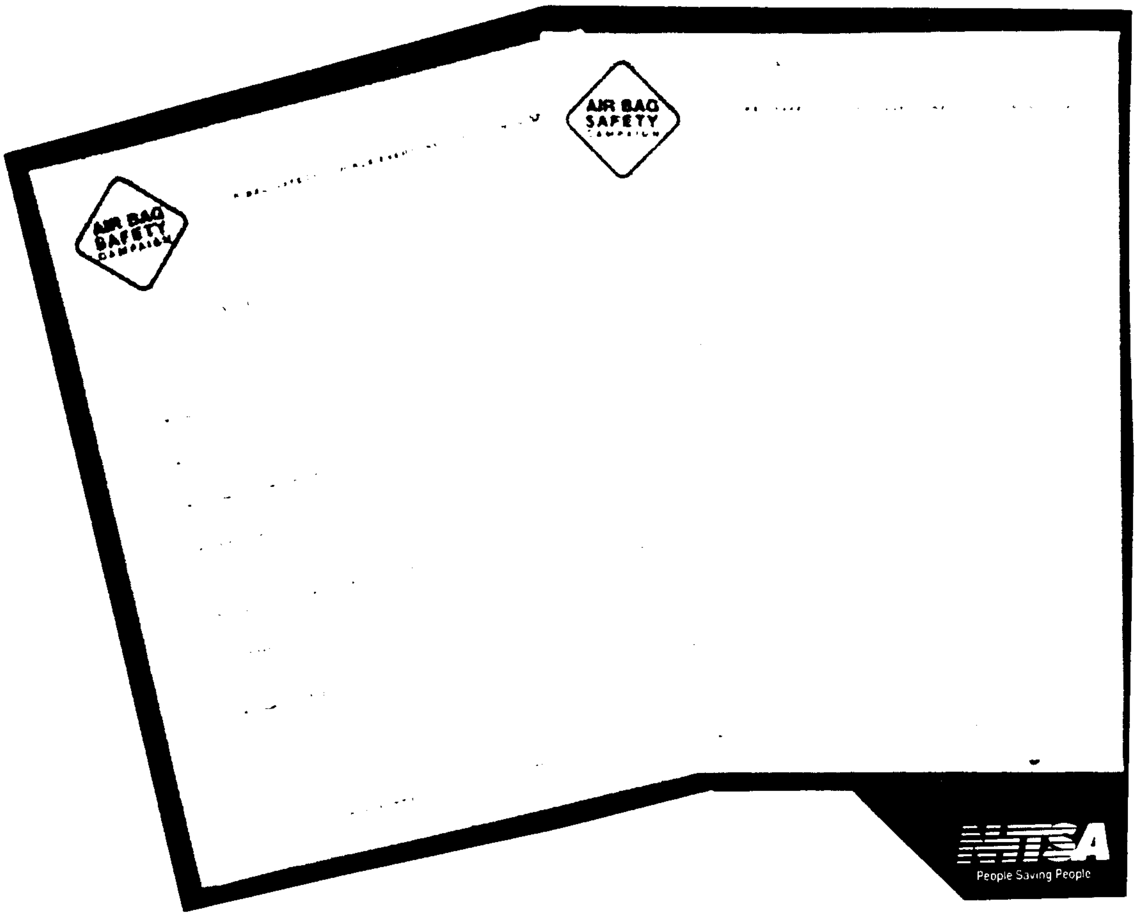
(202) 293-2270 ext. 339 • fax (202) 822-1399 • *InfoLine:* (202) 625-2570

National Safety Council • 1019 19th Street, NW • Suite 401 • Washington, DC 20036–5105

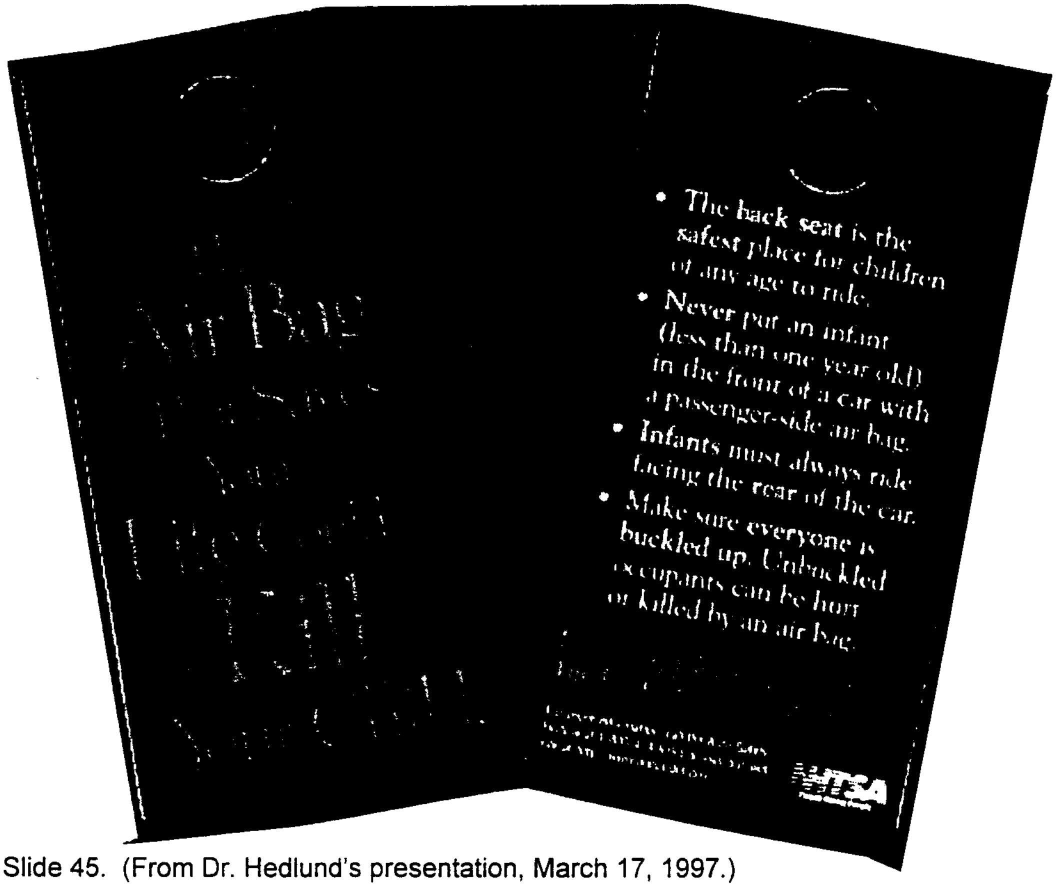
Slide 42. Partial list of organizations. (From Dr. Hedlund's presentation, March 17, 1997.)



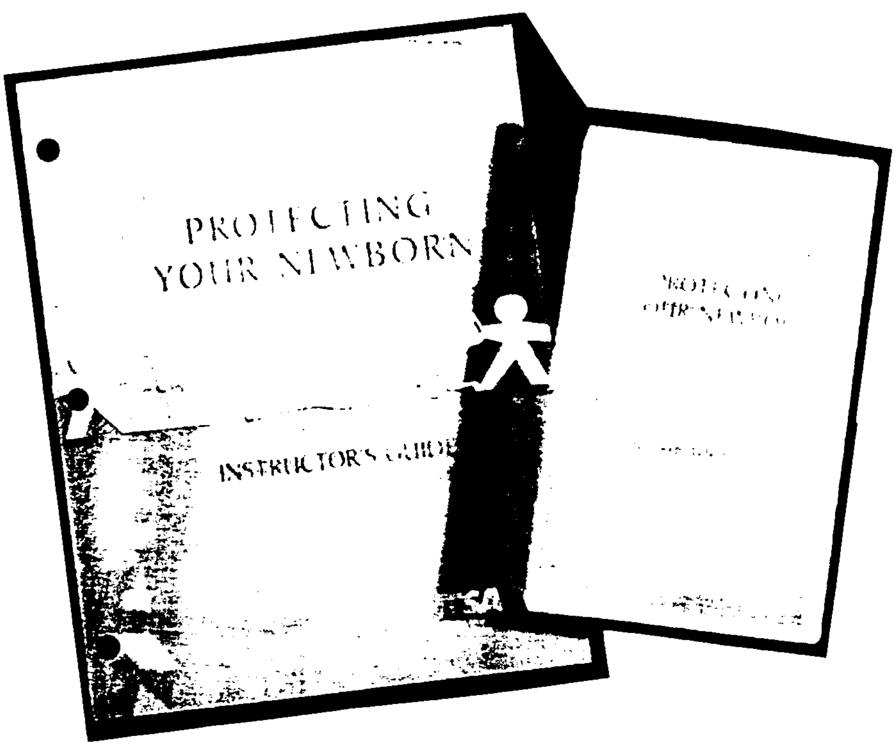
Slide 43. (From Dr. Hedlund's presentation, March 17, 1997.)



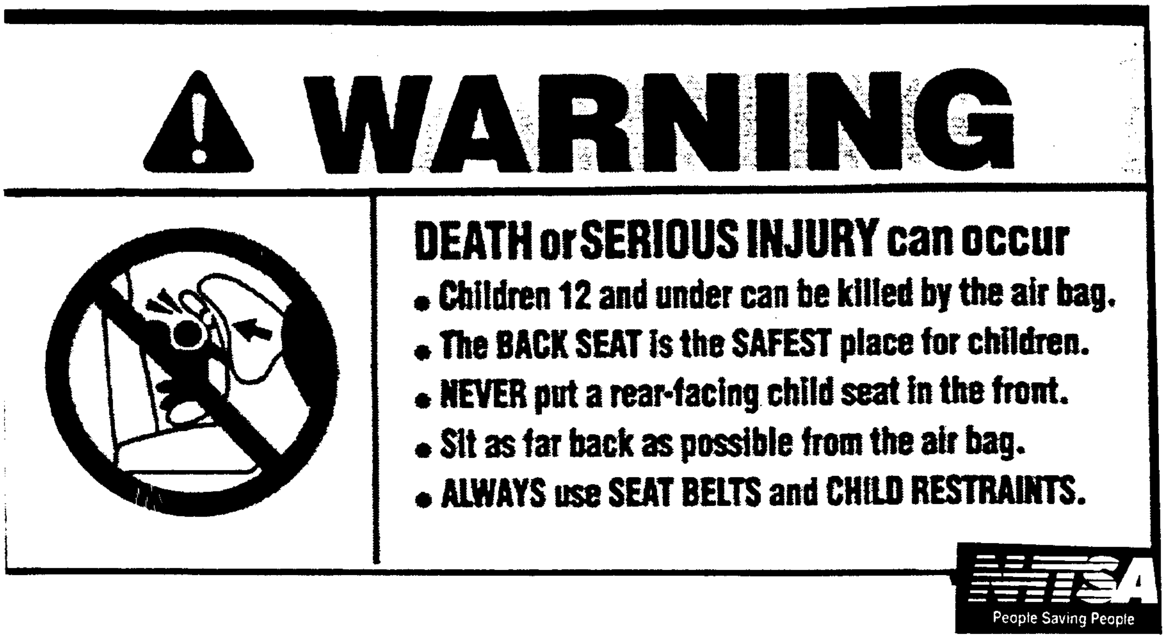
Slide 44. (From Dr. Hedlund's presentation, March 17, 1997.)



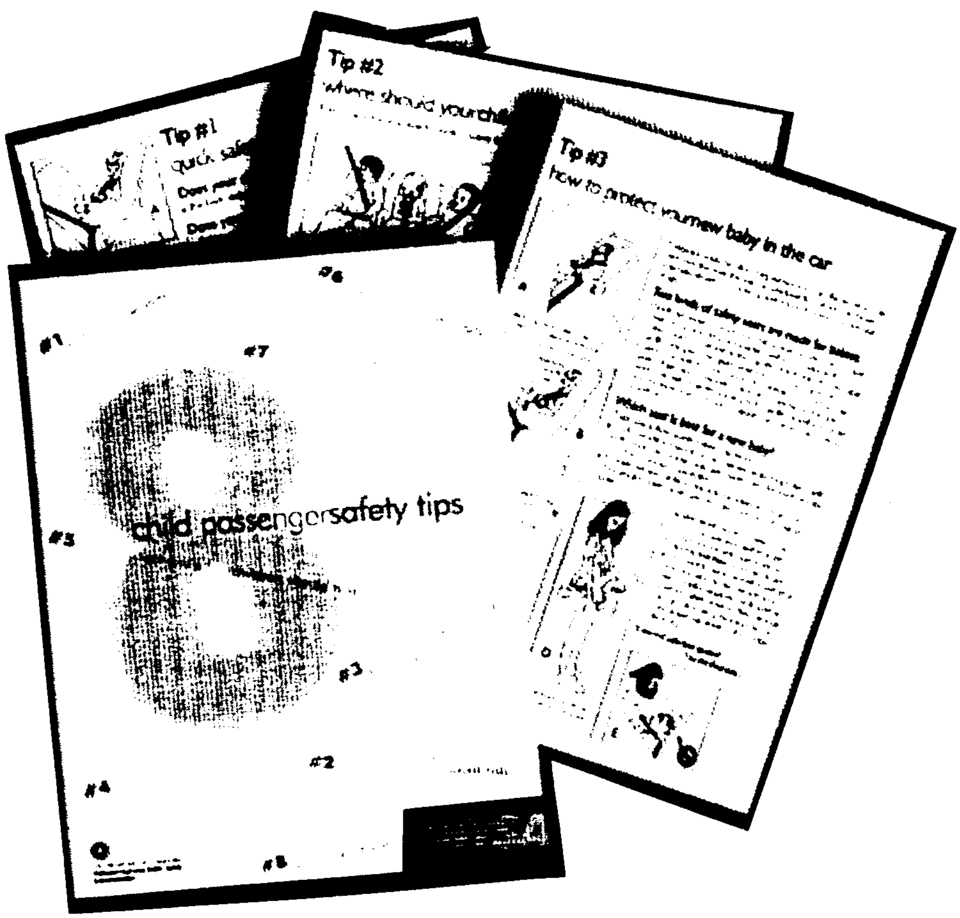
Slide 45. (From Dr. Hedlund's presentation, March 17, 1997.)



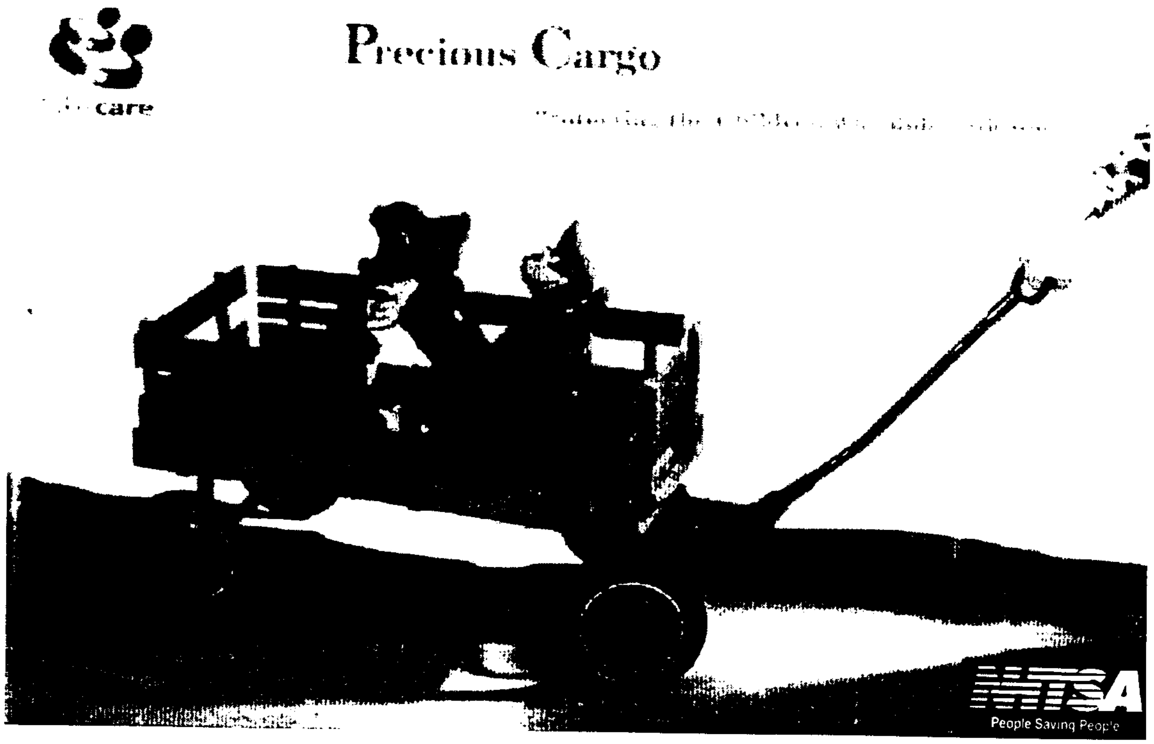
Slide 46. (From Dr. Hedlund's presentation, March 17, 1997.)



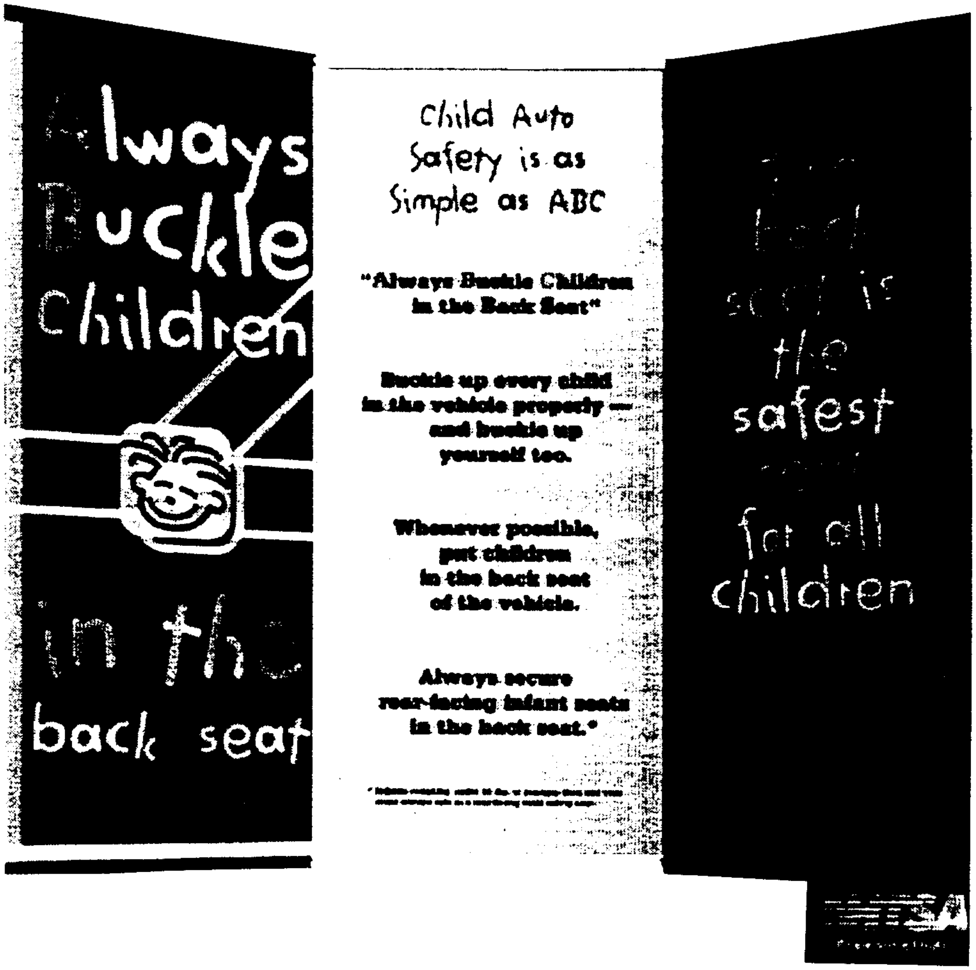
Slide 47. (From Dr. Hedlund's presentation, March 17, 1997.)



Slide 48. (From Dr. Hedlund's presentation, March 17, 1997.)



Slide 49. (From Dr. Hedlund's presentation, March 17, 1997.)



Slide 50. (From Dr. Hedlund's presentation, March 17, 1997.)

WITH THE CONTROVERSY OVER AIR BAGS, HOW CAN PARENTS PROTECT THEIR CHILDREN?

Keeping Them Safe

BY CRISTINE RUSSELL

The holiday season is a time when Americans pile the kids into a car or van or truck and hit the road. It's also a time of increased concern about traffic injuries. Recent publicity about children killed by the force of a vehicle's air bag inflating has left many ... confused about how best ... avoid serious ...

Poll shows adults know the dangers of air bags

By James R. Healey and Jayne O'Donnell
USA TODAY

Most adults know that seat belts are safer than air bags and that air bags can hurt or kill children, according to a USA TODAY poll.

"This is a very powerful suggestion that Americans are getting the message that air bags and children do not mix," says Phil Haseltine ...

The message is clear to Eric Bellnier, 25, of Coxsackie, N.Y. "Put the damn kid in the back seat," he says. Bellnier drives a truck with one air bag, but would prefer dual air bags. He is one of 1,229 adults surveyed Oct. 26-29 for USA TODAY by the Gallup Organization.

The government recently began warning parents not to let kids younger than 12 sit in front of an air bag ...

Put kids in rear seat if it's at all possible

By G. Chambers Williams III
FORT WORTH STAR-TELEGRAM

Air bags have been promoted by auto-safety advocates for nearly two decades, and now the government requires two air bags in the front seat of every new vehicle.

But I'm sure most of you have been following the developing controversy over passenger-side air bags, required in all passenger cars as of this year.

Air bags have saved many lives ... at least 1,500, according to the National Highway Traffic Safety Administration. Yet these bags are also killing people. Little people. Children.

And even though th... protect children in ... them buckled up, ... accidents in which ... killed by air ba... many of them w... the front seat, ... approved child ...

The air bag ... front of the... speed of up ... broke their ... were so lo... leaning fo... when it d...

"This ... way Tr... propos... discor... bag ... tine... fro... ...

Seat Belts Called Key In Crashes

NHTSA Urged to End Air Bag Standards

By John Mintz
Washington Post Staff Writer

States that aggressively enforce seat belt laws are achieving their goals of getting more people to routinely buckle up, federal and industry officials told a congressional hearing yesterday.

The 11 states where police officers can issue tickets any time they see an unbelted person in a car have the highest rates of belt use—including California, with a rate of 85 percent; New Mexico, with 86 percent; and Oregon, 80 percent.

The Senate Commerce, Science and Transportation Committee called the session to examine the danger that air bags may hold for children ... small adults. Offici... closed ...

"We must never, ever lose [this] most fundamental lesson ... Ricardo Martinez, administr... the National Highway Traffic ... Administration, said seat belts r... the risk of death in crashes by 45 ... cent and cut injury risk 50 percen...

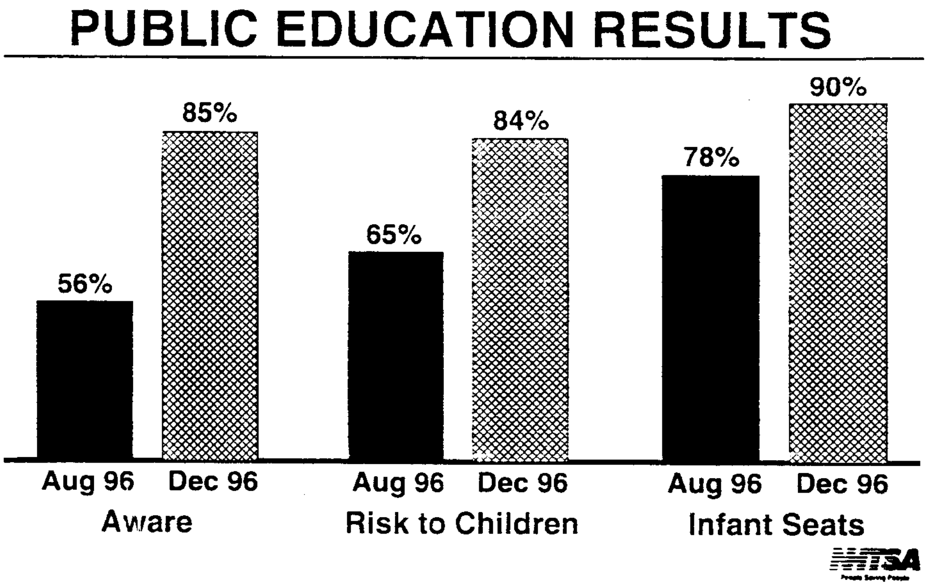
Forty-nine states and the Distric... Columbia require motorists to w... seat belts. (The exception is Ne... Hampshire.) While 67 percent of dr... ers and passengers nationwide wea... lap and shoulder seat belts, the numbers vary widely among states, largely mirroring the leeway that states grant their police officers in enforcing the laws.

Thirty-nine states and the District let officers issue seat belt tickets only if they find another violation first. The states include those with the lowest seat belt use rates: South Dakota, with 40 percent; North Dakota, with 42 percent; and Mississippi and Oklahoma, with 46 percent.

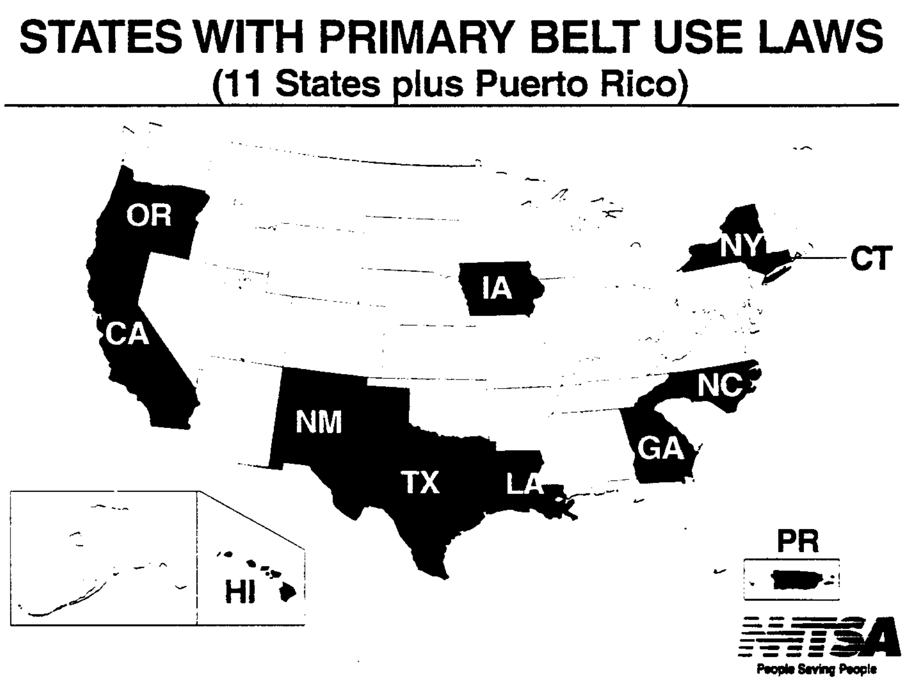
The District, with 63 percent usage, is near the national average, as are Maryland and Virginia, with 70 percent.

Seat belt use rates are higher in other industrial nations than in ... United States: Canada ... cent rate ...

Slide 51. (From Dr. Hedlund's presentation, March 17, 1997.)



Slide 52. (From Dr. Hedlund's presentation, March 17, 1997.)



Slide 53. (From Dr. Hedlund's presentation, March 17, 1997.)

Afternoon Session

(Time Noted: 1:30 p.m.)

CHAIRMAN HALL: On the record. If we could reconvene this meeting, this public forum of the National Transportation Safety Board. I welcome everyone back. I thought we had a very informative morning session. I'm looking forward to this afternoon. I, again, apologize for my voice. I screamed it out cheering for the Chattanooga Mocs yesterday in Charlotte. And for everyone's information, they'll be playing Providence Friday in Birmingham.

(General laughter.)

CHAIRMAN HALL: So, we can't let this hearing go into Friday. We have to finish in the allotted time that we have. I would like Mr. Osterman to introduce the first panel, the subject is the role of air bags and seat belts as primary or supplemental restraint system? I would like to thank our panelists for their participation this morning, and ask Mr. Osterman to begin our session.

Panel 1

The Role of Air Bags and Seatbelts: A Primary or Supplemental Restraint System?

MR. OSTERMAN: What I would like to do is if you would enter your name and your affiliation and your current title for the record. Ms. Petrauskas?

MS. PETRAUSKAS: I'm Helen Petrauskas. I'm Vice President of Environmental and Safety Engineering for Ford Motor Company.

MR. O'NEILL: Brian O'Neill, President of the Insurance Institute for Highway Safety.

DR. GRAHAM: John Graham, Professor, Harvard School of Public Health.

MS. CLAYBROOK: Joan Claybrook, President, Public Citizen.

MR. OSTERMAN: Begin the questions with Mr. Roberts.

MR. ROBERTS: This panel is slightly unique. It's unique in that we will begin with each participant being allowed on the order of five minutes to make a general statement as to their thoughts about this topic. And it's also a little unique in the fact that it's more of a philosophical panel than the others.

The philosophy here has to do with whether bags or belts are primary or supplementary. I think a lot of the world perceives the air bag as being a supplementary system in terms of marketing, but yet from the design standpoint, the engineers have to treat it almost as a primary system in order to pass standard 208, FMVSS 208. So that's the general topic of discussion.

I would like to start off alphabetically, as we have the panelists aligned, with Ms. Claybrook, to give us her thoughts, please, on that.

MS. CLAYBROOK: I thank you very much, Mr. Chairman. The tragedies that we've heard about today and before today cry out for extraordinary leadership of Government and industry. And we appreciate very much your taking the time and putting the energy into having this proceeding.

There's been a debate for over 25 years about whether air bags or safety belts are more important or better. And since these restraint systems provide different elements of protection for occupants, they should be thought of as an integrated restraint systems, not as competitors.

Belts provide extra protection, not only in frontal and rollover and some side impact crashes, but provide no protection if not worn. Currently, belts are worn in only

50 percent of fatal crashes. With belt use laws now in all but one state, non-users are often risk takers and often teenagers.

There are also limits on belt capacity. They do not protect against severe head injury and crashes about 25 miles an hour, and can cause internal injuries in higher speed crashes. Some 9,000 belted occupants die every year in crashes.

Air bags provide automatic crash protection only in front and front angular crashes; although, additional air bags are being designed and have been used for side impact. Air bags provide excellent protection in frontal crashes and are essential for protection against devastating head injuries.

Thus, no level of belt use can substitute for air bags. But air bags, as currently designed in some vehicles, have caused deaths and injuries in lower speed crashes, primarily to occupants who are unbelted and out of position, especially children and smaller women.

The automotive Air Bag systems installed in vehicles today are not designed to protect children under age 12. Automotive vehicles have never been designed to protect children under 12. Infants and toddlers can be protected with add-on baby restraint systems. And a few vehicles do have built-in child restraints, but often the add-on systems are difficult to install properly or the parent doesn't install them properly, losing maximum protection.

Adult belts do not properly fit and protect children. For unrestrained children who lean up against the dashboard, or are thrown there by pre-impact braking, the rapidly inflating air bags can be harmful. So cars have never been or vehicles have never been designed for children.

Air bags can be vastly improved, while safety belts are unlikely to be changed significantly. There are a number of short term and longer term inexpensive changes that can be made in air bag designs to avoid injury, these can be made without any changes in the Federal Standard 208. And NHTSA can urge manufacturers to make changes to upgrade their air bags very rapidly. And belt pretensioners could also avoid the problem of out-of-position belted occupants.

The major short-term changes that I believe could be made are to raise the threshold from 12 to 14 miles an hour, NHTSA had originally recommended 15 miles an hour back in 1970 when they first issued this rule. The current marketplace standard is seven to 12.

This would vastly reduce the number of air bag inflations in crashes below 20 miles an hour where the air bag induced injuries are occurring.

The second is top mounted air bags, such as Honda has installed, also the 1997 Camry, and I believe Ford has also moved to this, that are installed next to the windshield, so that the full force of the air bag does not touch occupants.

Third, recess the steering module to increase the distance between the inflating air bag and the driver. And, finally, install dual stage or multi-stage inflation systems with less force in low speed crashes and more in high speed crashes where it's needed. This concept was developed by General Motors in the early '70s to protect out-of-position occupants and recommended by NHTSA experts, and outside experts, as well, in 1980.

The major air bag suppliers and comments to the NHTSA docket recommended this type of system and indicate they are prepared to sell them now.

Finally, to achieve substantial improvements with new technologies in air bags by all automotive companies, NTHSA should rapidly upgrade the air bag performance standard, to add tests for unbelted small women and children, to add neck injury criteria, and a frontal offset crash test. This will encourage suppliers and manufacturers to invest in, develop tests and offer for sale these improved technologies, and it will allow manufacturers to optimize their systems.

Thank you.

CHAIRMAN HALL: Thank you.

MR. ROBERTS: Thank you, Ms. Claybrook. Dr. Graham, do you have some thoughts to share with us on the subject?

DR. GRAHAM: Thank you. Thank you, Mr. Chairman, for the opportunity to be here today. I've devoted a substantial amount of my career to studying the science, the economics, and the politics of automobile air bags. I have also been a vocal advocate of the air bag. The recent field experience has tempered my enthusiasm for this technology.

Today, I would like to make separate comments on the driver's side air bag and the passenger side air bag. Overall, the driver's side air bag has proven to be a useful safety device with the cost-effectiveness ratio that is comparable to other well-accepted measures in preventive medicine. I will discuss this cost-effective issue in more detail on Wednesday.

However, I must confess that the evidence has shown that we oversold the benefits of the driver's side air bag. We predicted that driver's side air bags would reduce fatality risks to unbelted occupants by 30 percent when, in fact, it appears based upon the best available data, they are reducing them by only 13 percent. For belted drivers, our estimate of a 10 percent fatality reduction has proven to be about right.

We have also learned that the driver's side air bag is not as effective in preventing injuries, as we expected, and that air bags cause many more injuries to drivers than we anticipated. For almost half the crashes where air bags do deploy, relatively low speed crashes, a case can be made that they are actually causing more injury to belted drivers than they are preventing.

Obviously, we need to work hard to enhance the effectiveness and the cost-effectiveness of the driver's side air bag, taking into account the special needs of the belted driver, women, our elderly citizens, and Americans of short stature.

Let me comment now on the passenger side system. In my opinion, the United States needs a fundamental re-examination of its approach to passenger side protection. We are perhaps the only nation in the world that is so committed to passenger side air bags at the present time, even though the available data do not warrant such enthusiasm about them.

We now know that we overstated by a factor of three the safety benefits of the passenger side bag. We have also been stunned and appalled by the harm they have inflicted upon young children. They appear to kill more children than they save, with the best estimate around a net 33 percent increase in risk of death to these children.

Even among children who are properly restrained, we cannot say with confidence that air bags save more of these children than they kill. For America's children, the current passenger side air bag is a big loser. Taking into account risk, cost, and benefit, my own opinion is that the current passenger side air bag is not acceptable. We need to either change human behavior, change the technology, or do something. We cannot have the status quo.

This morning, the Harvard Center for Risk Analysis is releasing a national survey of 1,000 Americans regarding their opinions about air bags. This survey demonstrates that we in the safety community have created a falsely positive image of this technology in the public's mind. Consider the following misconceptions. Fifty-nine percent of Americans believe that air bags save more lives of children than they kill. This statement is incorrect. Seventy-four percent of Americans believe it is safe for children under age 12 to ride in the front seat. This statement is incorrect. Seventy-eight percent of Americans believe that a driver's risk of being injured by an air bag is minimal if the driver wears a safety belt. This statement is also incorrect.

With the exception of one-third of American women who are developing less favorable attitudes towards air bags, the vast majority of Americans have an unqualified enthusiasm for this technology that is not supported by the scientific evidence. We can take some comfort in the massive public education campaign that is now underway urging parents to buckle their kids up in the back seat, but education is not enough.

When the media's interest in this story winds down, 30 million cars with passenger side air bags will still be there, being resold to millions of lower income, less educated owners, who we know in the field of safety are less aware of the safety issue and tend to be less safety conscious.

Unless America has a change in its safety culture quickly, we can expect millions of children to be riding in the front seats of cars with passenger side air bags, many without proper restraint.

In conclusion, integrity and safety policy means not just taking credit for success, but accepting responsibility for problems. We can be proud of the model success of the driver's side air bag, even though it won't save as many lives as we predicted. However, we should not be proud about the passenger side air bag and we can do better.

We should be mature enough to re-examine what we have done and work hard to clean up the mess we have created. I look forward to an honest discussion about what we will do, not just about new cars, but about those 30 million vehicles out on the road, who have children in them as we speak today.

Thank you very much, and I look forward to the questions and discussion.

CHAIRMAN HALL: Thank you, Doctor.

MR. ROBERTS: Those were very sobering thoughts. Thank you, Dr. Graham. Brian O'Neill, your thoughts, please?

MR. O'NEILL: Thank you, Mr. Chairman, for the opportunity to be here. In order to address the question for this panel, which is the role of air bags and seat belts, I think it's useful to briefly recap the history of air bags in relation to seat belts.

When air bags were initially developed in the late 1960s, most cars did not have shoulder belts. Use of lap belts was low, about 20 percent, and shoulder belt use in the relatively few cars with such restraints was an even lower 2 to 5 percent.

The differing use rates were possible, because in most cars at the time, shoulder belts were entirely separate from the lap belts. In the early 1970s, the air bag was viewed as an alternative to the virtually unused shoulder belt. Most people agreed that lap belts still would have to be used in cars with air bags, because while the bags would protect people in frontal crashes, lap belts would be needed for protection in other crash modes.

There was a hope at that time that additional passive or automatic restraints could be developed to protect occupants in side and rear impacts and rollovers. This was reflected in the National Highway Traffic Safety Administration's early rulemaking proposals for passive restraints, which envisions the possibility of fully passive or automatic protection in front, side, and rear impacts, and rollovers.

Under these NHTSA proposals, manufacturers would not have been required to put lap or shoulder belts in the front seats of cars with full passive protection. However, lap belts would have been required in cars equipped with passive protection for frontal crashes only.

The technology was not developed for passive protection in side, rear, or rollover crashes. So the idea of fully passive systems replacing manual belts became moot. And it was just about the same time that lap shoulder belts were first mandated for front outward seats, with the exception for cars with air bags. But in those cars, only lap belts were required and lap shoulder belts were permitted.

Thus, air bags never were envisioned as more than replacements for the shoulder portions of belt systems. They were, in effect, considered to offer passive or automatic crash protection in frontal crashes only. It was later when automatic seat belts were allowed under FMVSS 208 as an alternative to air bags, that the idea took hold of bags and belts as alternatives.

Even though air bags clearly could not replace belts entirely, there was an expectation that they would provide automatic protection to both belted and unbelted occupants in serious frontal crashes. To ensure this, the requirements of FMVSS 208 specified tests with both belted and unbelted dummies.

Have these requirements relegated either seat belts or air bags to secondary status? I believe the answer is no. It's long been recognized that the combination of lap shoulder belt, plus an air bag offers the best available protection in the complete range of crashes. This combination is, in fact, the primary restraint system.

The air bag by itself protects people only in serious frontal crashes. And as such, has a secondary role. But it's important to recognize that air bags do add significantly to the protection offered by belts alone. Air bags reduce fatality risks among belted drivers by about 12 percent and about 9 percent among belted passengers.

There are also very important reductions in serious non-fatal injuries. For example, NHTSA estimates that the combination of an air bag, plus a lap shoulder belt, reduces the risk of serious head injury by 75 percent compared with a 38 percent reduction for belts alone.

To help illustrate this point, I've brought with me a steering wheel from a recent 35 mile per hour crash test run by the Institute in which a driver dummy representing a fifth percentile female was fully belted and the air bag was disconnected. The dummy's face did this to the steering wheel rim. This was a fully belted fifth percentile female test dummy. In an identical crash test with a belt, plus an air bag, there was no damage to the steering wheel and the forces on the dummy's head were much lower. But why we're here today or for several days, is because even though air bags increase protection among both belted and unbelted occupants, they can also cause serious injuries, even death to out-of-position occupants.

Obviously, we need to find ways to reduce these serious side effects while preserving air bag benefits. This leads to two important questions. How have the requirements of FMVSS 208 influenced restraint system designs and have these influences contributed to the problems with today's air bags?

There is no question that the unbelted test requirements of FMVSS 208 have constrained manufacturer's ability to optimize the performance of belts and bags together. Inflator output is dictated by the unbelted test, which means performance of the primary restraint system, air bags used in conjunction with belts, cannot be optimized.

Furthermore, it is now widely accepted that today's inflator power levels contribute significantly to injury risks among out-of-position occupants. Even multi-stage inflators which could reduce out-of-position problems in lower severity crashes, would not eliminate these problems in higher severity crashes, because inflator output would still be dictated by the unbelted test requirements.

The question then becomes will reducing today's air bag inflation power levels also reduce the protection offered by air bags? We strongly believe the answer is no for both belted and unbelted occupants. Unlike the unbelted dummy in the crash test specified by FMVSS 208, many unbelted occupants in real world crashes at both low and high speeds are out of position when air bags begin to inflate.

They, therefore, would benefit from inflators with lower power. The crashes and circumstances in which unbelted occupants would receive significantly reduced protection are relatively rare events, if they occur at all.

Although the unbelted test requirements of FMVSS 208 have resulted in air bag inflators that are too powerful, some good design characteristics have resulted from this test. For example, the test requirements effectively preclude the so-called face bags or Euro bags for drivers. We think this is good, because such bags, which are much smaller than the full size bags, are likely to offer only limited protection to unbelted occupants and reduced protection for belted occupants in many offset crashes.

Another example is the addition of knee bolsters, which are intended to prevent unbelted occupants from submarining underneath air bags. This protective feature which results from the unbelted test requirements is essentially benign for belted occupants.

As far as restraint system designs are concerned, FMVSS 208 has thus been a mixed bag. Some good and some bad design features have resulted. This should not surprise us, because after all, the standard has remained basically unchanged since the 1970s.

In the future, we need a standard that allows belts and bags to be optimized as a system. This means improvements like pretensioners and force limiters for belts. And for air bags, full size bags with inflation characteristics tailored to minimize the forces experienced by belted occupants.

Nothing in FMVSS 208 should preclude any of these advancements. This optimization can be accomplished without reducing the protection air bags alone offer to unbelted occupants, providing full size air bags and knee bolsters are not eliminated.

Future restraint systems will be greatly improved compared with today's. Deployment thresholds will be higher for belted than for unbelted occupants. Crash sensors will do a better job of deciding when to signal air bags to inflate. The inflators themselves likely will be two or multi stage. There will be automatic suppression of passenger air bags when an infant or child restraint is in the front seat.

Changes to 208, however, should not focus on any particular technologies. Instead, the standard should address performance. There should continue to be high speed crash test requirements with belted dummies and possibly other requirements to ensure continued use of full size air bags and knee bolsters.

This should result in restraint systems that provide optimum protection of belted occupants in all crash modes, as well as protection of unbelted occupants in frontal crashes. There should also be a series of deployment tests with out-of-position dummies of various sizes, including some in infant and child restraints.

These requirements should result in restraint systems that protect occupants in severe crashes without injuring out-of-position occupants in the much more common low severity crashes. And such requirements should remain in place, regardless of the level of belt use in the United States.

Thank you, Mr. Chairman.

CHAIRMAN HALL: Thank you. Just one clarification. We heard this morning that NHTSA has not certified a child size dummy or a fifth percentile female dummy. Who developed the fifth percentile female that you used in the test you referred to?

MR. O'NEILL: Well, there are accepted fifth percentile, 95th percentile male, six year old, three year old, 12 month, and six month old dummies. They are hybrid three dummies—not the 12 month and six month old. They have just not yet been certified as

Federal crash test dummies. But these dummies do exist and are used widely now for testing.

CHAIRMAN HALL: Thank you. Okay. Helen. I'm sorry, Vern, you're supposed to call on Helen.

(General laughter.)

MR. ROBERTS: One quick question—a detailed question before we move along, if I could. In the test with the steering wheel. Do you recall what the seat position was, forward and aft, and whether that car had pretensioners on the belts?

MR. O'NEILL: The car did not have pretensioners. The seat was all the way—almost all the way forward. It was not all the way forward, because in that position, the fifth percentile dummy's knees would have been touching—the knee bolster or would have been touching the dashboard.

CHAIRMAN HALL: It's nice that we have some C-Span covering this and so we've got an opportunity for a lot of the American public to watch and be educated through this forum. Could you explain briefly, please, what a pretensioner is, so if anybody out there is listening, they can understand what we're talking about.

MR. O'NEILL: There are a range of pretensioning devices so that early in a crash, they take out the slack that is normally on a seat belt reel, so that there is less forward movement of a belted occupant. Typically a pretensioner will fire using similar technology to air bag technology, but will fire earlier in the crash than an air bag. In fact, in some designs, pretensioners will fire in crashes where the air bag itself doesn't deploy, because the ultimate severity of the crash is not that high.

CHAIRMAN HALL: And there are some makes that have those pretensioners, but that is not a requirement now under FMVSS 208. Is that correct?

MR. O'NEILL: That is correct. There are a number of manufacturers offering pretensioners on their belt systems, but it is not required nor is it precluded by 208.

CHAIRMAN HALL: Thank you.

MR. ROBERTS: Okay. Thank you. Ms. Petrauskas.

MS. PETRAUSKAS: Thank you very much. Let me simply commend the Safety Board for bringing together over this period of four days truly all of the experts in the world on these subjects, and I know that it will be a very valuable session for all of us as they talk about the technical issues in the engineering approaches and test procedures.

I hope that one of the outcomes of this forum is that we are able to articulate in plain English, in words that the public can understand, our safety objectives with regard to air bags and the premises on which those objectives are based.

My basic premise is that belts are the primary restraint systems and air bags are supplementary to that, but there is no question that the two together work as a system. I think what's more important is, I believe, that will continue to be the case regardless of how sophisticated we get about air bag systems.

Based on that basic premise, I believe that our public health and safety objectives should be articulated in the following way. Our first objective, our first priority should be to provide additional protection for all restrained occupants. I think, second, we have to come as close as we can to the goal of doing no harm with an air bag, particularly to those members of our society who are most vulnerable, and that is children who can't buckle themselves and short statured persons who can't change their stature.

And our third priority should be to provide the best protection we can for unbelted occupants, provided we can do so without causing additional risks to belted occupants and vulnerable occupants.

I think to reach those objectives, we've identified at least four tasks that need to be accomplished. The first of those is to get people to buckle up and to use proper child restraints. Just very recently, we completed a study that looked at the correlation between use by the driver and then use by other occupants.

What we found is that 92 percent of pre-teen kids in the front seat were buckled up if the driver was buckled up. That number fell to 9 percent—9 percent when the driver wasn't buckled up. So what that says to us is if we can get the driver buckled up, we'll also get the children properly restrained.

I think our second task is to identify the real world conditions. And by that I mean type of accident, type of occupant, and position of occupant that represent the greatest opportunities for improving safety. And, in fact, let's create that safety matrix, which will then give us the road map to the technology we should pursue and the order in which we should pursue it.

I think this is a task that can be accomplished in six to nine months. And we would hope that NHTSA would start on that task immediately under the auspices of the Motor Vehicle Safety Advisory Committee. Certainly, there are people in academia who can really contribute greatly to that task, and we ought to get on with it.

As importantly, I think we need to structure a system that will tell us the real world performance of depowered air bags and will tell us that about 12 months after they're introduced in any significant number.

I think our third task is to identify the promising technologies and then match them against the safety opportunities in that opportunity matrix. In that case, with the view of being able about two years from now to try to define the effectiveness estimates, so that we can begin to define the next generation of air bags.

Fourth, and that's a task that is already well underway, is the introduction of depowered air bags, the production of which was authorized by the rule that NHTSA published last Friday. I believe that depowering doesn't represent a detour and I don't think that represents a temporary measure. Rather, what I think it represents is a step in the direction of smarter and better air bag systems.

Just in summary, I believe we will make progress in increasing belt usage, and I believe we're going to make progress in providing better air bag systems to the customers, but we will do our best if we—and by "we," I mean Government and industry and the safety advocates are willing to clearly and honestly tell the public what priorities we've established and whatever tradeoffs we've made among those priorities, and then ask them for their support.

Thank you.

CHAIRMAN HALL: Well, thank you, and I like the way you do the goals and the tasks and, of course, the real world test is one of the recommendations the Board has made. So, thank you.

MR. ROBERTS: I want to thank you all for some very good thoughts. One of the main purposes of this forum is to get cross dialogue between experts—experts that we have brought here. And I can sense that the panel has some reactive thoughts based on other panel members' statements.

I would like to make one quick pass through the panel to see if we have some of those thoughts that you would like to get out, maybe just a minute or two apiece.

Ms. Claybrook, do you have any thoughts to respond to any of the other panel members comments?

MS. CLAYBROOK: I think that what Helen Petrauskas said about everyone trying to identify our goal and move rapidly towards developing the future technology and the future standard or the upgraded standard by NHTSA is extremely important. I think that that ought to be the focus of our energies.

NHTSA today testified they see it as a performance standard. The industry believes it should be a performance standard. The consumer advocates believe it should be a performance standard. So, I think that we're on the same wavelength, and the question here is how rapidly can this be done, so that we not only have a test that tests middle size males, but also unbelted females, who are the ones who are now primarily being harmed in low speed crashes, as well as unbelted, out-of-position children, because those are the realities that are facing us here today.

On John Graham's comments on the passenger side air bag, I, of course, have not had the opportunity to see the data on which he makes his decisions or his conclusions, but I think that they are wrong headed. It seems to me that the focus of our energy should be not on condemning the first generation of this system for whatever deficiencies it contains, but rather to look to improve and make it so that it does do the job that it should do.

There are a huge number of suppliers and manufacturers who are diligently involved in designing improved systems. This is a huge investment that they have made. We want them to make that investment. And I think that in order for that to occur, we have to have the presumption that these systems can be improved and improved rapidly. And steps have already been taken to try and deal with the deficiencies and problems that we now face. That may not be enough.

There are other things yet to come, in terms of NHTSA actions. But I think that our focus should be on improving this technology and getting it to do its job.

MR. ROBERTS: Okay. Thank you, Ms. Claybrook. Dr. Graham, do you have any other thoughts?

DR. GRAHAM: Sure. Let me first of all reassure Joan that she is not the first person to say I'm wrong headed. I've got two daughters and a lot of students who would agree with her. So she certainly is entitled to make the charge.

Let me first comment that I feel that the focus of my remarks was with regard to the passenger air bag systems that are already out on the road. And I have a lot of sympathy with a variety of things that Joan was talking about, but they were directed toward the future design of passenger side air bags.

In terms of a constructive suggestion, I would like to suggest that NTSB consider the value of holding a meeting with the National Governors Association when they meet here in Washington, which I believe they do periodically. And I think you should present some of the data that you have at NTSB and that you've had during this hearing to our nation's governors, because I think the only realistic way to reduce the side effects of these air bag systems in the long run is have a cultural change about how we think about where children are seated in the motor vehicle.

In France, in Germany, fewer than 10 percent of these young children are in the front seat of the motor vehicle. In this country, that percentage is 30 to 50 percent. And I think if we can work, first of all, through education, but in the long run through some kind of legal requirement that, in fact, children should ride in the rear seat. If we take that step, I don't think the passenger side air bag will be endangered as many in the air bag lobby, if you will, may fear.

I think that we can have the safety benefits of the current passenger air bags and improve passenger side air bags at the same time that we reduce the dangers to children.

CHAIRMAN HALL: Well, thank you. We had asked the National Governors Association to be a party to this forum. I'm disappointed to say that they declined. If you have any idea how we can get the attention of the National Governors Association, I would be glad to do that, because I agree with you.

DR. GRAHAM: Well, I saw you on TV this morning, and I think you're working in the right direction. That will get their attention.

CHAIRMAN HALL: Thank you, sir.

MR. ROBERTS: Thank you, Dr. Graham, for some reassurance. Brian O'Neill, do you have some responsive comments?

MR. O'NEILL: Well, I certainly agree with John that it is absolutely imperative that we improve the situation with respect to the performance of passenger bags on the road today. And the only way we can do that in the short term is through behavior change. And so it is a very high priority to get the message out to the public, that we must have children in the back seat restrained away from the air bag.

The numbers, as we have heard this morning in terms of deaths, are unacceptable, and everyone has to work to help change those numbers. And we need to get improved technology in cars as quickly as possible. I, personally, don't believe that NHTSA standards are the only answer to that. I think the table of suppliers, air bag suppliers down there have enough technology and enough ingenuity to be developing systems with much improved performance.

I tend to think the Government should be very far removed from the business of designing air bags. I heard this morning hints and indications that NHTSA's partially in the business of picking preferred technologies. They shouldn't be doing that. They should be setting pure, simple performance requirements.

I don't think we should encumber the supply industry or the manufacturers with multitudes of additional Federal requirements. The Federal Government should just be setting some performance requirements to ensure that air bags don't do harm to out-of-position occupants, and that they also provide some level of protection in high severity crashes, and they should leave the rest to the industry.

CHAIRMAN HALL: Do you have to have an approved to dummy to do that? Should NHTSA be deciding what a fifth percentile dummy is and a—

MR. O'NEILL: I think one of the things that NHTSA should be doing is getting the various size dummies certified as quickly as possible, because I think some of the out-of-position testing should be done with different size dummies. You cannot do all the tests with a 50th percentile male, particularly, some of the out-of-position tests. You definitely need the smaller size dummies.

CHAIRMAN HALL: Thank you.

MR. ROBERTS: Ms. Petrauskas?

MS. PETRAUSKAS: Just one very quick observation. As I was listening to my colleagues, I found much more that I agreed with rather than what I disagreed with. But I was struck by the fact that as we talk about improved technology or we talk about a better way of doing things, that the measure of better or improved has got to be real world performance.

And I think we would all agree that we don't have as much knowledge as we should have. And so one of my strong recommendations would be that it would be very, very good if we could find the resources for the agencies who do the study of that data to be able to do more of it very quickly.

MR. ROBERTS: I have several other questions before I pass the right off to the parties.

MR. ROBERTS: This question would be to Ms. Petrauskas and then anyone on the panel who might want to respond also. A question from the industry standpoint. If the unbelted test requirement of FMVSS 208 was eliminated, do you feel that the automotive engineers could do an even better job to design seat belts and air bags to work in a more complementary and integrated fashion than they currently are?

MS. PETRAUSKAS: I guess, one way to answer that question is by citing our experience outside of the United States. The U.S., I believe I'm correct, is the only country in the world that mandates a particular technology. In this case, air bags. And secondly, mandates the testing be done with unbelted dummies. Yet, we offer air bags in every market in which we do business. And in many cases, the air bags are standard equipment, but they've all been designed and tested with a view towards matching it with belted performance or with a belted condition. And I think you're going to hear from some of the Government officials from those countries as to what their experience has been, but they will probably say to you that their experience has been very good, and we would agree with that.

I think one of the important things to remember is that the unbelted test requirement we've had is not the only way to test for unbelted performance. And so that as we look to the future, we shouldn't assume that that's the only thing we can come back to. And, therefore, as we look at where the opportunities are to improve safety based on real world data, when we look at what are the technologies to cause that improvement to happen, we also should be looking at test procedures, whether they're in connection with a standard or simply as market accepted test procedures that best measure that.

So it isn't an all or nothing proposition. I think we should remember that there are many ways in which one could test unbelted performance. And running cars into walls at 30 miles an hour may not be the best way to test it.

MR. O'NEILL: I would just like to add that I think one of the mistakes that has been made—and I think many people here were party to some of these mistakes—was in assuming that an unbelted test dummy represents or is a reasonable representation of how unbelted occupants are faring in actual crashes. But in the unbelted crash test that we run, that dummy is sitting back in the seat in a proper position immediately prior to impact. What we are learning to is that in many real world crashes, there are events preceding the impact or the principal impact, and those events often put people out of position where they are no longer likely to be protected by the air bag, but can be harmed by the air bag. This is especially true, as we've seen on the passenger side, for unrestrained children.

It is also true for unrestrained or unbelted drivers on the driver's side. We are seeing problems with out-of-position people, and they're mainly out of position, because they're unbelted. In the unbelted crash tests the dummies are not out of position and that's one of the problems with the tests.

MR. ROBERTS: Okay. Thank you. I have another question, Mr. Chairman, if we have time. Let me just ask one more and then I'll pass along to my associates on the Technical Panel. Now, this is a thought stimulating type question. But there's a school of thought that product liability decisions, perhaps to a disservice to the consumers, are driving many decisions that are made on restraint systems. For example, on the use of cut-off switches, the use of deactivation, and deployment thresholds.

I just wanted to see if the panel at large feels that there is some sort of process of liability restriction, perhaps, that the Government in some fashion might play to provide some assistance to move things forward. I'm talking about assistance to the automobile manufacturers and to the dealers and so forth.

MS. CLAYBROOK: Well, I'll comment on that first. I don't think taking away the rights of consumers in court to resolve disputes is a proper public policy, to assure that you have properly designed systems. In fact, just the opposite.

The pressure of product liability does make the manufacturers pay attention in the thousands of decisions they make all the time to the way that they design their products. And I don't know anyone who has ever shown that not having liability improves product design. So, I think it's just the opposite of what you suggest.

The real question here is do we have the basis for upgrading and improving this standard or do the manufacturers have information, so that they can upgrade and improve the designs that they put in their cars? And I think that if you look at the different designs, there are some different designs now on the highway, I think that there's no question that, for example, the top mounted passenger air bag is a preferred design. And, in fact, many of the manufacturers are moving to adopt the top mounted air bag. That has nothing to do with product liability per se. It has to do with manufacturing a really effective air bag system.

DR. GRAHAM: Just a quick comment. There's a lot of talk here about the proper amount of liability to the manufacturer, and there's been an awful lot of talk about technological fixes to the problem that we're in here today. So, I think we should talk straight to the American people that there is some responsibility of parents in the problem.

We have children riding in the front seat, often unbuckled, and I think we need to create a culture in this country, maybe even a law, that parents are liable for the consequences. If we could have that kind of change in cultural norm that we have across the Atlantic Ocean, okay, it would reduce a lot of the problems we're facing on passenger air bags.

So let's have some liability with manufacturers, but let's have some liability with we, as parents, who are a significant part of this problem.

CHAIRMAN HALL: All right. Well, let's move around the Technical Panel here.

MS. WEINSTEIN: Mr. O'Neill, are you aware from any of your research who the second and third generation owners of cars are?

MR. O'NEILL: Not specifically, but clearly, as vehicles' age, they move down the socio-economic status in terms of ownership. So lower socio-economic groups will be owning the older and older cars. Those, unfortunately, are the groups that we find hardest to influence when it comes to correct restraint usage. So as cars age, you will see lower levels of belt use typically, for example.

CHAIRMAN HALL: Until they get to about 30 years old, then they become more valuable.

(General laughter.)

MR. O'NEILL: Yes, sir.

MS. WEINSTEIN: How do we make sure that the families who will be buying today's cars with air bags five to eight years from now, have the information that they need to make sure that their children are in the back seat and that they use their seat belts, if they are the population that's hard to reach?

MR. O'NEILL: Well, I think that clearly the educational efforts have to continue. We need better enforcement of child restraint laws, because even in the front seat if children are properly restrained, the risk is much, much reduced from the passenger side air bag. So, we need more education, continuing education. We most definitely need better restraining laws and better enforcement of the restraining laws around this country.

MS. CLAYBROOK: Could I comment on that?

MS. WEINSTEIN: Yes, Joan.

MS. CLAYBROOK: I do think that when there's a title transfer process, there is an involvement of Government at that stage. And that it might be a recommendation to the Governors conference that there be some kind of information made available when there's a title transfer for these vehicles.

MS. WEINSTEIN: Thank you. Ms. Petrauskas, the auto industry has sent a letter saying that they are opposed to deactivation of air bags. Does that also include cut-off switches?

MS. PETRAUSKAS: I think one has to make a distinction between the circumstances under which people do something to turn off their air bags. And then the second question is once you've made the decision to deactivate, how you go about causing the deactivation.

The concerns that we have expressed have not had to do with the question of whether you retrofit a switch into a vehicle at a customer's request or whether you use some other mechanism to shut off the air bag, but rather, the circumstances under which customers would be authorized to seek one or the other. And our real worry has been that we have yet to define a system which will help assure that when the customer makes that decision, it's truly an informed decision. That has been our big concern, that we run the risk that customers will react to the most recent headline they've seen in the paper or the most sensational thing they've seen on television. And at the time they make that decision, they don't have the information they need.

So, what we have advocated is the following: One, that NHTSA set up a scheme that's a customer-friendly information system as opposed to a permission system which is what they have now. And, secondly, that once that system is created, that we then give manufacturers the flexibility to accomplish what the customer wants by use of a cut-off switch.

CHAIRMAN HALL: But, again, this morning we heard some testimony that Ford had done some surveys of the off-on switch with pickup trucks and not found—

MS. PETRAUSKAS: That's correct.

CHAIRMAN HALL:—problems with the customers.

MS. PETRAUSKAS: We were the first—as far as I know, we were the first manufacturer to introduce those. And the reason we had them was for the customer with a truck, you can't say to that customer, put the baby in the back, because there is no back. And, therefore, we felt that by providing the manual switch, we were assuring that on balance, we were providing more safety.

CHAIRMAN HALL: How do you educate those drivers as to when that switch should be on and when it should be off?

MS. PETRAUSKAS: It's a combination of things. Some of which is by the labeling that appears in the vehicle. We have done a lot with material that's provided as part of the owner's manual. We have an indication when the air bag is turned off, there is a light telling you that the air bag is turned off. And we have gone to extraordinary lengths just with the public media to try to educate customers how these switches are to be used.

MS. WEINSTEIN: I have no more questions.

CHAIRMAN HALL: Any other questions from the Technical Panel? If not, we will move to the parties. We can begin with Table 1, the National Highway Traffic Safety Administration. Do you have any questions for this panel?

MR. BISCHOFF: I would like to ask, Ms. Claybrook, you recommended that NHTSA set deployment thresholds through regulation. Two questions: What data you might be aware of that would help us document the tradeoffs attending to that regulatory position? And secondly, whether you believe that setting a threshold would be a damper on the development of new technologies, such as multi-level inflator?

MS. CLAYBROOK: What I actually said was that there were a number of changes that could be made without any change in the standard. I didn't recommend that NHTSA take this step. I said there were a number of changes that could be made without any change in the standard by the manufacturers.

And I said that I thought the threshold should be raised from 12 to 15 miles per hour. I know that some manufacturers have it at 12 miles per hour. And my reason is to—

CHAIRMAN HALL: Joan, again, would you explain what we're talking about with the threshold—

MS. CLAYBROOK: Sorry.

CHAIRMAN HALL:—and the 12 to 14 to 18 for people who might be listening and wondering what we're talking about in Washington, D.C.

MS. CLAYBROOK: Thank you for reminding me. The threshold is the speed, of the crash and it's called the Delta V. And right now, manufacturers have it inflating at 7 to 12 miles per hour crashes and in some cases, with belted occupants at higher speeds.

I suggested raising the threshold, because a large number of crashes that are fender benders occur below that speed, below 12 miles an hour. And given the number of injuries that have occurred at those low speeds and the lack of need for an air bag in those low speeds, it would be preferable to have no inflation below those speed levels.

There may be some injuries at 12 miles an hour, but there's also been a large number of injuries from air bags at that speed and below. Do I have the data? No, I don't have data that I can show you on that and I certainly hope that NHTSA will develop it. I think that it's a key issue for both the manufacturers, as well as the Government to know the optimum speed. Right now, the standard does not require inflation at any particular speed of crash.

It allows that decision to be made by the manufacturers. And some manufacturers, I think, have set it at a very low number.

In terms of the second part of your question, which is whether or not that would undermine the development of other technologies. I don't see any reason why that would undermine the development of technologies, even a dual inflation air bag, it seems to me, is still important, because your dual inflation air bag presumably would have a lower speed or force below 20 miles an hour. So you would have a lower or less air bag force in a crash up to about 20 miles an hour and more force in a crash above that.

CHAIRMAN HALL: Other questions from table 1?

MR. BISCHOFF: I would like to ask Mr. O'Neill, you stated that the unrestrained requirement of 208 precludes the optimization of belt/air bag systems even with the use a of multi-stage inflator. I want to know if your remarks are constrained to dual-stage inflators or multi-stage or variable inflators in general. What I'm thinking of is a tri-level inflator, if you will. One that would have a low severity, one tuned to belted, and then one tuned to unbelted at the higher speed.

MR. O'NEILL: I mean by my remarks that the inflator output levels in a 30 mile an hour crash test, whether it be multi-stage, dual stage or single stage, are, in effect, dictated by the unbelted crash test. And I believe that those inflator output levels are too high even at 30 miles an hour for a belted occupant. So, they are not optimum for the combination of a belt, plus an air bag, even in the 30 mile an hour crash.

CHAIRMAN HALL: Other questions from NHTSA? Okay. We'll move now to table 3, the Domestic Automobile Manufacturers.

MR. FELRICE: Thank you, Mr. Chairman. I'm Barry Felrice, Director of Regulatory Affairs at the American Automobile Manufacturers Association. If I could ask my first question to Brian O'Neill. Brian, we've heard today, and many of us in the past, that top mounted bags are somehow superior in terms of technology and that only some companies have them. Can you tell us in your view in the analyses that the Institute has done, do you detect any differences in overall performance of top-mounted bags? And are you aware of how wide spread they may be in use, at least in terms of the different companies?

MR. O'NEILL: I think it is premature at this point to conclude that a top-mounted system is superior to any other kind of mounted system on the passenger side. We're looking very hard at that question. It's entirely possible that some mounting locations for passenger bags are preferable to others. It's an over simplification just to say there's a top mounted system and some other kinds of systems. They're mounted all over the location of the dashboard on the passenger side, as you know.

I think it has a lot to do with the size of the vehicle, the windshield angle of the vehicle. There are many features of vehicle design that influence the design of the air bag, but, again, if you think of it in simple-minded terms, a bag that is mounted on the top of the dashboard near the windshield has to have more energy for full inflation than a bag that's mounted on the mid part of the dashboard. Whether that is good or bad is not clear at this point. I think it is clear that there are a lot of different designs out there and some designs will probably turn out to be better than others. I don't believe we know the answers to which design characteristics are superior at this time.

MS. CLAYBROOK: Could I comment on that? In 1980 or 81, Honda gave a paper on this issue and said that they could not find the advantages of the top-mounted system. In 1991, they gave a paper in which they said they had done a lot of work and it is a combination of factors. It's the bag shape and a whole number of other factors, where they did find the advantages, and I would refer you to their two papers.

MR. FELRICE: Brian, one more view, if I might. In Germany, we understand that large increases in belt usage were achieved by a combination of a national law or some combination of belt use laws and intervention by the insurance industry. Based on this, can you offer an additional role or can you think of an additional role that insurers can play in this country in terms of increasing belt usage?

Mr. O'NEILL: In many European countries, it has been standard practice for a long time for civil awards or awards resulting from motor vehicle crashes to be reduced if someone was unbelted at the time of their accident. And insurers in Europe have played an active role in having the damages reduced for failure to wear belts. When the 1984 version of FMVSS 208 was introduced in the United States, as many of you know, there was the so-called trap door provision, which provided for the recision of the automatic restraint requirements if sufficient states passed stated laws with certain criteria.

One of the criteria that was included at the time was mitigation of damages for failure to wear your belts. That was to be incorporated in the laws that would qualify under FMVSS 208. At the state levels when seat belt laws were being passed, that provision was not only not included in most states laws, in fact, there were provisions that specifically precluded mitigation of damages for failure to wear belts.

So, it's my understanding that in most states now, it is legally not possible for failure to wear belts to be used to reduce awards. I think it is very difficult to change those laws.

MS. CLAYBROOK: I don't think that's quite correct. I would be happy to take a further look at it, but I believe that most states have comparative negligence. And comparative negligence allows for taking into account the negligence of the person who is injured on a percentage basis. And while it doesn't completely prevent the award, it does reduce the award. And I don't think that many states, that I recall, adopted the opposite of what the 1984 standard suggested, which was mitigation by law.

MR. O'NEILL: I think they did.

MS. CLAYBROOK: By statutory law?

MR. O'NEILL: Yes. Actually, in the belt laws in a lot of states. And some states, which do allow mitigation of damages, restrict it to about 5 percent of the award. So if the award is X thousand dollars, it can be reduced by 5 percent maximum. It's specific to belts and belt laws.

CHAIRMAN HALL: Other questions from table 3?

MR. FELRICE: I have two more quick ones, Mr. Chairman. Do I have time?

CHAIRMAN HALL: Please, if you could just keep them—put them both out there, so they can be thinking about them.

MR. FELRICE: Okay. The first would be for John Graham regarding children in the rear. And in your survey today, you showed that about 71 percent of the people favored that. We heard 90 percent of children in Germany and France are in the rear, and about two-thirds in this country already. I guess my question to you would be do we need laws to accomplish this or is there something that could be done before there is legislation? And if so, what that would be?

And my other question would be to Joan regarding deactivation, do you feel that deactivation is appropriate at all? And if so, in what instances would you have that?

DR. GRAHAM: With regard to child seating behavior, I think what we need to do first of all is to develop some controlled community-based intervention trials in several states that have high percentages of kids in the front seat, and have both an intervention community and a control community. And then attempt through grassroots community-based activity to increase the percentage of kids who were seated in the rear seat and to work with parents to get their reaction to the effort to get kids to the rear seat.

Based on that educational experience, I think we will start to change the attitude and the cultural norm and that will pave the way, along with the national media effort, to the kinds of legislation that are required really to make a fundamental change in norms.

So, ultimately, I think we have to get the police enforced legislation, but I think there are important communication based activities that both the Center for Disease Control and the National Highway Traffic Safety Administration should be collaborating to make happen at the state and local level.

MS. CLAYBROOK: On deactivation, I oppose deactivation. My reasons are that, number one, it's a relatively permanent change; although, it could be reversed. Nevertheless, I doubt that that would happen. I think particularly for the owners, as Elaine Weinstein mentioned, second and third owners of cars having a bag without the air bag working, it is something that would cause a lot of confusion. There would have to be some way of communicating it.

There would also have to be probably a database set up, so that by vehicle identification number, it was clear which air bags had been deactivated. And also, I think there would have to be a special effort made at the dealership to explain it to people. But my major concern about it is that more people will be injured than will be helped, because the change is permanent and cannot be adjusted depending on who's riding in the car.

My comments to the docket at the National Highway Traffic Safety Administration said on this issue that I believe that if there's a choice of one or the other, that definitely we should have the on/off switch. And that on/off switch is something that, as I understand it, can be retrofitted, and that the public when they go to get the on/off switch would—should have a public information program, a video tape, an explanation, and there needs in the on and off switch to be a light, so that they know whether the system is on or off. I would prefer to have it always on, unless turned off, so that the public would know, and I think that would take care of a lot of the particular problems with the deactivation.

CHAIRMAN HALL: Let's move to table 4, to the Association of International Automobile Manufacturers.

MR. PARKER: Yes, I'm George Parker with the Association of International Automobile Manufacturers. I have a couple of questions. The first one is for either Helen Petrauskas or Brian O'Neill or both. There's a concern that with optimizing for belted occupants, there will be too much depowering. And NHTSA said this morning, it plans to monitor this through its NCAP test. Is that a legitimate concern in your opinion, and is there a more efficient way to demonstrate that this is not the case?

MS. PETRAUSKAS: I can certainly speak for the approach that we're taking in our company. And we have established some internal guidelines for ourselves to try to define, as best we can, what we think the appropriate amount of depowering is. And as others have alluded to earlier today, that's going to differ from vehicle to vehicle.

Frankly, on the whole question of NCAP testing, I think we collectively in the safety community need to have a discussion of that. And the extent to which NCAP testing—meaning, testing at higher speeds that when you test for purposes of the standard, I think one of the questions we have to ask ourselves is whether our desires to perform well on that particular task is, in fact, causing bags to be more aggressive than they otherwise need to be. And if so, we need to answer the question and deal with that.

I don't think that's the top priority at the moment. I think there are other issues that are the top priority at the moment, but that's certainly something that we need to look at.

CHAIRMAN HALL: Helen, just for the record, what's NCAP?

MS. PETRAUSKAS: I'm sorry. It's the new car assessment program and it's a crash test program that NHTSA runs and makes the results publicly available on a variety of vehicles.

MS. CLAYBROOK: It's run at 35 miles an hour with belted occupants.

MR. PARKER: Another question for Helen Petrauskas. Do you agree with Brian's statement that depowered air bags provide benefits for both unbelted and belted occupants?

MS. PETRAUSKAS: Yes, I do.

CHAIRMAN HALL: That's the best answer we've had yet, Helen.

(General laughter.)

CHAIRMAN HALL: Any more?

MR. PARKER: No, that's it.

CHAIRMAN HALL: If not, we'll move then to table 6, which is our advocates for Highway and Auto Safety—AAA, Center for Auto Safety, and the Parents Coalition.

MS. STONE: Thank you, Mr. Chairman. I'm Judie Stone with Advocates for Highway and Auto Safety, and we have several questions from our table. I would like to ask the first question of Joan Claybrook. Is it necessary to eliminate the unbelted test under the current standard in order to protect children?

MS. CLAYBROOK: I don't think so. I think that the technology opportunities that are available for the manufacturers make this not a necessity. And I think that the burden of proof certainly rests on anyone who advocates that this is a necessity with the technologies that are coming forward. The air bag suppliers have indicated that they have a number of different systems that would deal with this issue. Certainly, it should be tested, but I certainly don't see the necessity at this time.

MS. STONE: There's a follow on to that. Can air bags be viewed as only supplemental protection while passengers are unbelted in 50 percent of fatal crashes?

MS. CLAYBROOK: Well, I think that I tried to make that point in my statement. I don't think so. I think that when you only have 50 percent belt usage among people who are killed in car crashes, then I don't think that you can call an air bag a supplemental system. In that circumstance, it's the only system that will protect the occupant in terms of a restraint.

MS. STONE: Thanks. Our next set of questions is for Dr. John Graham. Regarding the cost effectiveness of passenger air bags, is your view or your study based on fatalities alone or fatalities and injuries? I have a series of questions here and I can read them all or—why don't I do that, so that you get a sense of—

DR. GRAHAM: Well, I can answer the first one quickly.

MS. STONE: Okay.

DR. GRAHAM: It's based on both fatalities and on serious injuries. And we have assumed in those calculations that they're equally effective for the two.

MS. STONE: Did you measure the cost effectiveness of air bags based on the lifetime use of air bags or some shorter time period?

DR. GRAHAM: Over the life of the vehicle.

MS. STONE: What is the size of the database on which your study relies? Does the database have sufficient power to yield a statistically significant result?

DR. GRAHAM: Well, that's a good question for Wednesday. It's a complicated question. The effectiveness estimates we have for air bags, in some cases are statistically significant, and in some cases, they are not. But the bottom line is, that requires a more intensive conversation.

MS. STONE: Okay. I would like to have that conversation.

DR. GRAHAM: Sure.

MS. STONE: And the last for you, Dr. Graham, is NHTSA tests and data show significant differences in passenger air bags. What would your studies show if you did a make and model analysis, particularly focusing on the best model?

DR. GRAHAM: I think it's a good question, and I'm not sure I'm the right person to answer it. I haven't actually studied the different passenger air bag systems in different cars. So, in a sense, our answer is kind of an average of all the existing passenger air bags. But perhaps, Brian, have you looked at whether the passenger side air bag systems differ from each other in effectiveness? We're actually using some of Brian's numbers. That's why I'm asking him.

MR. O'NEILL: Sample size is inadequate at this point to do any make or model analyses on the passenger side.

MS. STONE: And, finally—well, actually, not finally, but for Helen Petrauskas. Once Ford and other manufacturers develop depowered inflators for post 1997 models, can consumers retrofit their earlier years of that model with the depowered inflators?

MS. PETRAUSKAS: I think Joan Claybrook answered that question for me when she talked about how the vehicle and the belts, the crash characteristics of the vehicle, the structure of the vehicle, the belts, and the air bags are all part of the system. And, therefore, we are depowering bags the same way.

In other words, it's not a one size fits all at all, originally, the air bags in vehicles today were designed differently for each vehicle in order to meet a certain performance characteristic. And as we depowered the bags, we are doing the same thing. We are now tailoring the bag to the vehicle, to the belt system that's in the vehicle, in order to reach a certain performance objective.

What that says is the likelihood that a depowered bag would fit with a different—with what could potentially be a different structure and a different belt system, suggests that it's unlikely that the bags would be directly retrofittable, if that's a word.

MS. STONE: Okay. And we just have one last question and that's for Brian O'Neill. Do you believe that the 68 percent—this is about belt use. Do you believe that the 68 percent belt use rate accurately reflects real world experience, and are you satisfied that belt use rate surveys provide a reliable measure of belt use?

MR. O'NEILL: Belt use rate surveys can provide a reliable measure if they're done correctly and comprehensively. Unfortunately, the 68 percent number is, as you heard this morning, basically an averaging of the individual state numbers. And the quality of the state surveys vary considerably. Some states, for example, will only survey passenger cars. They will exclude trucks, light trucks from their surveys, because they're not covered by the law in that state or for whatever reasons.

Only a few of the state surveys are true probability samples, and they do provide very reliable estimates of the belt use in traffic in those states. But the 68 percent number is probably considerably inflated.

MS. STONE: Thank you.

CHAIRMAN HALL: Okay. We'll move to table 5 where we have the Association for the Advancement of Automotive Medicine, the Blue Ribbon Panel, the Insurance Institute, and the National Safety Council.

DR. WINSTON: I'm Dr. Flaura Winston, and I'm with the Association for the Advancement of Automotive Medicine. We have four questions. First, this is for Helen Petrauskas. Would you from the engineer's perspective define deployment threshold and explain the factors manufacturers consider in setting these thresholds?

MS. PETRAUSKAS: I hasten to add that thanks to the good organization that the Safety Board has done, there will be other people throughout the next three days that can probably give you a much better answer than I can.

Fundamentally, what we try to do when we define a threshold value for deployment is to identify the kind of accident that could result in significant injury to occupants. In the case of having an unbelted—remember, that the requirement we have to meet is one that says that we will protect unbelted occupants from injuries up to a speed of 30 miles an hour. So, therefore, for that reason and as a matter of good engineering practice, we try to identify the kind of accident—and by kind of accident, what I'm talking about is the deceleration that occurs.

So, what we try to do is design a system so that if the sensor senses that the vehicle is stopping so quickly, that it's not simply braking, it's stopping quickly because it's run into something very hard, at that point, it sets the air bag off. So I think we need to be very, very careful when we talk about raising the deployment threshold.

In other words, saying that we ought to have the air bags not deploy at certain kinds of speeds, because we know that at those slow speeds, unbelted occupants can get hurt and get hurt seriously. And it doesn't happen very often. It's a rare event, but it does happen. And earlier when I was saying how important it is that we articulate tradeoffs when we make public policy choices. I think this is one that we need to discuss in those kinds of terms.

MS. CLAYBROOK: Could I comment on that, because I do think this is a very important issue. It's an issue that I know the Safety Board itself has been very, very interested in. There's been a lot of talk about not worrying about the unbelted tests, particularly, at the 30 mile an hour range, because it forces the air bag to be too forceful. But there hasn't been much talk about people who are unbelted at the much lower speeds, who might get some level of injury at those lower speeds.

And it seems to me if you're talking about whether or not to have a slightly higher threshold, so that lots of people don't get injured from the—some people don't get injured from the air bag who are out of position, particularly the children that we've been so concerned about, versus someone who is an adult, who might get some injury. I think that certainly is a place where I would focus on raising that threshold a little bit as opposed to focus on getting rid of the unbelted tests overall.

DR. WINSTON: As a follow up to that, as a public health issue, air bags are important in reducing the health care costs associated with the very costly bills associated with irresponsible unbelted occupants in crashes. On the other hand, as a moral issue, air bags induced injuries to responsible properly belted occupants by air bags, optimized for the unbelted occupants, are unconscionable.

Prior to smart air bags, how do we optimize air bags, both fiscally as far as the public health issue and morally? This is for everyone on the panel.

MS. PETRAUSKAS: If I may, I really feel strongly about that question. Particularly, the last part of that question which said, until we get smart air bags. Smart air bags are going to represent an evolutionary progress in the development of air bags. I continue to believe regardless of the level of technology of air bags that we have, we have to set priorities.

We can't—we don't have the luxury of saying there are no tradeoffs, because there are tradeoffs. And we should identify what those are. And for me, our first objective has to be to protect the belted occupant. And that I believe to be true regardless of the level of technology that we have.

And I think the second thing we have to do is set ourselves a goal of doing no harm by the use of technology that's supposed to help people. It may not be easy to reach that goal, but that's what that goal ought to be.

And I think our third goal ought to be to protect the person who should know better, but doesn't buckle themselves, who's capable of buckling themselves up and chooses not to do it. I think we should protect that person, but we should not protect that person if the way we give them protection is to increase the risk for people who are belted or for people who are vulnerable. And I think that's a truth, that's the right way to do it, across the whole spectrum of technologies.

MR. O'NEILL: I pretty much agree with Helen. I think we need to optimize performance for the belted occupant. I think that we definitely need higher deployment thresholds for belted occupants than we have in most cars today. If we talk about one size fits all, I think one of the biggest problems we have is the same—having the same deployment thresholds for both belted and unbelted occupants, which is the situation in virtually all cars today.

We ought to have this kind of system that we have in BMW and Mercedes models where there's a higher deployment threshold for the belted occupant, because then the belted occupant is, again, not exposed to the risk of let's say an arm injury from an inflating air bag in a crash where the belted occupant is not at risk of a significant injury.

I happen to think that the deployment thresholds need to be higher for both belted and unbelted occupants, even if that means that we see a few extra broken noses or lost teeth on the part of unbelted drivers. I think deployment thresholds definitely have to be higher.

DR. GRAHAM: Yes. I would like to comment that there's a very practical reason why, I think, we should endorse Helen's suggestion of focusing on protecting the belted occupant, and that's because we're designing new air bag systems, not today, but for cars that will be on the road for five, ten, 15, and 20 years. We're talking about an air bag system for the year 2010.

I think that we have, as a country, to commit ourselves to continue to increase the safety belt use rates. And since we've made progress in this direction and I hope we will make more progress, I think it makes perfect sense that we're going to tailor the design of those air bag systems to protect the belted occupant.

I also would like to endorse Brian's comment that we clearly should look into the merits of a different deployment threshold for a belted occupant versus an unbelted occupant, because I think you're going to find in both a risk benefit and a cost benefit basis that in a lot of these crashes, a belted occupant really isn't doing much good by having that air bag go off.

MS. CLAYBROOK: You mean at the lower speeds?

DR. GRAHAM: Correct. At low speeds, correct.

MS. CLAYBROOK: My first comment is, is that the decision made by the National Highway Safety Traffic Safety Administration on Friday to permit depowering, I think essentially accommodates the concern that you expressed for cars to be manufactured in the immediate future.

It essentially lowers the amount of force required in a way that you could say removes the unbelted tests, even though it doesn't remove the unbelted tests, because it permits a sled test rather than a crash test and it allows the depowering. So for those cars, there's that.

For cars that are already on the road, I think that Mr. Felrice raised the question of deactivation versus the on/off switch. My comment would be that I think that the on/off switch is far preferable for cars that are on the road with the retrofit of an on/off switch.

I'd also point out that we keep talking about getting rid of the unbelted—not having the standard to accommodate people unbelted. And that doesn't mean that they won't be protected, but we keep referring to it that way, but it is the unbelted females and the unbelted children, primarily unbelted, who have been the ones at risk here. And it doesn't make a lot of sense to me to protect unbelted women and unbelted children and not protect adult males. I can't accommodate that. That's very confusing. I think it would be to the public.

So, I think that for the future, we have to rely on improvements in technology to accommodate the different size occupants we have, whether they're belted or unbelted, at least in the very far foreseeable future.

I don't agree with John Graham that you should ever not have air bags, because head injury is what is the most devastating part of an auto crash. And head injury is what is protected by air bags.

DR. WINSTON: This is again for Helen Petrauskas. Can you comment on whether air bag switches in pick ups are typically in the turned on or turned off position? Also, what would Ford define as abuse of this switch?

MS. PETRAUSKAS: The way our system has been—I believe I'm correct when I say the way our system has been designed, that when—if the parent gets into the car, if they have to put a baby in the passenger seat, they then turn off the air bag and the light comes on indicating that, in fact, the air bag has been turned off.

I believe I'm correct that that light—in other words, once you've turned it off, it stays turned off unless you turn it back on. So, that each time you start up the car, it would again show you whether the bag has been turned off or has been turned on. Your question to me—I'm not sure I understand what it is, when you say that—when you ask what we would view as misuse of the air bag.

I guess, one thing I would—it isn't so much a question of misuse as it is the potential that people who could benefit from having the air bag there. They've paid for that air bag, and because they are concerned about what they've read in the newspaper or they don't understand what they've read in the newspaper, they may turn that bag off. That would be the concern we'd have that the benefit of the air bag would be denied to someone who could really use it, because we don't have an education program that goes with the disconnect program, I guess is the biggest concern we would have.

DR. WINSTON: This is our last question. There has been much focus on aspects of air bags that have injured and killed occupants. Optimization requires knowledge of what works. These situations do not come to our emergency departments or hospitals or trauma centers. How do we know what works and isn't this something that's important for designing smart air bags? This is for anyone there.

CHAIRMAN HALL: Let's let one person take this one. Who wants this one—okay, Brian.

MR. O'NEILL: I think there are a number of reasons we know what works. We know the failures from in-depth investigations and we know of successes from in-depth investigations, even though those investigations don't finish up in a trauma center. We do know about successes through the same mechanism, we know about the failures, from investigations of the performance of restraint systems in high severity crashes, where injuries have clearly been avoided by the restraint system.

CHAIRMAN HALL: And let's move now to table 2, the Automotive Occupant Restraints Council, the Governors Highway Safety Representatives, the National Center for Injury Prevention and Control, and the National Automobile Dealers Association.

MR. VOS: Thank you. Tom Vos, AORC. This first question builds a little bit on Ms. Claybrook's last comments about confusing the consumer. And this morning's discussions about change is good, both in technology and in standards, I guess, I should direct this to—let me see who—maybe Ms. Claybrook or anyone else that could handle the issue of public information and education.

As we roll out in the future additional technologies in restraint systems, we are going to end up with vehicle attrition and so forth, a proliferation of system types, with the old or current air bag systems. We will have the depowered systems, and we will have the emerging smart technologies. I don't mean this to be a rhetorical question, but have we given a lot of thought to public information in how we help people to understand what they have in their car, what special precautions or benefits they are going to have with their systems, and can they distinguish the differences?

MS. CLAYBROOK: I think that that was the gist of Elaine Weinstein's earlier question. And I think the answer is probably that there hasn't been a lot of focus of energy on this. There have been so many other things to think about and to worry about for all of us. Not just myself, but for the manufacturers and for all of the individuals who are engaged in highway safety work. My one suggestion before was that there be some kind of a document that attaches to the title, so that when there's a transfer of title, at least people are informed of the air bag system.

There is also of course the owner's manual. I know most people don't read it from cover to cover, but today's owner's manuals are quite informative in many respects about the systems. And they give a lot of emphasis, particularly in the newer models, to the contents of the air bags.

And I think that maybe Helen Petrauskas should comment on what changes will happen in the owner's manual to at least inform the buyers of cars that are now to be depowered and future technologies.

MS. PETRAUSKAS: I'm not sure exactly what your question means Joan. I mean, certainly, we're going to continue to try to have the owner's manual provide information that is both understandable and usable to a customer. I think I understood the question that was being asked was of a more general one, not what information you provide to a particular buyer and for them to use when they brought their car home, but rather, how can we enhance even further people's understanding of air bags and how they work and how they ought to be used and how to assure the safe use of air bags.

I think we've all worked hard in this area. We've all done a lot, but clearly, this is one area where I think we're going to have to do more if we hope to continue to enjoy the kind of public support that we have with air bags up to now.

DR. GRAHAM: Just a quick addition to that. I think that we should not put too much reliance on the point of purchase, kind of information about safety. When people buy a new car or a used car, they have a lot of things on their mind other than the subject of safety, even though safety is very important.

I think we need to work harder with our state health departments, our local health departments in getting them more sophisticated in providing information to people about different kinds of air bag systems. So they are in a better position throughout the time they own a vehicle to understand it, and in the future make a choice of a new vehicle.

I would also like to highlight a transportation research board report of I think about two years ago, entitled "Shopping for Safety." And one good idea I think in that report was the idea that the Federal Government, with a group of experts, might want to, in fact, entertain a rating system for different types of air bag systems, rather than trying to require any particular design, but give consumers a sense of what these different features are, tether versus untethered bags, top-mounted bags versus low-mounted bags.

People, ordinary consumers need information what this means and how they should evaluate these kinds of claims. And I think that regulatory agencies should go beyond simply trying to write these manufacturing regulations and actually try to get some information to consumers that they can understand.

MS. CLAYBROOK: In fact, NHTSA has the authority to do that now—

DR. GRAHAM: Correct.

MS. CLAYBROOK:—under its existing statute.

MR. O'NEILL: I think there are going to be some very, very important educational and informational challenges. I don't think the owner's manuals are the answer. The best description of an owner's manual I heard recently was that owner's manual are written by lawyers for lawyers.

(General laughter.)

MR. O'NEILL: I'm not going to comment on my two Ford owner's manuals, but it's certainly not written for consumers. But we are at the point, or going to be at the point, with some of these smart systems where we will be moving away from today's simple straightforward message which is children restrained and buckled up in the back seat, to children restrained, buckled up in the back seat unless you have a smart system which makes it okay to put the infant restrained in the front seat. And that's a big challenge.

CHAIRMAN HALL: Other questions from table 2?

MR. VOS: Just a quick one and it's—I guess maybe, Brian, you can handle this. It was suggested that as we go through further discussions on whether or not to deactivate—Brian, are you aware of any studies—particularly, for European vehicles that may have, in fact, had their air bags designed more in concert with seat belt performance, should those particular systems be deactivated, would there be any reduced effectiveness based on those particular seat belts? Are you aware of any such studies?

MR. O'NEILL: I'm not aware of any such studies, and I think most European systems have not been fully optimized for the belted occupant. In fact, probably the one system I'm aware of that really has been designed that way is the Holden system, and we've heard a little bit about that this morning. And, I guess, we're going to hear about it later this week.

I think the whole question of deactivation, whether it's deactivation by pulling the plug or deactivation by a switch is one that is a problem for everyone to face, but there are enough people out there with concerns. Most of those concerns are unfounded, but there are the concerns that need to be dealt with. They absolutely must be informed choices, education.

It's very important before anybody opts for deactivation or switches, because most of the people who are concerned are the people who are not at risk.

CHAIRMAN HALL: Okay. Following up on that before we move to the Board of Inquiry—and, Helen, I know you may be on a time schedule where you have to excuse yourself, but I would like to see if I could pose a question to you before you leave.

You talked about real world tests, which I certainly agree with. Here's a real world problem. The Safety Board received a call from a consumer on Friday. His wife is four months pregnant. They have three children under the age of 12. These children ride in the back seat now. The man wants to know if his wife is safe in front of the air bag, and also what he's supposed to do when his fourth child is born.

I guess, what would you tell this individual and who is the person that needs to answer that question that is going to kind of hover over this whole forum is who should disconnect their air bag? Are there individuals that should?

MS. PETRAUSKAS: I guess to take the general and then go to the specific. I believe there are no bright lines. And by that, I mean, you can't look at a particular family as you've just related and say that for that family, I can tell you with 100 percent certainty if you do X, no one will get hurt. But if you do Y, there's a likelihood that someone will get hurt, there's too much variety in the way that accidents happen for us to be able to give you 100 percent certainty. And, therefore, one has to make judgments as a matter of public policy. And to me, that's a uniquely Governmental function. And it's a uniquely NHTSA function.

Now, obviously, NHTSA ought to draw on all of the resources, including ours, that are available for making that determination, but I think the only honest way to answer that question is to say that the risk is very low that anyone will get hurt if you follow the following rules. And we think those are the best rules to follow, but we can't give you 100 percent guarantee, I think, is the most honest thing to say.

And I say it's a Governmental function, because it isn't purely data driven. It's making a public policy judgment as to what represents a minimal risk, and that's a uniquely Governmental function and Government does it every single day.

CHAIRMAN HALL: Well, let's move to the Board of Inquiry. Mr. Osterman?

MR. OSTERMAN: I have one for Mr. O'Neill. Would you please describe the difficulties in validating and conducting the real world test versus the pure frontal barrier test?

MR. O'NEILL: The standard crash test that's in FMVSS 208 is a car hitting a rigid barrier where the whole front end of the car hits the barrier at 30 miles an hour in two tests; one where the dummy is belted, and one where the dummy is unbelted. That is a short duration, high-severity crash. The G forces are relatively high.

In the case of the belted occupant, the dummy does represent the position many belted people would be in at the initiation of the impact.

In the case of unbelted dummies; however, the dummies are seated in position at the moment of impact. In the real world, there are many preceding events for the impact; very heavy braking, bouncing over underbrush, if you're running off the road, for example.

So that the unbelted test is a poor representation of a lot of real world events that will put people out of position. And the issue we're dealing with is the risk of injury from an air bag when you were out of position. And what we get with the unbelted test is a dummy that by definition are dummies that are in position. Whereas, in the real world, many unbelted people in both low and high severity crashes are out of position when the air bag begins to deploy.

CHAIRMAN HALL: All right. We will limit our questions up here to one each, because I'm informed Mr. O'Neill has to leave at 3:30 to get a plane. So we lose our whole panel here. Mr. Arena.

MR. ARENA: Great. If I may, Mr. Chairman. I just have one question, but I would like to direct my question to Dave Rayburn, our investigator. I don't believe we had an opportunity this morning in discussing these worldly problems with our victims that were here, but I would like to ask Mr. Rayburn to clarify for our viewing audience how close to the American home this problem really is. In these three tragic crashes that we heard about this morning, approximately how many miles from the families' homes did these three crashes occur, if you can recall that?

MR. RAYBURN: Yes. For our first witness, Mr. Ambrose, the accident occurred about two miles from his house. It was in a residential neighborhood about two miles from his house. The second witness, Ms. Susan Hayes, I believe the accident occurred within ten miles of her home. And the third witness, Mr. Lechtenberg, the accident occurred two to three miles from his house.

MR. ARENA: I think it's important to point that out. Thank you, Mr. Chairman.

CHAIRMAN HALL: Thank you. Mr. Sweedler?

MR. SWEEDLER: Yes, Mr. Chairman. We've had a lot of discussion today so far and leading up to this point about how important it is to increase seat belt use. Unfortunately, we haven't been as successful in the last few years as we had been in previous years.

We also have come to agreement that there needs to be primary enforcement and greater use of enforcement in whatever could be done to foster greater seat belt use. With the Congress debating and considering the Surface Transportation Act this year, do you see a role in that legislation through—various means, incentives or sanctions that might move this issue forward, because we are not having that much success or as quickly as we would like in getting the states to improve their seat belt legislation. And I would open this to all of you.

MS. CLAYBROOK: Well, I would be glad to comment on that. The age 21 drinking rule—law that passed in 1984, I think is a good model. It has a very severe penalty. You lose highway funds if the state did not pass an age 21 for drinking law. The restaurant industry, and a lot of other people—very much the alcohol industry was opposed to it. Every state passed it. It would not have passed without that penalty.

Last year, Senator Robert Byrd added a .02 for youth requirement. It has a significant penalty. There were 24, 25 states that had that before. This last passed last year. I think they have three years—I'm not sure. I think it's three years to do it.

This year, we expect—last year, I think it was ten to 12 states passed it. This year, we expect another ten to 12. In fact, a penalty works. The states do sit up and take notice. When they're going to lose highway money, they do act. And I think that is your goal as public officials. Our goal is as private advocates should be to try and persuade the Congress to put a penalty provision in the ISTEA or it's now called NEXTEA law, a bill which will become law. It has a lot of money in there for the states.

And I think that they should be required to both have primary enforcement, as well as significant penalty for non-usage. A penalty either in terms of points or dollars. And I think that is what it's going to take to get to the next level of usage.

CHAIRMAN HALL: That's such a good answer, I'm going to ask Dr. Ellingstad to move to the next question.

DR. ELLINGSTAD: I'll try to keep this one short. There still appears to be some ambiguity with respect to the public policy of whether air bags and seat belts are primary or supplement restraint systems. From that point of view, is a single performance standard necessary? Is it possible to deal with the complexity of more than one with respect to belted and unbelted or with respect to different stature and sizes of occupants?

MR. O'NEILL: I believe with appropriate performance levels targeted at belted performance, including some performance requirements for out-of-position occupants, you can accomplish both. You will have a first-class primary system which is the belt, plus the air bag, and the air bag itself will also provide very good protection to unbelted occupants in frontal crashes.

MS. CLAYBROOK: I think it has to include, though, other size occupants who are unbelted. That is children and smaller stature individuals who are out of position—unbelted/out of position.

MR. O'NEILL: Let me amplify. Yes, the out-of-position test should include a range of occupant sizes.

DR. GRAHAM: Just a quick comment. In the history of the air bag issue over the last 20 years, both Brian and Joan and a variety of people have been very confident and optimistic about what we could do in the design of air bag systems. And I think the American people should recognize that from the air bag designer's point of view, it is not easy to design an air bag system that's going to do all of the things they're describing, then write a performance test, and a regulation that will induce these manufacturers to put all these specific kind of air bag systems in.

That leads me to the point that Helen Petrauskas made before she left, that we may have some tradeoffs. We may not be able to do all of this for every size occupant. And I think under that circumstance, her point that we should optimize the design of an air bag system for the belted occupant is, in fact, the correct priority, and I think it's one that most of the American people would support.

MS. CLAYBROOK: I'm not sure that that's fair to the people who design air bags. And I think that that's a technological issue that should be driven technologically, not by presumption.

CHAIRMAN HALL: Well, this has been an excellent panel and an excellent discussion. What I would like to do is defer any questions that I had, and I had a few, but what I would like to do is give you all an opportunity due to the time, if anyone has 60 seconds of observations or closings that you want to make, because I appreciate your being here and we'll start with Joan. If you have anything in closing you would like to say?

MS. CLAYBROOK: I think that the key issue for the short term is that the American public be informed about how to use the vehicles that they have now on the road, and in the short-term future. And there's been a tremendous effort to get that information out. This hearing is yet another opportunity for that to happen. And I think that there's a real sense among all of us, regardless of our differing views on some pieces of this issue, that our primary goal here is to protect the American public and to help them be informed about how to protect themselves.

DR. GRAHAM: I can agree with that. And just a quick question, which Governor did you invite to this session today? I was curious.

CHAIRMAN HALL: No, we invited the National Governors Association, as well as the Sheriffs Association, and the Chiefs of Police. We wanted them to have a panel table here, because we thought it would be extremely important, because all of this without enforcement at the local level is a lot of rhetoric or could be a lot of rhetoric.

DR. GRAHAM: Well, let's work some more on that.

CHAIRMAN HALL: Right. Okay. Mr. O'Neill?

MR. O'NEILL: The last thing I would like to say is to emphasize that a properly positioned, properly belted occupant need not be at risk from an air bag. They are then in a position to be protected by the air bag, including protection against serious head injuries, the sort of thing that can result from your head hitting the steering wheel, even when belted in a serious crash.

CHAIRMAN HALL: Well, we have had on panel 1 discussions of the role of air bags and seat belts, a primary or supplemental restraint system. We had a discussion that it may be an integrated system. And I don't know that we have gotten closer to asking, which I'm going to continue to do that during these panels, ask specific questions that American citizens call in and ask the Safety Board and how we can address that issue.

One other thing that we have not really gotten into, I hope we can, too, in other panels, is what can be done to improve the design and effectiveness of seat belts. But this has been a very, very informative panel. If there is anything else which you all would like to add for the record, the written record, please feel free to do so. And I hope that your schedules will permit you the opportunity to participate in some of the future proceedings.

But it's now 3:25. In the interest of trying to get our next panel, which the conversation will be air bag induced injuries, who is vulnerable and how do we know it, that we have some very outstanding people. And I would say we take a short break and promptly begin at 3:45.

(Whereupon, a short recess was taken.)

Panel 2

Air Bag-Induced Injuries: Who is Vulnerable and How Do We Know It?

CHAIRMAN HALL: On the record. All right. We will reconvene this public forum. We have a distinguished panel here for the next discussion on air bag induced injuries, who is vulnerable and how do we know it? And I'm pleased to note that the panel includes someone representing the University of Tennessee. I want to make it clear that that's not the University of Tennessee at Chattanooga that's in the [NCAA] Sweet 16, but it's the University of Tennessee at Knoxville. That is where I—where the Chairman went to school. And I'll turn it over to Elaine for introduction.

MS. WEINSTEIN: Mitch.

CHAIRMAN HALL: Oh, Mitch. Dr. Garber is handling this panel. So, Dr. Garber, please take it away.

DR. GARBER: Okay. First, I would like to have the panel, if they could, very briefly introduce themselves and their affiliation. What group they're with, please?

DR. PRICE: Yes, I'm Richard Price. I am a Senior Research Scientist with the Army Research Laboratory.

DR. KRESS: My name is Tyler Kress, I'm an Assistant Professor at the University of Tennessee, where I also serve as the Associate Director of the Engineering Institute for Trauma and Injury Prevention at the University of Tennessee.

DR. HUELKE: I'm Don Huelke, University of Michigan Transportation Research Institute, and from the Department of Anatomy of the University of Michigan Medical School where I'm a Professor.

DR. AUGENSTEIN: I'm Jeff Augenstein. I'm a Trauma Surgeon at the Ryder Trauma Center in Miami. I'm a Professor of Surgery at the University of Miami, and Director of the William Layman Injury Research Center.

DR. MERTZ: I'm Harold Mertz from General Motors Corporation. I'm in the Safety and Restraint Center over there, and I deal in the engineering of the air bag, plus the biomechanics.

DR. GARBER: Gentlemen, I would like to thank you all for being here today. The National Transportation Safety Board obviously believes there's a lot of public interest in who is specifically at risk of air bag induced injuries. You are, by and large, experts in various areas of that topic.

I would like to ask that you keep your answers brief and responsive, and, please, in lay terms, so that folks besides myself and the panel will understand exactly what we're discussing here.

The first question would be for each of the panelists individually and in order, please. I would like for you to—starting with Dr. Price, to describe the types of injuries with which you are familiar that drivers or passengers may experience as a result of deploying air bags. And where it's possible, if you could tell me how your research leads you to those conclusions, and estimate the frequency of occurrence of those types of injuries. Starting with Dr. Price.

DR. PRICE: The focus of my research career has been in the effect of intense sound on the ear. Now, as you can understand, the Army, obviously has an interest in the effective intense sound, probably dating back to the invention of gun powder. But it terms out also that society has an interest, as well, certainly for sport shooters, law enforcement officers, and all those air bag owners out there.

The bad news is that the current noise standards for intense sounds, both in the U.S. and in the world, are essentially inadequate, especially for sounds that have a large low-frequency content. So what can you do about that? Where do we go from here? If I can have the first slide, please, or viewgraph?

(Slide 1 shown.)

DR. PRICE: What we see simply is a diagram of the ear, just to give you some feeling for the—what we think is going on and where in a physiological sense.

CHAIRMAN HALL: If you could wait a moment until the ear appears.

(General laughter.)

CHAIRMAN HALL: Where is our audio visual component? We'll proceed ahead, but—

DR. PRICE: I can go ahead. This is fine, until we get the ear apparent. We understand that the loss that we're concerned about is essentially inside the inner ear or cochlea. It doesn't matter, the ear works on both sides of the head.

(General laughter.)

DR. PRICE: You recognize the external ear. And this is the inner ear or cochlea. It is in this location that the losses occur. It's also interesting to note that the mechanism of loss changes as the intensity of the sound changes.

For industrial kinds of sounds, we think of the losses as being fundamentally metabolic in nature. The ear is tired out. On the other hand, as the level rises and it becomes sufficiently high—gun fire, air bags, that sort of thing, the loss changes to one of a mechanical nature. It's almost instantaneous in which the ear is torn up. And so permanent threshold shifts occur in an instant rather than over a period of years.

Now, so the scientific problem is how do we predict mechanical stress inside the inner ear. Since we can't measure it directly, what we can do is generate a mathematical model of the ear as a way of gaining insight. This is—this being the electro-acoustic analog of this physiological structure here as a way of gaining insight into what's going on inside the ear. I don't present this with any particular esoterical arcane interest. The point is that the model provides a theoretical context in which I can couch my remarks.

It provides predictive power, it shows that the results fit in a coherent, technical structure, a theoretical structure. And so we're not just looking at random data elements. We can say more than we otherwise would.

Well, in order to validate the predictions of a model, such as this, we have been exposing ears, biological ears to a wide range of noise and testing them for hearing loss. And so we've exposed the ears to primer impulses, to rifle impulses, to cannon impulses. And then the moment came a couple of years ago when engineers from GM called us and said, what can you tell us about the problem of air bag noise exposures? And to make a long story very short, we entered into a—just in a collaboration with them to try to get an answer for them, but also as a way of testing the provisions of the model, because it's a very interesting kind of impulse.

And so this cooperative program between the Army Research Laboratory, General Motors, and the University of Maryland Medical Center had evolved. They had the interest in human exposures.

To give you a quick sketch, we have tested cats as the experimental animal. The details in the model are for the cat ear. The cat and the human ears are similar, ears are similar. We exposed 32 animals on one occasion at the driver or passenger head positions of a mid-size pickup truck. On seven occasions, it was to a passenger bag alone. On nine occasions, it was to a passenger and driver air bag. We used three venting conditions; doors open, doors closed, or the doors closed and sealed with tape.

And we got changes in hearing sensitivity by measuring electrical potentials from the outside of the animal's head. And so it was we were able to get measures just before the exposure, just after, a month after, and six months after the exposure. And we actually have histological measures on 16 of the ears, of the six month group.

Well, the results acoustically were about what we expected. That is to say air bag deployments in that compartment, the peak pressures ranged from about 166 to a little over 170 decibels. In the sealed passenger compartment, of course, the pressure was the highest. Interestingly enough, the total energy in that passenger compartment is about the same as in the crew area of one of the Army's Howitzers. The results are very clear, fortunately, as far as hearing loss is concerned.

(Slide 2 shown.)

DR. PRICE: This viewgraph should show us the essential finding for hearing loss. That is to say, the frequency of the test tone is here. If we could see this edge a little bit better, this is the amount of loss in decibels. And so we got an immediate loss of about 60 decibels in the—in all the animals.

We have a permanent loss, some recovery occurred, of about 38 decibels in the animals. This is a very clear finding. That's a significant hearing loss. Now, can we apply this to the human condition? The model that you saw correlates with all the hearing testing we have done, all the noise measurements we have done, and exposures we have done at about a 0.9 level. That's a very high predictive ability, but it is for the cat ear. The cat and human are similar.

We have produced now a human model. It's the same structure, just variables that are sized to fit the human head. That model is being validated by ourselves and also by our NATO research study on impulse noise. But what can we say about these findings at the moment? Well, if we think that the cat is—has hearing similar to the human being, shifted a little higher in frequency, is a little more sensitive than we are. So think of the cat as a susceptible human being. As a rule of thumb, that's probably not so bad.

So these data would suggest that the more susceptible human beings may be suffering from permanent changes in hearing, perhaps ten or 15 percent of the exposed population. Who are the more susceptible? The models would suggest that it's people who don't see it coming, no middle air muscle activity involved, where their muscles tend to contract and protect the ear.

So if you don't see it coming, that's probably worse. Children tend to be more susceptible than human beings. That's some work that we did some time ago. There are some, of course, who are just naturally more susceptible. You just expect to see that as a natural case for almost everything you measure. And there are also those with fragile ears. There are people who have pre-existing conditions, such as tinnitus or hyperacusis or perhaps they've had recent surgery and just may be especially susceptible.

What's needed at the moment is a epidemiological test, which I think we can do. It's an interesting possibility. The Department of Defense has a database of-an active hearing conservation database of about 400 to 500,000 ears. That means we have pre-exposure audiograms. If we can manage to connect accident statistics with that database, we ought to be able to establish the epidemiological importance of these findings for the human ear. That's interesting from the modeling standpoint, but it's also interesting, I'm sure, for people such as yourselves.

If we can do that, then we have a chance of validating this model for the human ear, as well. And with a validated model, we now have the possibility for providing design guidance in whatever the next generation of air bags will be.

In a nutshell, that's what we've done, Mitch.

DR. GARBER: Dr. Price, thank you. I would like to follow up just briefly. You talked about an amount of hearing loss. You talked about a susceptible population. What percentage of the population that is in cars today would you expect to be susceptible to hearing loss based on the work that you've done?

DR. PRICE: Mitch, it's not firm. We're working with the individual susceptibility issue, but the guess would be somewhere in the 10 or 15 percent region would be considered susceptible.

DR. GARBER: And you described a certain amount of hearing loss in terms of decibels. Obviously, I'm familiar with that term. A lot of other people may not be. Can you describe what that amount of hearing loss means? What you would and would not be able to hear with that type of hearing loss?

DR. PRICE: Yes. The—a 20 decibel loss is considered clinically significant. People who have losses of 30 or 40 decibels have trouble understanding speech. They become socially isolated. If it's more than that, then the costs personally can be devastating. It's a serious loss.

DR. GARBER: And so based on what you're seeing in the susceptible population, they may actually have that amount of loss as a result of an exposure to an air bag—

DR. PRICE: That's right. The suspicion would be that there are some who already know it, especially those who have the kind of injury such that results in hyperacusis. They become extremely susceptible to almost any noise then, sensitive to noise. The suspicion would be that there may be people out there who have these losses, but don't know it or don't report it; children, people who haven't had their hearing tested and don't know. You can get along with a fair amount of loss, especially if you have one good ear and not know it. It only catches up with you later in life.

DR. GARBER: Okay. Thank you, Dr. Price. Dr. Kress, I would like to ask you the same opening question, which is basically if you can describe—I know that your research has been primarily with eye injuries. Can you describe the types of injuries with which you're familiar that drivers or passengers may experience as a result of air bag deployments? And, again, if you can estimate the frequency of those types of injuries and tell us how you come to that data?

DR. KRESS: Okay. Well, actually, a lot of the research that we've been conducting has involved looking at the overall design of the air bag system and all of the injuries that can be induced by the system. A big part as Dr. Garber said, we focused on eye injuries as a large portion of our work to—for one big reason is there's just not a lot of work that's been done in that area.

And also, it's one of the permanent disabling injuries that can result from the air bag. You look at, obviously, fatalities from brain injuries or neck injuries or bleeding that can be induced by air bags, but one of the other serious concerns, naturally, would be loss of sight. It's like loss of hearing.

So we looked, again, a great deal at that issue. We took a perspective where we completely understood the state of the art with respect to knowledge already in the area. We looked at research that's been done, the comprehensive review of all case studies and clinical studies.

We looked at both medical data, and engineering data, and looked at it from an epidemiological standpoint. And also looked closely at the data to try to associate the design of the air bag with the result in injuries to see what, indeed, may be important variables, so that the smarter air bag systems can incorporate some improved knowledge in the area of reducing eye injuries without introducing any new injuries or things of that sort, and still allowing the air bag to be as effective as it is in saving lives.

So, it was kind of—it's kind of an interesting area to be working in, because eye injuries are so rare. That is, air bag induced eye injuries. You look at the overall picture of injuries and you get down to well less than 1 percent of the air bag induced injuries are those that are eye injuries.

And then when you go into that data, the permanency associated with the eye injuries are naturally even less. You have a certain level of eye injuries that you care about, but you don't care about near as much, because there's no permanent consequences as a result of it. And if you look at the orbital region and the eye included, you can kind of divide it into four different anatomical regions. You've got the—and I've got the anatomist sitting beside me here that might slap me on the hand here.

You've got the outside of the eye, the periorbital region, the bony structure, and the surrounding skin, and eyelid. And then you can look at the globe as the outside surface, the white part, the sclera, and the conjunctiva, which is a coating and the cornea. And then you've got the inner components, the front part of the eyeball and the back part of the eyeball.

The front part contains aqueous humor and the lens kind of divides the front and the back. And the back part has vitreous and retina. All of these areas are vulnerable to injury.

You can kind of naturally understand the distribution percent wise. It's the—you see the minor injuries occurring the most, down to the major, and the major ones are occurring to the inside of the eyeball. You have a significant enough force, a velocity, or pressure of the bag that causes a certain bio-mechanical action of the globe that results in failure of the tissues inside and results in inflammation and bleeding that can cause permanent injury.

So, the types of injuries you look at—when you look at eyes, they can be injured by a perforation type injury, a sharp cut. That's not something naturally that you're dealing with.

Your primarily dealing with the blunt impact of the air bag. And something that is generally, but not always in the air bag's case, spread out to be larger than the globe. So, it's a pressure type of injury, but sometimes it can be a slapping injury as some of our experiments have indicated. But, again, the abrasions on the outside, the scratches and lacerations to the periorbital region, people heal quite well from. We have not found or seen, even though some people have reported on it, and I question the association with the air bag, actual significant fractures of the orbital region. You can have some, but that is extremely uncommon.

What's slightly more common, but less common than the scratches on the front outer surfaces and the periorbital region are the injuries to the inside of the eyeball, where you have hemorrhaging in the interior chamber. You can—that can lead to serious hyphaema or lens damaging or lens subluxation.

You also can have retinal detachment, or choroid damage that causes some retinal problems in the back of the eye, which all can result from impact from the air bag. The interesting thing, part of our research, as I said, looked at a lot of what has been done. We also went in the laboratory, deployed a variety of air bags to look at folding patterns and different materials and different speeds. And we used dummy heads. We used cadaver heads. We also used some pig eyes in dummy heads to investigate what's going on and try to induce injuries and understand them.

We found through most of what we did that it's not necessarily the deploying air bag that causes the injury. It can be just simply contact with the bag that's already deployed. We also noted that there wasn't a significant difference in our findings between vulnerability, between males or females, and we didn't see a large difference in adults and children either. That's kind of a non-information, but it's information in itself in some forms or fashion. But that's in general, the types of stuff that I've been looking at and we've been look at the University of Tennessee.

DR. GARBER: Thank you, Dr. Kress. A couple of quick follow-up questions to that. Did you notice in your review of the cases that the people that were receiving disabling eye injuries were also receiving other injuries? In fact, were the eye injury the most severe injuries they received or were there other injuries that were at least as severe?

DR. KRESS: That a very good point. Often, the individuals that had the severe eye injuries had other significant injuries. However, you kind of almost had a bimodal or distribution in the sense that you had the eye injuries showing up on the 60 mile an hour violent collisions, where there was multiple other injuries. Yet, there were those—a significant amount of reporting on cases where you're looking at the low deployment speeds and the low deployment threshold issue where eye injuries showed up and there wasn't other types of injuries.

So, really our findings can't support the concept of—with respect to eye injuries of increasing the deployment threshold.

DR. GARBER: And let me ask you one more brief question. That is, you didn't identify any particular susceptible population. What about people that wear glasses?

DR. KRESS: That's a good question. We pursued that issue in the laboratory. We put different eye glasses on cadavers, because we had from our identification of cases and the literature, there had been some reports on eye injuries as a result of glasses. That's when the lacerations show up. That's when you literally do have the perforations when the glasses fail. But an interesting thing to point out, someone's not going to report on an eye injury that did not occur when they had glasses on.

So, what you're going to see in the literature is a medical explanation of the injury resulting from eye glass failure. We tried to get a variety of eye glasses and we found them to be more protective in the sense that it's like having safety goggles on.

DR. GARBER: Thank you very much, Dr. Kress. Dr. Huelke, again, briefly, if you can describe the types of injuries with which you're familiar through your research that drivers or passengers may experience as a result of deploying air bags. And, again, if you can estimate the frequency of those types of injuries and tell us who might be most susceptible to them?

DR. HUELKE: We've been investigating air bags since about 1988 when they first showed up in a continuum of our research program on injuries and deaths in motor vehicle accidents that started at the University of Michigan in 1961.

As of last summer, I did a cut and I said let's look at some data now and we cut it at our then 550 steering wheel air bag deployments. In those cases, we had 2 percent people who had an eyeball injury—2 percent. Some of them with a scuff on the cornea.

There was one blindness. We never saw any involvement with eye glasses or contact lenses as a cause, if you will, in association with the air bag.

We have seen abrasions to the face, dislocated necks, erythema, redness to the anterior chest and upper neck. We've seen fractures of the upper forearm, of the mid forearm, of the wrist and hand. We have seen internal thoracic injuries, including broken ribs and some lung involvement. They are there. And it's not like we only see this or we only see that.

If you put your forearm across the steering wheel when you're making a left-hand turn and you get hit in the right-front wheel well and the air bag goes off, one of two things will happen. Your forearm will be broken by the air bag, because you've got it right on the module itself or the air bag may blow your hand extremity away and you snap your forearm bone on the edge of the instrument panel. So we see those sorts of things.

Our upper extremity injuries occur at a rate of about 3 percent. Most of these are of the moderate level, but a single bone. Sometimes they are both bones of the same extremity. Knuckles and hand bones get fractured basically from the air bag blowing the hand into the rear-view mirror, into the windshield, the sun visor, or the instrument panel.

One of the things that I would like to say right off the bat, is that in the newspapers, in the television, even in Senate hearings, we talk about or we read about the air bag, and the problems associated with the air bag. We must realize that there are two air bags in the car and each one is distinctly different and each one has a different set of injuries associated with it.

When you're talking the steering wheel air bag, don't worry about children. Children don't sit by the steering wheel air bag. So, it's an adult problem over there. And when you look at the adult problem supposedly, there are concerns about the short driver who is sitting close to the steering wheel and being injured.

We now have at the end of January, 650 air bag deployments on the steering wheel side and so I did a quick cut of the data and I looked for short drivers. And we have 126 short drivers; i.e., 5'4" or 4-1/2", actually 165 centimeters, if you like that number, where the air bag deployed. Some are belted, some are unbelted. Of those, two-thirds of them had a minor injury, as the most severe injury of the body.

There were some who were dead at the scene of the accident. In some cases, it was due to the air bag alone, but often, it was due to just one heck of a crash, that they died in and air bag, no air bag, they would have been dead anyway.

Half of those people with the more severe injury who survived had an injury in a body area unassociated with air bag deployment. And we've heard about, especially the offset frontal collision, where with air bags and lap shoulder belts, the people are surviving, but they are getting significant lower extremity injuries of the foot, ankle, or lower leg.

We see that often, but that's their most severe injury. It's not the air bag. Yes, there are a couple of cases of very minor deployment, where women have—short women, again, of our series—there's only two males and all of the others, 124 of them, are females. There are a couple of cases where the air bag deployed, causing a thrust to the under surface of the chin, dislocating their skull from the first cervical vertebrae. Needless to say, they were dead at the scene.

But when you look at 126 of these short people, you hardly ever find that. It's a very, very infrequent event, but it's very newsworthy, isn't it? And that's what we're looking at. So the eye injuries are about 2 percent.

It's interesting that someone early on here mentioned about hearing. Over a year ago, we decided to do something quite different and we went back to all of our old cases of air bag deployment, steering wheel air bag deployment, and tried to call these people up for an interview. And of those 240 people, we were able to contact 174 of them. And we got chit-chatting with them and we never said anything about hearing. We asked them how their sore knee was and that broken wrist that they had. And at the end we said, oh, and by the way, did you ever after the crash have any problem with seeing or smelling or taste or hearing? Of the 174 people, three of them said that they had ringing in the ears; one for three days and one for three weeks and one for three months.

We now have two people who were "hard of hearing," with a hearing deficit before the crash. It is now at least three months for each of those; one guy was a year. We had them go back to the audiologist and have an ear test. There was no change in their hearing test for what they had five to seven years previously.

We do not have people complaining about hyperacusis—i.e., can't stand loud sounds any more. I can't stand loud sounds when the rock station is on, but I guess that's something else. Chest injuries are relatively infrequent, probably less than the 2 percent level. But the upper extremity fractures is what really clouds the data. And if we talked with some of our colleagues from insurance institute and in the Government, you know, air bags are really doing real good if you take out those upper extremity fractures that are caused by the air bag.

I don't know if depowering is going to do anything with it. It's, again, a problem of—if you put your anatomy near the air bag, that piece of anatomy is going to get hurt. So, maybe we have to start thinking of turning the steering wheel from the bottom from 6 o'clock, if we're going to turn left, rather than starting at 3 o'clock and ending up with our forearm across the air bag.

Those are the kinds of things that we've been seeing and we often get calls like was mentioned earlier by the Chairman, of the family, we've got all of these kids and what are we going to do with the air bag? To answer the question that was raised before, three children, a pregnant mother, and the father, and I'm surprised that Helen didn't bring this up, buy a minivan. Don't try and put them all in a Geo. It doesn't work.

One of the concerns that I have when we talk about injuries, however, and this was brought out to touch about what the government is requiring, and isn't it interesting that we have in every state, I think, except one, a state law requiring the use of the belt systems in the car. Yet, our federal government is saying, well, you can test with belts and bags, but you also have to help out this guy who's breaking the law.

Now, to me, there's something paradoxical about that, that we have to protect the people who are breaking the law. And I suppose, you know, we have to have redundant brake system if someone decides to not have their brakes fixed when they don't work. I suppose we have to protect those people, too.

It just doesn't seem sensible. One of the things that we do is a lot of lecturing to EMT, to nurse's groups, the Kiwanis Club and all, talking about safety in terms of the air bag and the lap shoulder belt. But one of the things that was brought up today, we've got to educate the public. Every mother, almost every mother who has a pending child goes to an OB & GYN man, a physician or a doctor, lady doctor. And after the child is born, they go and see the pediatrician or they go to the well-baby clinic at the hospitals.

They are a captive group when they're sitting in the waiting room. Everyone sits in the waiting room like forever. That's where the education of these parents can be done, by the doctors.

So, I think it would be very important to get the American Academy of Pediatrics highly involved in this, to get the American Academy of Obstetrics and Gynecology involved, because people basically listen to the doctor.

DR. GARBER: Dr. Huelke, is it my understanding then that you're stating that there is an increased risk to people who are pregnant or to children specifically from air bag induced injuries from your research?

DR. HUELKE: From our research, we have never seen an injury due to an air bag to a pregnant woman, and we have a number of pregnant women. With the children, obviously, you've all heard of the horror stories about the rear facing child seat in the front. Isn't it interesting that almost all of these children who have died as passengers have died because they were unrestrained?

We have very few children passengers. Of our 660 drivers in air bag equipped cars, we only have 130 passengers with air bags. And of the 130, there's only 15 who are under the age of 11—11 or younger. And so, the exposure is extremely rare. Of our kids over there, most all of them have zero to one level injury, all of them are restrained.

DR. GARBER: Dr. Huelke, how do you come by your cases?

DR. HUELKE: We have several things going. Our research started, as I said, in 1961. And so the whole county area is alerted to our study. We get police accident reports every day from all the police agencies in our county. We have a 1-800 number for other people to call in about their air bag accident. We have a cooperation of some of the automotive companies who alert their dealers to call us when they have an air bag crash. And so we get—and also our burn trauma unit at the University of Michigan Hospital is cooperating in this study. And we get calls from all over the place.

People who call us that heard about this study. We get calls from doctors and nurses, basically, all over the United States who have heard it, because I've lectured at vast known international groups.

DR. GARBER: And this would not be a random sampling of air bag deployments. This sounds like it would be more traumatic injuries that have been received through air bag deployments?

DR. HUELKE: If the bag off, we will look at the crash. We do not pick injuries. We don't say, they all have to be dead or they all have to be very seriously injured. And that's why, like in any other system before the air bag, most of the people are relatively uninjured.

One of the things we have to long remember and never forget—I heard the expression used several times earlier this afternoon—we want a system that will do no harm. There is no system ever to be developed that will do no harm. Every object within the interior of the automobile causes injury. The instrument panel, the brake pedal, the head rest, the side door interior, and air bags do, and lap shoulder belts do, reduce the frequency of harm, that's a better thing to say.

There is no polio vaccine for traffic medicine, and I don't think there ever will be.

DR. GARBER: Thank you very much, Dr. Huelke. Dr. Augustine, if you could go over, again, the types of injuries with which you are familiar—you are our lone physician there on the panel—with which you are familiar that drivers or passengers may experience as a result of deploying air bags. And, again, if you could estimate the frequency of those occurrences and tell us who may be specifically at risk for those types of injuries?

DR. AUGENSTEIN: Well, let me start off by telling you a little bit about the study we have been involved with for the last seven years. The Ryder Trauma Center, which opened in 1992, is the sole injury provider, injury care provider for a catchment population of about 2.3 million people.

So in urban environments, it's one of the unique situations where there's one hospital that provides care for that larger population. Because of the building of the trauma center, we were able to build a research program at the same time. And our focus through funding from the National Highway Traffic Safety Administration was to look at injured occupants involved in frontal crashes, who were protected by some form of safety device.

Seat belts were our predominant mode initially and now we're moving into seat belts and air bags. But our population bias is that we're looking at severely injured people who come into our center.

The protocol of our research program is to be identified as—to identify the crash as early as possible. And because of cooperation we have gained with the various EMS systems and police systems, we're often notified while they're on the scene and we can send our crash investigator to the scene at the same time the patient is being extracted from the vehicle.

When the patient arrives in our center, we begin to document injuries in a very precise fashion. And one of the problems that exist in the industry research arena, is that if you try to reconstruct injuries, particularly, subtle injuries from a medical record, often some of the subtle bruises and things that are useful in locating an occupant during a crash are not part of the medical records.

So, we've developed a protocol where we photographed the individual as a part of the care process and we maintain x-rays and begin a multi-disciplinary analysis of the crash and the injuries as early as possible.

With that background, we have looked at approximately 100 air bag deployment crashes over the past few years. The majority of severe injuries we have seen have occurred because the occupant was out of position. And we have seen the spectrum of injury reported in the literature of severe head injuries, neck injuries, base of the skull injuries, and we have analyzed crashes in two of the rear facing infant seats, and have seen the reported injuries.

In the properly restrained occupant, we have seen minimal other injuries. It's kind of surprising that we have not seen—we've seen about one or two upper extremity injuries that were probably questionably related to the air bag. What we have seen, as Dr. Huelke has described, is the lower extremity injuries. And this is probably a byproduct of the excellent work that the air bag is doing.

Many of these crashes involve tremendous intrusion and typically would have involved a fatality at the scene. And now we're seeing people who literally do not have head or chest or abdominal injuries, but because of the crush of the vehicle are affected by severe ankle and other parts of the lower extremity injuries.

I think it's important to point out that we need to in the long-run address these injuries also. And that much of the focus in injury—in injury prevention has been to the prevention of death. And if we look at our abbreviated injury scoring system, it's a system that tells us the severity of injury with respect to whether you're going to live or die.

We have not put, in my opinion, as much emphasis on disability potential as we need and as we look at these individuals who have lower extremity injuries, particularly, devastating ankle injuries, the long-term disability of those are quite significant.

So, I think in the long term, we have to address all of that, but in our experience, which is, once again, a very biased experience, we're looking at people who are severely injured, are the population who is being injured by the air bag is largely the out-of-position occupant.

DR. GARBER: Have you noticed that any particular group is over represented in the folks that are being severely injured, either short-statured women or any other particular group that's being over represented in those severe injuries, other than out-of-position occupants?

DR. AUGENSTEIN: We have not seen any significant unique distribution. We've had representatives of all of the short stature, and very tall individuals who seem to be out of position at the time of the crash. I think the concern at this time with respect to the children that are out of position—I mean, clearly much of the infant problem can be addressed.

One of the—addressed by putting the child in the back seat, of course. One of the challenges that I think was mentioned earlier that we're seeing as we discuss crashes with the parents who have been involved in it, is that it's very difficult for them to fit their kids in present seating systems. And as they grow out of their child seats, their infant seats, and they try to come up with a progression of seats, it's hard to find that.

So one of the recommendations we have is to help the parents fit the kids into the restraint systems a little better.

DR. GARBER: Just for clarification, by out of position, are you also including the unrestrained occupants?

DR. AUGENSTEIN: Yeah. In the—thank you for asking that question. In most of the out-of-position occupants we have seen are unbelted. We have had two deaths where the individual was belted, but out of position; one, a passenger leaning forward at the time of the passenger bag deployment, and another one where it was what one would refer to as a soft crash pulse where the deployment of the air bag came late in the crash and the person was probably somewhat—a short-statured person was somewhat over the steering wheel, even though she was restrained, as the air bag deployed.

DR. GARBER: And just one more follow-up question. Do you feel that the medical community generally recognizes the types of injuries that you've been seeing as potentially caused by the air bag or do you think that when these people end up in an emergency room, as you've described previously, that there may not be much evidence as to what exactly caused their injuries?

DR. AUGENSTEIN: Having had the privilege of being involved in this area for the past few years, I have recognized how little I knew as a trauma surgeon about injury. I think we have a challenge to educate the medical community about the whole spectrum of safety and how to communicate to their patients about what to do and how to anticipate injuries when they see patients.

It is interesting to me that if a patient came in with high blood pressure, we would—in an emergency department, we would have a pretty standard work up for that problem. And yet, we don't always apply the same sort of background analysis to people who have been involved in a crash. We don't ask the same sort of questions. And I think it's an educational process that we have to embark upon to make sure that the medical community is more comfortable with these concepts.

DR. GARBER: Thank you, Dr. Augenstein. Dr. Mertz, I would like to focus a little bit differently, since your background is a little bit different from the rest of the panel. I would like to ask you some specific questions on how adequate the test procedures are that we have currently available. How adequate are those to predict real world injuries? How well are we able to in the medical community determine how people—who is going to be at risk as we're designing these products for people?

DR. MERTZ: Now, that's one of the areas that I've spent a lot of time on, obviously. Part of my background, I'm involved with the Society of Automotive Engineers in terms of their various subcommittees and task force that developed the injury criteria of the dummies, the test procedures. I'm also involved in the International Standards Organization in terms of those working groups that are involved in restraint system evaluation.

We've developed a set of dummies, called the Hybrid-3 dummies, mentioned this morning. There's a large male dummy, a mid-size male dummy, a small female dummy, and we have two child dummies now: a three-year old child dummy and a six-year old child dummy. All this work on these Hybrid-3 dummies have been done under a task force I currently chair, just called the Hybrid-3 Dummy Task Force.

We also have three infant dummies and they're called the CRABI dummies. That means child air cushion interaction dummies, restraint system interaction dummies. And there are a—let me see, it would be a six month, a 12 month, and an 18 month infant dummy. Now, those—infant dummies were designed specifically to evaluate the interaction of the air cushion, the passenger air cushion with rear-facing child restraints.

The folks in the child restraint SAE task force came to us and said to us, well, you're going to deploy your air bag right where we're telling the mothers to put their rear facing child seats. What are you guys doing about it? And at the time, we were working on it at General Motors, and the suggestion was to take it into SAE, so we would have everybody working on it and that's exactly what we did.

The task force was chaired by Roger Daniels of Ford Motor Company. And within a year, we had three dummies available for testing and as still available for testing of rear facing child restraints. The other types of dummies that we have go back a little further than that. Back in the 1977 to '82 range, General Motors was working on their second air cushion system, second generation air cushion system. And under that program, we needed a child surrogate, a dummy to assess the interaction of the deploying passenger air bag with a child that would be out of position or near the air bag module when it deployed.

So one of the things we did there was to develop what we call the three year old air cushion dummy, that I designed up in probably four hours, and it was manufactured and made in less than a week. And the dummy went through probably 1500, 2000 tests. We never failed.

We needed to correlate the response of that dummy to whether or not there would be an injury produced. In order to do that, we went to Southwest Research Institute down in San Antonio in Texas, and we conducted an animal dummy correlation study. At the same time, Ford Motor Company was also working on a passenger air bag system, and they were down there with their own program, as well. And we exchanged the dummy between Ford and General Motors. We allowed them that dummy. And they also did a correlation study down there.

The results of that effort ended up in a series of what we call injury assessment reference values. Those are the guidelines we used for our restraint development. What we tried to do is keep the response of the dummy below a certain level. If we do that, then the expectation, which is how we set the guidelines, was that the risk of significant injury would be minimal.

That didn't quite set well with us, because that was sort of a guess. And so we went into a statistical analysis of the data and generated what we call injury risk curves. And those give us the risk of injury as a function of the dummy measurement.

So, if you want to say you're going to accept the given risk level and you want to be below that, you go into the curve and you find the corresponding dummy response for that injury risk, and you can set that as your injury risk level.

One of the other aspects of that, of course, is in terms of designing anything. You always need a margin of compliance, which says there's a variability in your testing.

And so we always try to take that into account when we set our limits in terms of our designs.

All that work has been published. It was published in the 9th ESV in Japan. The ESV is the Experimental Safety Vehicle Conference sponsored by National Highway Traffic Safety Administration. And that data certainly was available for anybody to view.

In 1985, I presented a paper at the Government Industry meeting, in which I discussed the problems of putting air bags into smaller vehicles. Because of the oil crunch in the 1980s, the vehicle sizes were getting smaller, and the time required to inflate the bag and get in the position to restrain the occupant was getting shorter. That meant we were—ended up getting into a position where the air bag by necessity became more aggressive to anybody who was near it when it was deploying.

We ended up with—with that, we made two recommendations at that point in time. One that the unrestrained portion of 208 was forcing us to go to more aggressive air bags and that the way to get around that was a constant severity—accident severity test. And that's very close to what's been done now in terms of the generic sled test that NHTSA just proposed. We're glad to see that come about.

And the second part of that was that there had to be a set of test requirements placed on the out-of-position occupants, both the child and the driver. And for the driver, we had the Hybrid-3 dummy at that time. And for the child, we had the—what we call the GM-3 air bag dummy.

And for each dummy, we had a set of injury reference values that we could specify to assure that there would be a low risk of injury if the deploying air bag—if the occupant was involved with the deploying air bag. So, that was a set of performance requirements and test conditions that we put together.

In terms of the test conditions, I chaired also an SAE task force on test procedures. And we got together with the folks from domestic industry, plus the supplier industry, some of our European folks got involved in that, and we put out two SAE information reports that described test procedures on how do you go about testing. It describes also what dummies you can use in terms of making the assessment. And they were published in the—oh, the late 1980 time frame.

And then we decided that the Europeans would probably like to get involved in this, as they market cars in the United States. And so we put the test procedures into ISO, as well, and that ended up with the ISO, International Standards Organization test procedures, and there are two reports that are currently available there.

So in terms of the test technology available, it's certainly available to evaluate and assess the out-of-position occupant problem, both for the driver, the child, and the infant. There are test dummies. There are test procedures, and there are injury reference values. And one of the things you could certainly help make happen is let's get those in place, because I think that what's really required is some guideline as to a tradeoff between the—a balance between the protection of the air bag in the injury it can cause. That has to be balanced.

DR. GARBER: Dr. Mertz, thank you. If I can ask a couple of follow-up questions. The source of these injury assessment reference values, it sounded like you were saying those for the child and the infant dummies are primarily animal studies. Is that correct?

DR. MERTZ: That's correct. They came off the—there were two programs where most of the data has originated now. The one conducted by General Motors and the one conducted by Ford Motor Company at Southwest Research Institute. Dr. Prasad and I—Dr. Prasad works for Ford—had gotten together and combined the data sets and we're in the process right now working with the folks from NHTSA on an SAE committee.

We have put together actual injury risk curves, not only for the child dummies and the infant dummies, but we've extended that through the appropriate mechanical scaling and tolerance information to literature to the adults, as well.

DR. GARBER: Do you feel that the animals used in the studies to set these values are sufficiently similar to humans to permit use of those types of models to predict injuries in children and infants?

DR. MERTZ: We used a combination of three animal models in our studies. The original studies in the early '70s, we used the baboon and the chimpanzee. That's when we developed our first air cushion program called the '73, '74 ACRS program for General Motors. We did that work at Wayne State. And then in about 1974, Volvo used pigs as a surrogate. They had a study. They were worried also about the interaction of the child with the air bag.

And so when we did our work at Southwest, we did a species comparison, where we did tests on the baboon and the pig under the same impact conditions. The pig is a bit better surrogate in terms of its growth and its development. They were ten weeks old and 15 kilograms and the state of development was very close to that of a three year old child. So, we felt that was a bit more of a better surrogate. The baboons were more like and the chimpanzees were more like adolescents and teenagers, and the tissue strength was quite a bit stronger.

So, we felt that the pig was a better surrogate. So most of the work is predicated on the results we saw from the pig experiments.

DR. GARBER: Are there any significant differences that might make the pig an invalid model for infants or for children? Pigs, for instance, don't have chins. Does that present a problem from a bio-mechanical perspective?

DR. MERTZ: Well, we thought that would be the case. As you know, a lot of the injuries that were apparently unfortunately seen in the field to the children, involved the neck, the high cervical injuries, and I've looked at those x-rays. We have those x-rays. I've gone through that and looked at them.

Those injuries are remarkably similar to what we observed in both the pig and the baboon. In fact, both of them we produced high cervical injuries. That was the—probably the most predominant injury that we produced when the bag was deployed up in the head area.

So, the other part of that, while the pig has no chin, it does have a projected area the size of a human skull. The baboon, on the other hand, looks more like a dog, so it has an elongated chin. The formation of the vertebrae on the pig is very similar to that of the human in terms of the odontoid process and how it's—the number of cervical vertebrae. It's got a little bigger neck, but, indeed, these were anaesthetized animals and the muscle—was really not involved in the experiments that we conducted at all.

Other things that we done, we've gone the other way. We've taken results that we've done with cadavers. These would be adult cadavers now, and we got data on that in terms of the type of injuries that occurred in the field with the adult out of positions. Again, we see the high cervical involvement. We reproduced that also in the laboratory experiments with cadavers under the same types of situations that we believe to have occurred in the field.

And then we put our dummy back in there, a Hybrid-3 small female dummy, measured the loads. And lo and behold, when we scale up and down between the loads measured with the three year old air bag dummy and the loads we've measured with the Hybrid-3 small female dummy, going through a consideration for size, because size determines strength, also material problems, because there is a difference in material problems between the small and the large, the young and the old. We incorporated that type of analysis into it, and basically, it was very good, very good agreement.

In fact, when we got done with the program at Southwest, we could predict without a doubt the type of injury we would see or not see in the animal based on the measurements that we made with the dummy, because we always conducted the dummy test first, and then the animal test. And one of the requirements was that we wouldn't conduct the animal test unless there was a significant difference in the response of the dummy, and it was extremely predictive, especially for neck injury.

CHAIRMAN HALL: Can I ask Dr. Mertz a question? If we've done all of this work, why does—considering that the SAE and you have all these dummies, where are we with NHTSA only having one dummy that they certify?

DR. MERTZ: That's a question you ought to ask them. Let me emphasize that point. You ought to ask them why that September this year will the Hybrid-3 dummy, the dummy that's used around the world, finally become the only dummy in their standard? I think there's a lot of politics going on here and not good science.

DR. GARBER: Dr. Mertz, if I could ask one last question and then—

CHAIRMAN HALL: One last one and then we've got these tables and we've got to keep moving here.

DR. GARBER: From a bio-mechanical perspective, how much additional protection does an air bag afford a properly belted adult in the front seat in a collision, either in a low speed or a high speed collision, if you could address that?

DR. MERTZ: Okay. There are two things going on there. The purpose—let's take the adult driver, for example. What the bag does it keep—even when you're belted, it keeps your face off of the steering wheel. I think you saw an example of that from Brian O'Neill here this morning. That's exactly what it's supposed to do.

The other aspect of it, it allows us now to also moderate the shoulder belt load. There was questions about the weak and the frail can't tolerate high loads on their body. That's certainly true. So, one of the things that we like to do is we put in a force limiter. We can limit the force on the torso from the belt. And all the manufacturers are going through that type of belt system.

It's an outstanding belt system, but it has to work in cooperation with the air bag. You can't put it in there without the air bag. They tried to do that in Europe a few years back, back in the mid '80s, and the problem that they had there was, yes, they got rid of the chest injuries, but they ended up with a lot of face and head injuries, because that's what—you end up hitting that steering wheel.

So, you've got to have the air bag and it's got to be—the system has to be designed together. I'm—I've seen some of the systems. And if you go down to the SAE show, you see what the supplier industries have on the table down there. They have some fantastic devices. You're going to see those in your automobiles and they will be great systems.

DR. GARBER: Thank you very much, Dr. Mertz.

CHAIRMAN HALL: But all those great systems are only great if your seat belt's fastened?

DR. MERTZ: You better put it on. That's the best advice you can give anybody.

CHAIRMAN HALL: Okay. Well, let's move now to the—is there anybody else on the Technical Group? Well, let's move to the tables. And we will begin with—well, we'll just take them across. We'll start at table 6. Does table 6 have any questions for this witness—this panel, I'm sorry.

MR. DITLOW: Dr. Huelke, I'm Clarence Ditlow of Auto Safety. Dr. Huelke, have you observed any differences in injury frequency or type since you began your studies in 1988 that indicate any improvements in the air bag systems to reduce air bag injuries?

DR. HUELKE: No, because we don't look for it. We are interested in injuries in motor vehicle accidents. We do not know the manufacturer of the bag and could care less. We don't know anything about the folding type. We know nothing about their deployment speed. So, we're just looking from the aspect of the injuries and report on those injuries.

MR. DITLOW: Okay. For Dr. Mertz, since the—are the Hybrid-3 child dummies and fifth percentile female dummies sufficiently well developed to be used in federal standards today? And if not, what has to be done to them?

DR. MERTZ: Let's take them one at a time. The fifth female dummy has been developed now for quite some time. We developed that one specifically to look at the small female interaction with deploying air bag. It was the number one priority. The number two priority with that was the lap belt interaction. So, she was the first dummy that the group worked on.

As you heard, everybody is using that dummy now. What we're doing with it in terms of getting it ready to put into Part 572, we have recently upgraded the ankle joint and the hip joint in that dummy to be equivalent to our 50th percentile Hybrid-3. And that work is now completed and, hopefully, the documentation will be done. Our time table is to get that done by the middle of May. We are working in a cooperation with the folks from NHTSA on that.

The three year old poses a bit of a different question. It was the last dummy that we worked on. And the only reason for that is that we had a very good dummy for looking at air bag interaction. That was the three year old air bag dummy. That's the dummy that I put together back in the early '80s. I took that with the folks from Ford. We took that into SAE to standardize it. It is a standardized dummy now. And we could, indeed, use that dummy, and that dummy has been used for looking at the three year old interaction with the passenger air bag system.

So, the three year old Hybrid-3 dummy was the last one that we worked on. And we didn't start working on that one until about 1991, '92, I guess it was. That was the last one we got into. And what we wanted to do was to put the same type of instrumentation that we had on our air bag dummy onto our three year old Hybrid-3 dummy.

It has some additional instrumentation that we normally don't have on our Hybrid-3 dummy, but it was not too difficult of a job to put that on, and a problem with that one right now is the type of steel that we're using in the chest. From a manufacturing point of view, they use what we call a softer steel. As you get up in the hardness steels, they are more difficult to work with.

So, we're trying now to—we've gone to a very durable steel and that's been incorporated into the dummy. There's some rib guides that we put in there to keep the rib—the chest going in and out the way we wanted it to.

All that work should be done by now. It should be tested. It should have been tested last week with air bags, to make sure it holds up, and that we're satisfied with it. It will be the most advanced dummy that we have, and the group feels that taking a little time to get that job done and putting it into the standard would be the way to do.

As I say, we could have put the other dummy into the standard, but as I mentioned, it takes forever to change the standard and to get another dummy in there. So, the group thought it was appropriate to take the time and that's what we're doing.

By the way, the deadline on that dummy is also the middle of May. The deadline for the six year old dummy is the middle of May. The deadline for the fifth is also the middle of the May. We expect to give complete documentation to that. There's been excellent cooperation with NHTSA within the industry to get the job done, and I'm hopeful that it will happen.

MR. DITLOW: And the final question, Dr. Mertz, from our panel is that GM I guess, is still today, the only manufacturer ever to have sold a dual inflation rate air bag. How did those test out with regard to out-of-position occupants? Is there an advantage there?

DR. MERTZ: Well, as everybody in the room probably knows if they know me well enough, my middle name is dual level or very low rate. So, I'm a proponent of that idea. And it just makes logical sense to deploy in proportion to the crash severity. It is a technological challenge. We did attempt that. That was the basis of our [19]71—excuse me, '73 through '76 system.

We had one child fatality in that. There is debate over whether the air bag killed the child or the accident event killed the child. When we got into our second generation system, my job was to go back and analyze the data and come up with an estimate of what actually could have occurred in that.

There were three basic problems that I saw with our '73 through '76 system. We had a driver fatality. And so we did extensive work on out-of-position drivers with the Hybrid-3 dummy and that work's published. It was published by Horsch in '79 in SAE. And the results of that testing show that if you were within two inches of the module, an inch of the module—I guess it was an inch of the module, you could have completely collapsed the chest of the dummy.

Now, the indication there is, of course, severe thoracic injury. And that's—of course, we don't know what happened in that case because that man never had an autopsy—but clearly the dummy indicated that. And so we have a lot of confidence in the response of that dummy. So we decided that we had to do something about that in our second generation. So, we looked at things that we could do to reduce that type of loading.

The other observation was the fatality with the child. And that was the reason for doing the animal test—the extensive animal test program at Southwest Research Institute, was to explore all the combinations of what could happen. We did a lot of work in terms of where children sit in cars. What happens during the collision event, where they end up, how often they're in there, what's the frequency that they're close to the IP? All that work is published and all that work went into the test positions that we evaluated.

Of course, we needed the three year old child dummy to—as our instrument, because our design folks needed a test device that they could run every day at the lab and find out what they're doing in terms of changing the system, how is it affecting the dummy? We couldn't possibly run animals on all those types of tests.

I mean, we literally conducted thousands of them. Now, the third one is one that doesn't get much mention and that's the fact that the frequency occurrence of fractures to the leg was higher than we expected for the passenger, independent of how severe the accident was. And so we did a study as to what the causation of that was. I got all the x-rays, because we followed every accident case on those vehicles.

I got all the x-rays and I looked at them. There's a pattern that existed in terms of where the fractures occur. They were either on the inside or the outside of the knee or the ankle. And that's indicated to me that the people were not sitting the way we thought they were sitting.

We had conducted cadaver tests straight in and we conducted human volunteer tests straight into that air cushion system with no problems. So why we were getting all these fractures? What we did is we instrumented up again the Hybrid-3 leg and that's where all the instrumentation comes from on the leg of the Hybrid-3. And then we duplicated those events using the Hybrid-3 dummy. And low and behold, what we measured and comparing that to the fractured—for bone and literature, the loads were high enough to cause those fractures.

So, that the culprit there was the knee bag. We had an internal knee bag in there. No one could see it. It was a high pressured knee bag. It was coming off a separate port, a separate setting, and it was very high pressurized compared to the rest of the system. So that was the culprit in there.

The design group at the time decided that—we started off as we usually do. We were going to go with a variable rate or stage inflator. We were going to change the technology from compressed gas and a heater to sodium azide. And what we did is we had two compartments and we would set them off at different times that would give us a staging of variable rates. And we tried that and we ran our animal experiments on that, as well. We ended up getting severe injuries to the animal. So that was not the solution.

So the group got together and we said, well, that's not going to be the solution. What is going to be the solution? And at that time, we came up with two ideas. One was what we called the S-shape inflation curve. Slow on, set at fast in the middle, and slow at the end.

The other part of that was the bag shape. And we came up with what we call the L cushion. And the L cushion basically—those systems deport from the lower portion of the instrument panel and went up. What we wanted was sort of a wall. And we limited the amount of excursion that the bag could go to something like 12 to 14 inches coming out from the IP and then it would go all the way up to the top of roof in a series of little bubbles.

And we didn't know if that would work or we could do that. So one of the guys went home at night and got a soda straw, some plastic bags, and glued one up, and came in the morning and showed us how doing that was. It went straight up and that's it. We tried that bag. We put it in there, and lo and behold, the injuries started going down. The dummy numbers went down, the injuries went down, and we were very encouraged with that.

And we had three programs at that time. We started off with '82 rear wheel drive car. It was a bigger car. Nice protection. Excuse me. We started off with an A car, which is a smaller car, went to the '82. We put it into the '82, and the folks in the program thought we had a good system. We would with that, but the oil crunch came. We weren't going to sell those cars any more. The thing that came on line was the front wheel drive cars and we lost the time budget. We just clearly lost the time budget. We couldn't put that bag up as slowly as we wanted to, to meet the 208 requirements in the front wheel drive cars. And that's where this thing came.

Boy, if we could have put that across the board and get rid of the unrestrained portion of 208, that bag would have been in the cars. It would have been in all the cars, but we couldn't meet 208, unrestrained with it and so there we were. And at that time, the corporation decided there wasn't that much interest in air bags and the program was, I think, terminated in '81.

So, we looked at it, but there was no intention, okay, and there was no intention of putting the ’74 system into our cars.

MR. DITLOW: Thank you.

CHAIRMAN HALL: Table 5. Does table 5 have any questions?

MS. FERGUSON: Susan Ferguson, Insurance Institute for Highway Safety. We just have one question for Dr. Huelke. Dr. Huelke, some research suggests by the National Highway Traffic Safety Administration that female drivers are more likely to sustain air bag related arm injuries. Your findings suggests that males also sustain these kinds of injuries. Can you comment on whether females are over represented in this kind of injury or if there are differences, can you reconcile them?

DR. HUELKE: With the upper extremity injuries particularly of the forearm fractures, we see them both with tethered and untethered bags. We see them with about the same frequency of males and females and with belts and no belts. And so it just looks like that piece of anatomy is right at the bag, and it doesn’t matter if it’s a tethered bag, untethered, if it is a belted, a short person or tall person. We see it across the board.

Now, I’m talking from the vast experience of 18 cases. I mean, that’s the largest collection that I know of in the world. Again, that’s the 3 percent of the 540 or 550 cases that I mentioned before. And in that 18, there’s a bunch of hand fractures and they are not all forearm.

So, you know, the numbers that we’re talking about in terms of injuries are extremely low, extremely low. And to try to do a cut on 18 cases, you know, if you start filtering, you may find there’s more blue cars than red cars, but you’re not really going to get any information. You get a couple of zeros on the back of the 18 and something could be done. But we’re seeing it at across the board and at all kinds of speeds. It doesn’t have to be at high speed, because that bag goes off and you’ve got a piece of anatomy at that bag junction when it deploys, that part is going to get hurt.

CHAIRMAN HALL: How many air bag deployments have there been, do you know, sir?

DR. HUELKE: I’m sure—

MS. FERGUSON: Actually, our data would suggest it’s over a million. Probably about 1.2 million through 1996 of driver air bags, about 1.4 million overall. These are projections. They are estimates. We don’t actually have the data. It was about 780,000 through 1995.

CHAIRMAN HALL: Okay. I’m sorry. Did that complete the answer and questions?

MS. FERGUSON: We don’t have any further questions. Thank you.

CHAIRMAN HALL: Yes, sir, table 4.

MR. HUTCHINSON: Yes, Phil Hutchinson representing International Auto Makers. We have a couple of questions for Dr. Price. The first one, would air bag de-powering of 25 to 30 percent affect peak decibel levels in any expected hearing loss?

DR. PRICE: That's a good question, but harder one to answer than you might think. Although, I think in the end, the answer is probably that we can have our cake and eat it, too, in all probability, if we're allowed to design.

We haven't had time to work through the model in all its aspects, but the suggestion is that so far as the ear is concerned, it's the first few milliseconds that are really critical. And if we could eliminate certain aspects of the sound if that brief period, then what happens before or after that doesn't matter very much for a series of complicated reasons, but it doesn't matter very much as far as hearing loss is concerned. And so I think that there's real hope that something can be done with good design if you have the insight that the modeling provides.

MR. HUTCHINSON: Our second question, Dr. Price, you mentioned that hearing loss occurs as a result of low frequency noise and your diagram indicated that the highest hearing loss is in the 4,000 Hertz area. Does the low frequency energy cause permanent ear damage that has hearing loss mainly in the high frequency area?

DR. PRICE: That may have been a miscommunication. The air bag has a lot of low frequency energy in it. That's true. But again, for a set of very complicated reasons, it turns out that the low frequency energy may actually serve to protect the ear. There is a limit in the little bones of the middle ear, which simply can't move more than a certain amount. So if the low frequency comes and pushes and holds it, that actually blocks the flow of energy.

It's not an easy thing to visualize, but the model shows it to us in a little movie and the suggestion is that the loss at 4 kilohertz is predicted by the model. So it makes theoretical sense. That's okay.

MR. HUTCHINSON: I see. Thank you, sir. And the final question is for Dr. Huelke or Augenstein. Of any short statured driver fatalities that you've investigated, do you know how close were the drivers to the air bag at the time of the deployment?

DR. AUGENSTEIN: We can only make assumptions. In one fatality that we looked at, which is a small sports car, a relatively short occupant about 5'3" had her normal driving position in the full aft position, as I said, because this was—that was the crash I referred to initially. It appeared that she moved forward and her head was over the steering wheel.

In fact, I had asked Dr. Huelke to look at that crash with us. And I think we made the inference that her head was—even though she was probably belted, her head was actually out of position at that time.

MR. HUTCHINSON: Thank you.

DR. MERTZ: And that's true in our study, too.

MR. HUTCHINSON: Thank you. That's all the questions we have.

CHAIRMAN HALL: Okay. Table 3?

MR. LANGE: Thank you, Chairman Hall. Bob Lange from General Motors. I have a very brief question, I think for Dr. Huelke. Dr. Huelke, you've investigated a 126 air bag accidents in which the driver was of diminutive stature, less than 5'4-1/2" in height. Given the other descriptions that you provided in your statement today, what recommendations or advice do you have for diminutive drivers who drive in vehicles with air bags?

DR. HUELKE: Well, I'm always after my wife for the same reason, because she is shorter statured. She likes to drive with bent elbow. And I say, if you're going to get any older, you're going to the little old lady from Pasadena the way you're driving. And so she's retraining herself, as it were, to sit a little bit further back with the upper extremity, obviously, with the lap shoulder belt being worn. That's extremely important.

But a lot of these women are a very—not only are they short statured, but along with short statured frequently comes short and lower extremities. And there's no way that they could control the foot pedals, if you will, adequately. They can maybe get a little bit further back with their upper extremities holding up the steering wheel, but you can't get a short woman too far back in the seat, because of leg length.

But as I say, you know, approximately 70 percent, 67 percent of our short women in this study had the most severe injury of a level one, and that's a minor injury. And another 20 percent had a level 2 injury, the AIS 2 which is a moderate level injury and that could be a sprain of a major joint, a fracture of one of the bones of the forearm, that sort of thing.

And so there's—it's not the monster problem that it's been made out to be.

MR. LANGE: How would you relate belt use to that problem?

DR. HUELKE: We have an extremely high percentage of belt use. Our belt use is well over 70 percent in the study. And that's one of the things that we always look for, Mr. Chairman, is not only if they say they've got the belt on, we look for trace elements on the belt and other components that the belt was worn.

Also, we know that they weren't wearing the belt when they answer all the questions very quickly and when we say, and did you have your belt on, and they hum and hah for about five seconds, you've got a good idea that they didn't have their belt on.

We always check that. We have found some people who are not quite truthful about it. But in this day and age if you ask people do you wear your belt, you could get a lot of liars, because the law says you've better wear your belt.

And so the police reports are also incorrect along that line, because of—you know, the police get there. Do you have your belt on? You bet you I had my belt on. I'm not going to say no. But we look very, very carefully to make sure about that. But we have a lot of short women, as I say, a bunch of them. And now the number actually—I'm just looking at my notes and I misspoke. We have 196 of them of which 67 percent or 132 of them had walk-away injuries.

MR. LANGE: Thank you. This question is for Dr. Mertz. Dr. Mertz, you described the family of Hybrid-3 dummies and the GM three year old air bag dummy that was utilized or that was developed. Are those tools utilized by auto manufacturers in developing air bag systems to date, even though there are no regulatory requirements they do so?

DR. MERTZ: Well, they're utilized by the folks certainly that are involved with our SAE committee, because part of what we do—that the Society of Engineers, our committees have no resources other than the people who show up at the door and what they can bring to the table from their companies.

And so there's a lot of motivation there. So, the dummies are being used. For example, the air bags—the three year old air bag dummy, it's being used by General Motors in evaluating the side impact or the side air bag situation for kids. That's one of our concerns is that we're looking at side air bags and one of the things is the child could be next to it when the bag goes off. What's the interaction? That dummy is being used for that right now, so.

MR. LANGE: Do you know if that family of dummies are now being used by NHTSA in its testing?

DR. MERTZ: Yes, they are.

MR. LANGE: Thank you.

DR. MERTZ: Part of our program, SAE is working with the folks down at their test center in Ohio. They come up at the meetings. They're sharing their data with us, and we're trying to get this job done. So, as I said, at this point in time, there's a lot of good cooperation.

MR. LANGE: Thank you.

CHAIRMAN HALL: Table 2?

MR. VOS: Tom Vos, AORC. I think during Dr. Kress's comments, he mentioned that some of the people in severe crashes with bags also exhibit varying degrees of eye damage or injury. Do we have data to compare susceptibility of injury in air bag versus non-air bag? In other words, do we see—do we have evidence that say that a lot of the non-air bag crashes are also creating these similar types of eye trauma?

DR. KRESS: Well, actually from what I've seen, the non-air bag eye injuries generally involve significant other injuries. For instance, if you have eye involvement and there's no air bag there, in all likelihood if you're the driver, you've hit the steering wheel and you've fractured the orbital region or the frontal bone or the nasal ethmoid complex. So, you often have much more serious injuries.

I also wanted to note, to bring that up, and I can't stress the importance of belts like everyone else. I'm in accord with everyone. But our findings have shown that the eye injuries, the cases that show up, a majority of them are our belted occupants, the ones that are air bag induced.

MR. VOS: One other question and also with regard to susceptibility there was comments, particularly with regard to hearing. But if NHTSA were to continue to allow air bag deactivation based on a basis of criteria, serious health conditions, do we have any guidelines among those of you involved in the medical field as to how to define those medical conditions and should that be hearing or other things? I guess that's a question to anyone who cares to respond.

DR. PRICE: I don't feel really competent to respond, but I do know that some who have had air bag deployment and have resulted in hyperacusis, feel very passionately that they don't want to be re-exposed. So, I'm sure that that depends a lot on your outlook. Are there criteria that might be applied? Certainly from the standpoint of hearing, I think that that's what we hope to develop, because that's some sense of what the risks are. But ideally, I really have a whole lot of hope that we can design the hearing problem out, so that it doesn't become a risk. That really is the goal and I think a possibility.

DR. HUELKE: Mr. Chairman, let me respond also, if I may, very quickly. There is no hearing problem. If it does occur, it is so, so infrequent that it's an outlier of the far extreme. Most of this problem, if you will, came up, I think from a USA Today article some months ago about the hearing problem and the Tinnitus Association and the hyperacusis group went on record to say that it's a problem.

We're putting a paper together on the hearing, the lack of hearing loss due to air bags really. And one of the members is a professor of ear, nose, and throat at the University of Michigan, who is in charge of the audiology testing facility. He called up both the hyperacusis group and the tinnitus group and said, where's your data? And they said, we don't have any, but we heard a story or so about it, and, therefore, we think it's a problem.

Thank you.

DR. KRESS: Mr. Chairman, if I may comment briefly. In response to your question about deactivation, I think that what NHTSA does currently with a case-by-case basis and the criteria which they use to evaluate and make these decisions are good. My familiarity with them. It is a decision that has to be made clearly on the current state-of-the-art technology and what's in cars. As we see the design evolve over time, those decisions will change and eventually—of course, ideally, we'll get to the point to where deactivation is not an issue. The design in there will be the optimal.

Generally, I tend to think that the current case-by-case philosophy is good, because I fear across the board privileges associated with deactivation will cause some unnecessary injuries and deaths. And perhaps temporarily the cut-off switches is not a bad alternative.

Thank you.

CHAIRMAN HALL: Any other comments? If not, we'll move to table 1.

MR. KLEIN: Terry Klein, National Highway Traffic Safety Administration. I have a couple of questions for Dr. Augenstein, but, obviously, anyone who would contribute would be welcome. The first, what actions, if any, need to be taken to more effectively detect typical air bag injuries in real world crashes, especially those that may be less obvious to the eye?

DR. AUGENSTEIN: One of the problems I think that we're beginning to see, which I would assume is the basis of your question, is that some people look so good after these crashes, that the police may be fooled into believing that there actually is no injury at all. In many crashes in the past, it was pretty obvious that the person was injured. They hit the steering wheel—you know, they looked pretty injured.

So, I think we—in our study and in data reported by others, there are—there is a small group of people who have sustained some injury, look pretty good, and I think what we have to do is develop criteria that may put you in the probability of injury group and air on the side of if there is a question, bring that group to the hospital for further evaluation. It's tough to make determinations about intra abdominal injury at the scene. And that's the major group that is difficult to detect at the scene.

In our study, we've seen about three patients who had minor liver injuries and/or spleen injuries, who were actually not brought to an emergency department initially and deteriorated outside of the hospital. And clearly, we have found that at least one of the indications of injury is close proximity to the air bag at deployment.

We have also noted that in the era before the air bag where people were protected often by the shoulder belt, but not the lap belt, in the automatic system, that there's significant incidence of liver injury in the driver positions.

So, I think we have to develop some criteria that increases our index of suspicion and err on the side of bringing people who may have a question to the hospital.

MR. KLEIN: Thanks. That leads into my next question. And the risk of injury from safety belt contact if there is no air bag? For example, are some of the elderly females or short statured persons who have been injured by deploying air bags, are they also vulnerable to belt induced injury in these type of crashes?

DR. AUGENSTEIN: Well, there's no question that even though the topic of discussion today is air bags, that, as Dr. Huelke pointed out, there's nothing in the car that is without injury potential. And the seat belt is one of the causes of injury. Now in many cases, it—because you interacted with the seat belt system rather than something else in the car, it probably reduced the total injury possibility, but in our opinion—at least looking at the Miami data, there are a number of situations where individuals ran into the seat belt and probably didn't even see the air bag.

And that as Dr. Mertz pointed out, if we could develop synergy between the belting and bag system, then clearly one could mitigate some of those forces. And in the elderly who have a fragile chest, the incidents of rib fractures and coming into contact with the seat belt is reasonably high. And the mortality associated with chest injury is much higher than in the young population.

So, I think we have to be very careful to develop systems that protect against the total spectrum of injury, not merely look at the air bag, but try to mitigate the entire injury spectrum.

DR. HUELKE: One of the things, Mr. Chairman, that hasn't been thought of or brought out at all, but we've been talking about small children, little women, et cetera. Right now about 12-1/2 percent of our population is 65 years or older. In the year 2020, that's going to be 18-1/2 percent.

So, for every two people you see tottering around with their gray hair down in Florida for the season, you'll see three of them coming up very soon. And we've got to start thinking if we want to protect—if we want to protect the elderly population. It might be another whole story that we haven't looked into. And from what I've seen on the surface, it appears that the air bag is maybe the primary restraint for the elderly passenger and not the lap shoulder belt. Because in many of the elderly females especially, they're bent, they're crooked. The older we get, the more stooped we get, and it's very, very difficult to get a lap shoulder belt to be properly worn by an elderly individual.

So, maybe it's going to be a bag that's going to be of significance for the elderly, if we really want to worry about the elderly.

MR. KLEIN: Thanks. For Dr. Huelke and Dr. Kress. I heard Dr. Huelke say, eye injuries were about 2 percent of the persons in your sample received eye injuries. In a full air bag fleet, we're probably going to have one to two million deployments a year. So that's in the neighborhood of 20 to 40,000 air bag induced eye injuries.

Are there—could you speculate perhaps on whether depowering might mitigate this or whether there are other counter measures that might mitigate this?

DR. HUELKE: I could guess all day long. And my forte is that I've been in the field. I've investigated these crashes. I have the master data, and that's what I can tell you. If we're depowering air bags, I don't know if they're going to do any good for anything, but I'll tell you in ten years or so when we finish investigating another 500 of them.

DR. KRESS: I specifically tried to answer that question by depowering in the laboratory and looking and measuring the forces that the orbital and the ocular region felt, plus looking at the injuries to the cadaver specimens. And I wasn't able to—at the depowered by 30 percent, I wasn't able to induce eye injuries, and I wasn't able to measure forces that were representative of the force levels that would cause damage to the globe structures.

And, again, the data that I've looked at clinically suggests that depowering would naturally reduce air bag induced injuries. But it's almost silly to say that, because an air bag induced injury is one that's related to a material slapping you in the face. And if you slap it less hard, it's not going to cause an injury as bad.

So, there's a tradeoff and there's an optimal level there to where as soon as you start depowering it too much, you get rid of eye injuries, but you're introducing a whole new field of injuries.

MR. KLEIN: We have one last question for Dr. Mertz or anyone else up there who would like to speak about it. Are there ways to measure the potential for these air bag induced injuries in crash tests? Are there any dummy changes that need or will have to be made to measure such injury mechanisms as neck or upper extremity injury?

DR. MERTZ: The neck injury, the dummy is—the Hybrid-3 family of dummies—that's the adult dummies, the child dummies, the CRABI dummies, they're all instrumented to measure the loads at the base of the skull. That information is correlated with strengthening information we had concerning the strength of the neck, ligaments, and things of that nature. So, I think we are in very good shape when it comes to making an assessment of whether or not these types of—disastrous types of child injuries that we see in the field will occur with systems we need to redesign to make sure it doesn't happen.

I think the test device is more than adequate to do that right now. It was more than adequate, as I said, back in 1982, in my opinion, and it's still more than adequate right now.

In terms of the—what was the other part of your question?

MR. KLEIN: The upper extremity.

DR. MERTZ: Yes. In terms of the arm injuries, we have another SAE, Society of Automotive Engineers task group chaired by now Sarah Kirkish of Ford Motor Company, that's looking at the interaction of the deploying driver air bag with the arm. The National Highway Traffic Safety Administration is very involved in that, as well. That group is moving right along.

They're going to have a meeting coming up here, I believe next week or so. Yeah, next week in which hopefully we'll start looking at an actual test procedure in a test device.

Now, my feeling on that is a little bit different. I think we manage the deployment of the driver air bag system such that we don't get these disastrous injuries to the chest and neck. I think automatically we'll also do a very good job in terms of what's going to happen to the arm. And I fully expect to see those injuries go down quite a bit in frequency, because they are the type of injury that's keeping the driver system from having an excellent performance.

MR. KLEIN: Thank you.

CHAIRMAN HALL: Okay. Well, we will try to move quickly. We're well past our closing hour of 5:00, but we will close up here—see if we have any questions. I believe Mr. Rayburn had a question.

MR. RAYBURN: Yes, this question is for Mr. Mertz. Going back to the problem with out-of-position children, unrestrained children, and the depowered air bags, if you use the current injury assessment reference values, if you apply those to an unrestrained child, will the depowered bags still cause serious and fatal injuries to the out-of-position children?

DR. MERTZ: Well, the injury assessment reference values are guidelines that we like to keep. Originally, we had thought to set those at some—at something like, say, a 5 percent risk of significant injury or below and that was the guideline.

We are now coming up with, as I indicated, coming up with an injury risk curves. So, now we have a continuum in terms of given the measurements, we know what the—we'll have an estimate of what the risk would be. So, it's not a true statement that if we see the injury assessment reference value that everybody dies. That's not true at all.

If they are set at 5 percent, then the expectation that at least 95 will survive, if they're set at the level of fatality. Right now, they're not set at the level of fatality. They're set at the level of—we call it serious injury. We have a word for that, but it probably doesn't mean too much. But it's a serious injury where we observe some disruption in the neck area, but certainly not fatality. So, we'll be able to use those curves and make an assessment.

Now, I think it is, as Dr. Huelke indicated, we're not going to get rid of injury. If you're in front of the air bag or near it when it deploys, we're adding energy to it. And the time frame of a vehicle collision is so small, that it's hard to get the bag out without producing some sort of interaction. There will be forces placed on the child.

The best thing to do is wear the belt and don't be in the place—or the other technology that these folks here are working on is that if you're close to the instrument panel, you have a sensor that can sense whether or not you're close to the instrument panel, don't fire the bag. There's absolutely no benefit to be derived if you're close to the bag and you haven't fired it, to fire it. Just take what the action gets.

MR. RAYBURN: So your answer would be for the next couple of years before the smart air bag designs get out, that children still need to be in the back seat even with depowered bags?

DR. MERTZ: Well, I would say children always need to be in the back seat. Even with depowered bags, that's always a good place to have them. That's a safer place to put them. If you have them belted, seat full rear. Older children can certainly be put in the front seat. Just keep them away from the—make sure they stay in their restraint system. And as we get this smart technology coming on board, we'll do a better job, but it's going to take us a little while.

Now, what we call depowering is something that we can do with existing—the vehicles we're producing. They're not our new vehicle designs. Our new vehicle designs, okay, will have the opportunity of integrating some of the more advanced features in some systematic way, but what we want to do is to depower the cars we're producing out the door today.

They're not going to be redesigned. Clearly, they're not going to be redesigned, and clearly, the chore is to depower them as fast as possible. Okay. And so don't expect miracles on the first ones, but expect—and you should expect—some better technologies as say in the year 2000, 2001, those cars ought to show a substantial change in the technology than today's cars. And there's a lot of people working hard on it.

MR. RAYBURN: Thank you.

CHAIRMAN HALL: Dr. Ellingstad?

DR. ELLINGSTAD: Yes. Just one quick question for Dr. Mertz. Is it your opinion that we have the tools available right now to set performance standards or to begin to evaluate performance standards for the fifth percentile woman?

DR. MERTZ: I set the performance standards in 1982. So, obviously, I believed it then and I still believe it now. There may be a debate exactly what level to put it at, but we ought to have that debate. And as far as I'm concerned, the more conservative the better, but we've got to take into account the variability of the test.

MR. ELLINGSTAD: Thank you.

CHAIRMAN HALL: Now, given the fact that we have about 40 million of these vehicles that will be on the highways by the time we get through this model year, before we get to the depowered air bag, I would like to ask, I guess, any of the members of the panel, would you recommend if someone came and asked you, disconnection of the air bag for any individual or a group? We'll start with Dr. Mertz and take it down the road there.

DR. MERTZ: The problem, obviously, with disconnection is keeping track of who disconnects in terms of the next owner of the vehicle.

CHAIRMAN HALL: Well, what about an on/off switch?

DR. MERTZ: The on/off switch is certainly more of a viable alternative to that. And that now gives the person the freedom of choice. Now, I do know a lot of folks say that people can't make the right choice. I don't believe that. I believe that they—that it's their responsibility to make the right choice, and they ought to take on that responsibility. They bought the car and they ought to take on the responsibility.

They take on the responsibility of driving it, why can't they take on the responsibility of knowing when to put the air bag on or off.

CHAIRMAN HALL: Mr. Augenstein?

DR. AUGENSTEIN: I would prefer to see a continuation of what NHTSA is doing right now, which is an evaluation on a case-by-case basis.

DR. HUELKE: I basically see no reason for it, except in the pickup trucks where if you have the child and there's no other place to put it, to deactivate the bag on that side. I do not like the idea of permanent deactivation via the switch. I think that every time the ignition is turned off, that the bag should go back into an activation stage.

And the reason for it and I just have one data point, we had a crash not too long ago, right side impact, unrestrained driver who flew across the car, hit his head on the right pillar interior and died about five days later. If the passenger bag had been there and had inflated, he wouldn't have been able to get to the pillar. And so I don't think that the passenger bag is only for the protection of the front right occupant. It can be in the right side collision and protection for the driver, as well.

CHAIRMAN HALL: But you don't feel, sir, that with pregnant women, small statured females, elderly, that there's any need for a group to have disconnection or on a case-by-case basis or—

DR. HUELKE: Well, there's a study at the University of Michigan going on right now in the Department of Obstetrics and Gynecology and at the Transportation Research Institute looking for pregnant women who have a serious problem, post crash with the developing fetus or an abortion, spontaneous abortion. We can't find these cases. I mean, every doctor practically in the state of Michigan who lays hands on a pregnant woman is alerted to, "Please send us your information." The OB fellow is talking to his colleagues all over the state. We can't find them. There are very, very few and far between.

CHAIRMAN HALL: Dr. Kress?

DR. KRESS: Well, I've spoke to that some earlier. I've received—our institute and me specifically have received numerous phone calls from various people all over the country asking that very question and talking about these issues.

And I got a very passionate letter from a gentleman last week, and he was quite upset with the fact that NHTSA would not allow him to deactivate his air bag. And I returned—because he is afraid of the air bag and the reports that he's heard about a 200 mile per hour device. He made an analogous to a shotgun in front of him as he's driving. But I returned his letter and a statement that I wrote, and I've got it right here. I said, "Air bag systems were designed and are used to replace an injurious situation with a new improved less injurious situation." That's what obviously it needs to be recognized. And as soon as you allow or begin to deactivate this, the air bag is definitely ineffective at doing what it was designed to do and that is to save lives.

There are clearly, with the current state of the art, situations where you, as Dr. Mertz referred to earlier, you don't want your head and neck complex to be within the vicinity of the module while it's deploying. And certain accident situations would be desirable just to have the shoulder lap belt as opposed to the air bag, and that's why we've seen NHTSA approve a 1,000 of these 4,000 requests, be it for medical purposes having to have the child in the front, et cetera.

So, I do believe that there's a need to deactivate in certain instances. Along with that approval, though, needs to come serious education, because the next driver, the person that's—not even the next owner, just the other person who happens to be sitting in there as opposed to the person that it was so-called deactivated for.

So, with the current state of the art, I like the system with the NHTSA case-by-case approval.

DR. HUELKE: I think along that same line, that if the United States press would get on the bandwagon of talking how effective they are, using a case-by-case basis on effectiveness of these systems in a crash as they have reported on the case by case deleterious effect, if you will, of them, I think we would be much better off and in a different situation than we are today.

CHAIRMAN HALL: Well, in fairness to the media, since they don't have anyone here to represent them, I think they did pretty accurately represent the numbers that were presented years ago about 10,000 lives being saved annually and the over projections that were made at the time in regard to air bags.

So, usually, the media reflects that which occurs. And, unfortunately, sometimes it's not everything—I don't—I just got through this thing with TWA-800 and Pierre Salinger, and sometimes it's—you know, we all have an opinion of what ought to be reported and what shouldn't be reported, but my main interest is as closely as possible, we give people the facts. And that's why I really appreciate what you gentlemen have done today. But I wanted to have Dr. Price have an opportunity here.

DR. PRICE: I have my own quick personal response would be that a switch would make sense, a deactivation switch would make sense. Some feel very strongly about it. I don't happen to personally feel that way, but I can see that it's—having the option is a good idea. I would still hold out to hope that I think in the end, good design will eliminate the need.

CHAIRMAN HALL: Well, I think Dr. Huelke's made some good points initially on this, you know, that—do no harm. I don't know. Is it possible to do no harm. And then once we get into the tradeoffs, it's very, very interesting. I do know that I think that probably—and I have had one or two personal experiences and that's where everybody speaks of with air bags.

Someone in my office had had an eye injury with an air bag and I know that was not reported in the statistics. If you go to the state of Tennessee, that was not reported at the time. And I think we—as we do have this technology, that we're going to have to look in terms of how we better—I keep looking at this number of million deployments and the numbers that you're looking at, in trying to be sure that we are getting ahead the best we can of the curve in some of these areas.

Does anyone have closing comments on the panel? You all have been very patient and everyone has told us a great deal, and we've got a lot to digest out of your testimony. Does anyone have anything they would like to close with?

DR. AUGENSTEIN: I would just like to say that there's been a recurring theme about our need to have more data. And I would just encourage as one of the outcomes of this to put pressure on funding sources, so that we have a better picture of this issue. We really don't know all the successes we're having. And there is a potential—the work I've done is built on the work Dr. Huelke did, to develop a program that's based in hospitals and have detailed data, and that whole spectrum from general statistical data down to detailed injury data is very possible and would help us come to answers in what is going to be an evolving technology.

CHAIRMAN HALL: Anyone else? Dr. Mertz?

DR. MERTZ: Yes. I would just like to reiterate my position that the performance requirements need to be included in the safety standards that would limit the inflation and reduce injury potential of the driver and passenger system. And such performance requirements are needed to be sure that an appropriate balance is maintained between the air bags, occupant restraint potential, and its injury inducing potential.

I think one other point that needs to be made here, in terms of keeping track of the performance of air bag systems—we haven't gotten into that—but the fatal accident reporting system, I think the detail in that system needs to be greatly improved if you're going to use that to make an assessment as to what's occurring and what fatalities are occurring in terms of any statistical basis. And clearly that—you know, I would put a lot of money into that, just to keep track of what's going on there. It would be very useful.

CHAIRMAN HALL: Well, one of the nice things about heading the National Transportation Safety Board is I have no money to give away to anyone, to fund to any of this research.

(General laughter.)

CHAIRMAN HALL: But I have no problem with Dr. Augenstein or any of you all making appeals to NHTSA or anyone else to fund what's important activity. I would say that I think the American people go through their tax dollars and through the sticker price they pay on vehicles, funds a lot of this research in terms of the safety. And the important thing is to be sure that it's coordinated, that it's factual, and that to the extent that we can get—we can't always get ahead of the problems, but if we end up with problems, try to recognize them and deal with them as quickly as we can.

And I am—whether we have ear problems out of these air bags or not, these are areas that the data should drive us. We should be able to, if we can develop it. Yes, sir?

DR. MERTZ: Yes, there was a statement made this morning in terms of from NHTSA in terms of $3 million for additional research in dummy development and testing and I'm sure they're looking at probably doing some animal testing, clearly, that's not required. Additional animal testing is not required. I'd take that 3 million bucks and I would put it into the accident data to go after and see what's happening in terms of the real field accidents out there.

The other thing is our NAS data is so slow in terms of getting response. I mean, we're two years behind the fact. There's really no benefit in it. That needs to be on line, so people can see what's going on, immediate feed back, put it on the web, on the web page, so we can see what's happening to these systems we're designing, so we can take action quicker.

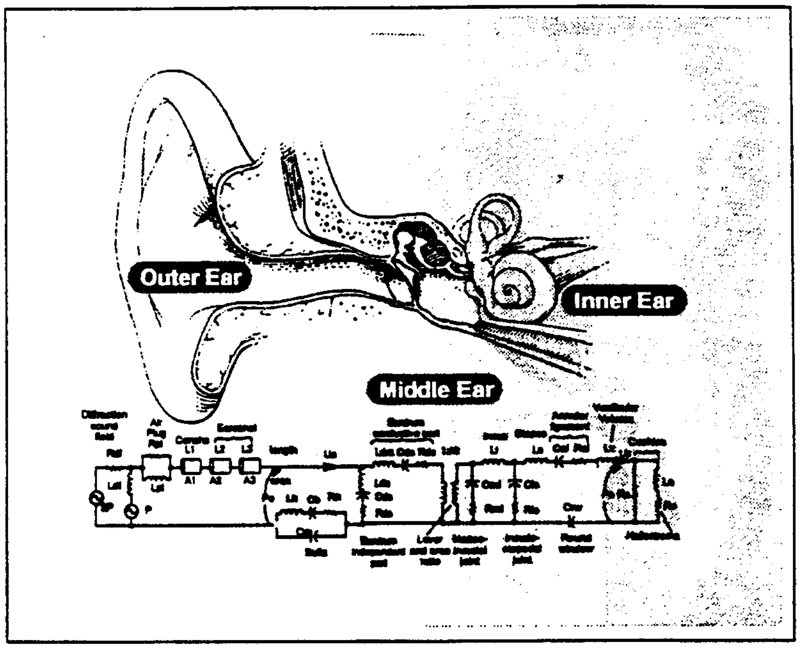
CHAIRMAN HALL: Well, let me thank the panel very much, as well as the party participants. This has been a very long day filled with a great deal of information for all of us to digest. Tomorrow morning, our first panel will be on the subject is a one size fits all approach appropriate for today or tomorrow's passenger vehicle population? We will begin at 8:30 in the morning, and we will attempt to finish closer to 5:00 than we did on day one, but I do appreciate everyone's hanging in there with us. We will now recess this meeting until tomorrow morning.

(Whereupon, at 5:50 p.m., the hearing was recessed. To be reconvened on Tuesday, March 18, 1997, at 8:30 am.)

Army
Research
Laboratory

Human Research and Engineering Directorate

MATHEMATICAL MODEL OF THE HUMAN AUDITORY SYSTEM



Modern high-performance weapons produce impulses so intense that they pose a serious hazard to the firer's ear and thereby limit weapons design and use. This problem is not limited to military weapons impulses alone, but extends to sport and police shooting, industrial processes, construction, automobile air bag deployment, and even children's play activities. Amelioration of the impulse noise problem has depended on the development of a scientific understanding of the ear's response to intense sounds. The Human Research and Engineering Directorate (HRED) has created a mathematical model of the ear which mimics its function at high intensities and provides physical insight into the processes operating at the level of the inner ear, which is where the damage occurs. Through a series of coupled nonlinear differential equations the model generates 'movies' of the wave action within the cochlea as a function of any impulse in air. These waves serve as the basis for calculation of the hazard. Because of its 'design from first principles,' the model predicts hearing loss from a wide range of impulse types that cannot be handled by other means. Furthermore, by providing engineering insight into the loss mechanisms, it suggests improved designs that move toward the elimination of the problem in both military and civilian settings.

ARL TECHNICAL POC:

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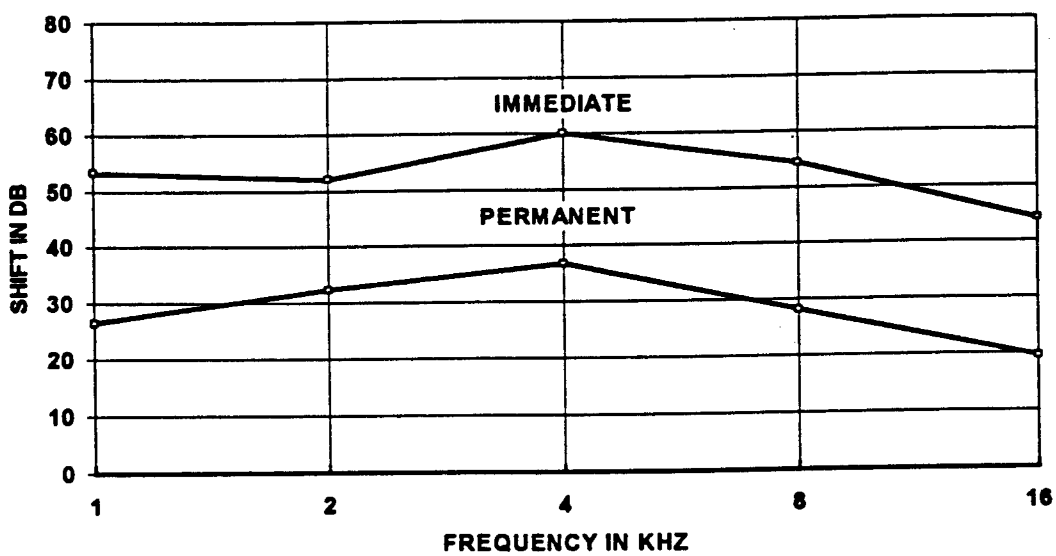
Slide 1. Diagram of the human ear and mathematical model.
(From Dr. Price's presentation, March 17, 1997.)

Auditory hazard from airbag deployments

G. Richard Price, Ph.D.
US Army Research Laboratory, Aberdeen Proving Ground, MD 21005

Airbag deployment is a highly energetic event with sizable acoustic components, which raises the possibility of damage to the ear. Unfortunately, almost no tests of auditory hazard have been done with real ears. Furthermore, recent studies have questioned the adequacy of current noise standards for impulses like those from airbags. Data from such exposures are also needed for development of theory and validation of our hearing loss model. Therefore 32 anesthetized cats, positioned at the driver and passenger locations in a pickup truck, were exposed in pairs to one air bag deployment (electrically initiated). Hearing was tested at 1,2,4,8, and 16 kHz by evoked-response audiometry just before exposure, immediately after and at 1 month and 6 months. Exposure conditions included doors open, compartment closed and closed compartment sealed with tape; 7 exposures to passenger bag only and 9 to driver and passenger bags. Peak pressures ranged from 167 to 173 dB. The mean shifts in Fig. 1 can be interpreted to indicate that susceptible human ears risk permanent hearing loss from airbag noise.

THRESHOLD SHIFT - ALL EARS



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Price, G. R., Rouhana, S. W., and Kalb, J. T. (1996). "Hearing hazard from the noise of air bag deployment", J. Acoust. soc. Am., 99, 2464.

Slide 2. Hearing loss in cats from air bag deployment.
(From Dr. Price's presentation, March 17, 1997.)

Tuesday, March 18, 1997

(Time Noted: 8:34 a.m.)

Panel 1

Is a "One-Size-Fits-All" Approach Appropriate for Today's/Tomorrow's Passenger Vehicle Population?

CHAIRMAN JIM HALL: On the record. We will begin the hearing this morning, and day two of the National Transportation Safety Board's public forum on air bags and child passenger safety. Mr. Joe Osterman, who is our Hearing Officer, has deferred the opportunity of presenting this panel to Elaine Weinstein. Elaine, if you would present the panel and begin today's session, I would appreciate it.

MS. WEINSTEIN: Thank you, Chairman Hall. Good morning. This is a panel on one size fits all. We talked a little bit about that yesterday and we want to explore it in more detail today: what are the implications for designing air bags for one size occupant.

Before we get started with the questions, I'd like to ask each member of the panel to give his name and affiliation for the record. We'll start with Mr. Dalmotas.

MR. DALMOTAS: Dainius Dalmotas, Road Safety and Motor Vehicle Regulation Director at Transport Canada.

MR. LANGE: Bob Lange, Engineering Director, Vehicle Development, General Motors Corporation.

DR. LUND: Adrian Lund, Insurance Institute for Highway Safety.

MR. PARKER: George Parker, Vice President, Engineering Affairs, Association of International Automobile Manufacturers.

MS. WEINSTEIN: Thank you. Mr. Lange, I'd like to start with you. The perception, for a lot of people, is that when they buy a car with an air bag, it's the same from one GM car to another and from one manufacturer to another. In fact, there are some differences. Could you describe some of the differences to us?

MR. LANGE: Yes, there are significant differences and it's a misconception to think that, with respect to air bag design, there's a great deal of uniformity across the entire fleet. In fact, in General Motors Corporation, there are great variations in air bag design dictated by the unique circumstances of the particular vehicle to which the design is to be applied.

The differences are associated with uniqueness in vehicle characteristics, that is the geometry, the packaging of the interior components, the front end structure differences from vehicle to vehicle, and the packaging of the engine compartment of the vehicle. All of those differences dictate that, to yield a specific kind of performance in the 208 testing requirements, the air bag designs be tailored to satisfy all of those unique geometry and performance characteristics of the vehicle.

There are also interactions that are crucial between the air bag, itself, and the occupant restraint system, so that we can tune the performance of the restrains to some extent within the confines of the rule.

So, all of those variations in terms of bag geometry, bag venting characteristics, inflator output, on-set characteristics for the inflation pressure curve, sensing characteristics, whether there are tethers or not, where the modules are located, how they are configured, whether they're top-mount or mounted elsewhere, are all design variables that affect air bag installation in individual vehicles within a manufacturer's product line and between manufacturers.

MS. WEINSTEIN: And how do these variations in design affect performance, particularly for your large-size occupants or your small-statured occupants?

MR. LANGE: There's—there's no simple answer to that question. As we heard yesterday afternoon, in the description that Dr. Mertz gave of the family of hybrid 3 crash test dummies, each of those dummies are used, to some extent, in air bag development, and what manufacturers must do is satisfy the requirements of the Federal Motor Vehicle Safety Standard or Canadian Motor Vehicle Safety Standard 208, or any other standard that applies to the market in which that vehicle will be sold.

And also then investigate the effects of the tuned restraint system, both air bag alone and air bag plus belts, on other size occupants, using the 5th percentile dummy, using the 95th percentile male dummy, and using the child dummy. So those tests are run today to investigate air bag effects on restrained and unrestrained dummies.

MS. WEINSTEIN: Can you give us a little more detail on the types of tests that are done with the 5th percentile female, the 95th percentile male dummy and child-size dummies?

MR. LANGE: Yes, I can. It varies from program to program, depending on how much knowledge we think we can transfer from prior work that might have been done with a particular model line.

And to the extent that information is transferable or applicable, sometimes judgments are made about the likely performance characteristics of one of the family of dummies in a particular vehicle environment.

Most of this kind of development work is done in a sled test environment instead of in a full-scale vehicle crash, simply because so much more work can be done so much more quickly. And for the purposes of investigating dummy interaction with restraint systems, the sled test is a perfect vehicle by which to do that, both in terms of efficacy of time utilization and in terms of the ability to turn around data very, very quickly.

So sled tests would be done, simulating both severe crashes, 30 mile per hour crashes, and less severe crashes with 5th percentile female dummies and with 95th percentile male dummies, with child dummies and with child dummies in restraint seats.

MS. WEINSTEIN: Mr. Dalmotas, Transport Canada has done some crash testing with 5th percentile female dummies. Can you summarize the results of those tests?

MR. DALMOTAS: Yes. For, I guess, the past two years, Transport Canada has placed a very high priority on 5th percentile female testing. Unlike the program, I guess, that was just related, we—because we are a regulatory agency, we've been looking at system performance, so we tend to evaluate the air bag, seat belt system.

As you're aware, in Canada, we are largely a belted population so we are primarily interested in seeing how the entire occupant restraint package works. Accordingly, we do almost all of our testing with full-scale vehicle crash tests. And our current program basically looks at what we would call high speed, hard crashes, typical of barrier, and what we would call low speed, soft crashes. And those two collision severeties, we're looking at the performance both with 5th percentile females and with the 50th percentile.

And the reason for this is fairly simple, I mean basically you have, essentially, two types of air bag interactions. You have the dummy going into the bag once it's fully deployed or, alternatively, you have the bag striking the person, but that obviously relates to the proximity of the dummy at the time of the collision.

So what we've been trying to do is see how much this proximity issue affects the performance of air bags to short-statured individuals, as represented by the 5th percentile female.

Certainly, in the case of the 5th percentile female test, we've seen much wider variation of dummy responses than we would, say, in the typical 50th percentile male test. Separation of the dummy to the air bag module is such that in virtually all crashes with 50th percentile male, the dummy basically engages the air bag after full inflation or very close to—near time of full inflation. In the case of the 5th percentile females, that is not necessarily the case and we frequently see high neck loads when either bag deploys late in the event, as is possible in the case of a soft pulse or even in a hard crash, just because of their close proximity. But it is very, very variable in terms of what loads you're going to see.

For this very reason, I think we are looking at setting up regulations which encompass a 5th percentile female in 208 in Canada.

CHAIRMAN HALL: Has Canada been using 208 or what's your standard?

MR. DALMOTAS: We have a 208. It is not the U.S. 208. I have to backtrack. First of all, we have not mandated air bags in Canada, nor have we mandated occupant restraint systems—automatic restraining protection in Canada. The policy has been to emphasize the proper use and promotion of three-point seat belts and so all of our standards have tried to be performance standards based around that theme.

Certainly we have encouraged the fitment of air bag systems or other advanced technology in Canada, but, no, we do not have, at the moment, the dynamic performance test that the U.S. does, largely because of our objection to the unbelted test.

We have posed regulatory limits, which we're going to phase in shortly, which address high speed protection, vis-a-vis, a 48 kilometer crash test with—with belted 50th percentile male dummies, and we're looking at the possibility of supplementing those requirements with a 5th percentile female test, possibly in a low speed crash line.

CHAIRMAN HALL: Do you all certify dummies, like we do in this country?

MR. DALMOTAS: We use the same, basically, families of dummies that NHTSA uses in its regulation. We rely on NHTSA to sort of develop dummies to the point that they can be used in certification-type testing.

CHAIRMAN HALL: Okay.

MS. WEINSTEIN: Mr. Dalmotas, one last question. Are there any design changes that you would like to see in air bags, based on your research and your crash experience in Canada?

MR. DALMOTAS: Oh, boy, now there's a simple question. I think we—we've already taken or are in the process, I guess, of taking the first step. We would certainly like to see bags less aggressive, again, because we have a belted population and we think they would benefit from less aggressive air bags. With less aggressive air bags, I think we will have also the opportunity to fine tune air bag thresholds a lot better than we have now.

We would certainly like to see the threshold levels for air bag deployments raised, but I think we have to do that in an orderly manner and safely.

MS. WEINSTEIN: Well, you'll have an opportunity to talk about thresholds a little more this afternoon.

MR. DALMOTAS: Okay.

CHAIRMAN HALL: Could I ask one more question, do you know how many vehicles there are on your roads in Canada with air bags with existing technology?

MR. DALMOTAS: Oh, I probably should. I don't have the statistic in front of me. Fitment practices in Canada have virtually been identical to those in the United States, both driver and passenger side bags. Right now, I think we're running about 30% of our vehicle fleet has got at least driver side air bags. So, basically, you could take the number of the United States and divide it by 10, and come up with a pretty good approximation.

CHAIRMAN HALL: Do you have any Canadian citizens, that have wanted to have the bag disconnected

MR. DALMOTAS: Yes.

CHAIRMAN HALL: And what procedures—what do you all do in Canada, in that situation?

MR. DALMOTAS: Well, the whole deactivation issue does not fall under federal responsibility. The federal government basically mandates safety standards at point-of-sale. The operation of vehicles is handled by provincial authority, and ultimately—right now, there are actually no, quote, unquote, legal, I guess, impediments to the whole deactivation issue in the sense it's not mandated the provinces would not preclude deactivation. The process by which a consumer could do it, though, is up in the air, since there is no person who will actually deactivate an air bag.

CHAIRMAN HALL: I guess, is it being done or is it not being done?

MR. DALMOTAS: You mean in a sanctioned manner or by individuals?

CHAIRMAN HALL: Anywhere. Legally, illegally, is anybody going into the GM dealer and getting their air bag—

MR. DALMOTAS: Not to the best of my knowledge.

CHAIRMAN HALL: Okay.

MS. WEINSTEIN: Mr. Parker, what are the implications for the auto manufacturers of designing air bags for extreme size occupants, in terms of testing, cost, performance?

MR. PARKER: Well, in terms of testing, there's not a lot of implications because most manufacturers already test with a range of dummies, including 5th and 95th percentile dummies, and also child dummies.

There could be an issue of additional cost because if it would be in a regulation, for example, manufacturers would need an additional margin of compliance to make sure every vehicle they produce would comply with whatever requirements were placed on them.

Manufacturers do a lot of testing beyond what's required by the standard. I think Mr. Lange covered some of that. Just to add a few other things, of course, child dummies, non-regulated injury criteria, all manufacturers have their own internal injury criteria that they apply.

System development and optimization, sensor and deployment algorithms that relate to the sensors, optimization of the safety belt and the air bag, when you bolster the steering column, etc., is probably the most important work that manufacturers do. And that's done vehicle tests, sled tests, simulation.

I guess the one thing that's probably important to keep in mind, whatever testing is added to the standard, you can't guarantee absolutely the same level of protection for all occupants in all positions, because there's just too much variability and there's not a technology that would allow for tailoring of, for example, the air bag for all possible occupant sizes, different levels of injury tolerance, and also position.

MS. WEINSTEIN: Are people more likely to be out of position on the passenger side than the driver side?

MR. PARKER: Well, I don't know if there is any statistic that I could cite to say that. I think, intuitively, you would say that if you're in the driver position, for example, on braking, you could brace yourself and I think that happens. On the passenger side, you have two issues, I guess, braking below the threshold when the belts lock up, if you're a restrained occupant, you could be out of position, and, also, if you're unrestrained, you could be out of position. But there are situations for drivers where reaching for controls, for example, the possibility of being out of position.

So, I guess in terms of the crash experience, especially with children, you would have to say it's more likely on the passenger side.

MS. WEINSTEIN: We've got testing for different size occupants. How about elderly occupants. Is there any testing that simulates frail bodies and what the effects of those seat belt design and air bag design are for those populations?

MR. PARKER: When the biomechanics testing is done to establish injury criteria, of course, those are usually older cadavers that are part of those tests. So, in some respect, that's reflected in the injury criteria that's in the standards. But, also, manufacturers have lower targets for performance, in other words, greater protection for occupants.

But I would doubt that any manufacturer would have a specifically elderly injury criterion that they would apply.

MS. WEINSTEIN: Mr. Dalmotas, the—the crash tests that Canada did with the 5th percentile female, was the seat track full forward in those tests?

MR. DALMOTAS: That's correct, the seat track was full forward and the seats were slightly more vertical than would be for a 50th percentile male test. I believe the angles sort of range between 17 degrees and about 21 degrees, as opposed to about 25 degrees. And I believe the steering column was essentially in the lowest type position.

What we're basically trying to simulate is a short-statured person, who typically likes to drive trying to look up over the steering wheels.

MS. WEINSTEIN: Thank you. Dr. Lund, on the difference between the driver's side air bag and the passenger side air bag, there is a lot more room between the occupant and the dashboard on the passenger side. Is there as much need for a passenger side air bag as a driver's side air bag?

DR. LUND: I think that probably the best answer to that comes from looking at the evidence data that we have so far. What we see in terms of the experience with passenger side air bags and driver's side air bags is that there is between a 10 and 15 percent reduction in the likelihood of fatal injury in crashes. That suggests that passengers are receiving important benefits from air bags, as well as the drivers.

CHAIRMAN HALL: Was that with restrained or unrestrained people, that 10 to 15 percent?

DR. LUND: We're seeing benefits for both, and they're not very different. That's one of the surprising things about air bags. When we first are implementing air bags in the fleet, we certainly expected to see a much larger benefit for unbelted occupants than for belted. What we're actually seeing, both for drivers and passengers is a slightly increased effectiveness for unbelted, but not as large an increase in effectiveness.

CHAIRMAN HALL: I wonder why?

DR. LUND: We think that one of the problems, if you look at real world crash data, is this problem of the position of the occupant when the air bag actually deploys.

People who are well-positioned and back in the seat, are probably getting exactly the benefits that were predicted when the standard was first put forth. However, people who are out of position, perhaps because they drive very close to the steering wheel, they're in a crash that has what we call a slow pulse, that is it's takes a while before the air bag decides to deploy, they get too close to the air bag, and we actually see, even in moderately severe to severe crashes, not just the low speed ones that we've been talking about so far, but we see in moderately severe and severe crashes, cases where the air bag has caused the fatal injury rather than prevented.

CHAIRMAN HALL: Well, now could a pretensioner prevent that? What I'm kind of wondering about is I hear this—this morning about this fine tuning and all this testing that goes on between the belted occupant in the car and the air bag, and all this fine tuning, and I'm trying to understand where that gets lost.

DR. LUND: I think that unless the pretensioner is one that activates on a much lower crash pulse than the air bag, it isn't going to have as enough of an effect to prevent the—the problems that we're seeing.

CHAIRMAN HALL: Okay. This is very interesting.

MS. WEINSTEIN: I have no more questions right now, but Dr. Garber has one he'd like to ask.

DR. GARBER: Mr. Dalmotas, just briefly, how do your findings of increased neck loads in the restrained 5th percentile female dummies translate into actual injury risk for the 5th percentile women drivers of those vehicles?

MR. DALMOTAS: Well, I guess that's the $10 million question. We're trying to resolve precisely what our crash data mean. I guess, the trick in this business is always trying to reconcile what you observe in a crash test with dummies with what you observe in the field with real people. Certainly, the incidence of neck injury in the field, short female drivers, belted or unbelted, is nowhere as near what certainly crash test data would necessarily say.

The incidence of neck injury is actually very, very remote in the air bag fleet. However, we know that from our special studies, from those conducted by NHTSA, the results from other research centers, etc., that if we come across someone who has a fatal head or a neck injury, those rare cases predominantly are females, predominantly short. So, what we're wrestling with is trying to reconcile what-is a safe distance at, and what unique set of situations caused that injury.

Certainly, from the Canadian cases, we can speculate that, normally, if a person is even in the full front position, alert, is bracing, etc., that we do not seem to have a problem. The problem seems to be when people are, for example, fall asleep, have a medical condition, or, in similar to more recent cases, if they lose control, and under situations where they may actually move forward rather than back when the air bag deploys.

So, I think, basically, what we have is a problem of excessive proximity which is, again, related to the fact that we have not enough of a safety buffer, I guess, and that's exactly what we'd like to see, a much greater safety buffer for out-of-position people. And, again, I think, certainly, the—the first step in this will be the depowering of air bags, which will have significant benefit for those out-of-position type situations.

Now the question from a regulatory standpoint is how do you establish that buffer, particularly if it's related to something like bracing. I don't know if you've ever seen a crash test dummy, but he'll go into the world's softest pulse, the vehicle may be pulling 6, 7 g's, and, of course, his head is just going slowly forward which, obviously, would not mimic what a real human does. On the other hand, maybe that is the means by which we provide that safety buffer, we may simply have to say that under no circumstances, or how slow the pulse is, etc., if you're going to deploy the air bag, you have to make sure that you do not fatally injure the person.

MS. WEINSTEIN: I have no more questions.

CHAIRMAN HALL: Any other questions? Well, let me ask one before we go to the tables. How do you get 90% seat belt use in Canada?

MR. DALMOTAS: We're at 93, actually.

CHAIRMAN HALL: Ninety-three? We would appreciate the magic potion here on what we can do.

MR. DALMOTAS: It's like air bags. There's no silver bullet. We have, obviously, legislation in all 12 jurisdictions. It is primary legislation.

CHAIRMAN HALL: It's at the state level, or your province level?

MR. DALMOTAS: Province level, but it is primary. That's not an expression in Canada we use, but a policeman can stop you and give you a ticket for not wearing a seat belt. It is enforced in Canada. The fines are not necessarily small. Demerit points can be involved. In other words, it's not a good idea not to wear a seat belt. Plus, we've been at it—we didn't get 93% overnight. The first province to pass legislation in Canada was in 1976, so it's taken considerable effort, education, enforcement, but obviously it is an achievable goal.

We're still not happy with 93. We don't think we're going to get much beyond 95, but—but our target officially is to get 95% seat belt use across all seating positions, across all people, by the year 2001.

CHAIRMAN HALL: Have you had any accidents where the investigators have determined that a child was killed by the air bag rather than the accident?

MR. DALMOTAS: Yes, one.

CHAIRMAN HALL: One?

MR. DALMOTAS: We have only had one child fatality in Canada, thank God, to date.

CHAIRMAN HALL: Now what do you all do about telling people—are you all part of this big campaign to put kids in the back seat.

MR. DALMOTAS: Yes, I think just about everybody is in the big campaign to put children in the back seat right now.

CHAIRMAN HALL: Right. What type of response are you getting in Canada? How are you making that happen, other than jaw-boning everybody?

MR. DALMOTAS: Through as much public education, media exposure that we can generate, you know, we're working on pamphlets, whatever we can do, videos, working with safety groups, the automobile industry, of course. I think everybody is committed to trying to pass that message. How successful we are, we honestly don't know. Like I said, we know that only one has been killed. I believe there's been 36, I guess, in the United States, so we—okay, 40. So, obviously, our ratio is lower relative to anything that we would expect.

CHAIRMAN HALL: Now have you all looked at this Holden Bag that we're supposed to hear about later this week, that's used in Australia with a belted test?

MR. DALMOTAS: We're certainly aware of the bag. I mean we have not—the car's not here, we have not evaluated, personally, in our own test matrix, as you say, but it certainly seems to embody all of the performance features that we believe would be desirable in Canada, i.e. soft bag and high pressure.

CHAIRMAN HALL: Okay. Well, let's give the tables a shot here. And we'll go first, to the National Highway Traffic Safety Administration, Table One. Does Table One have any questions for this panel?

MR. BISCHOFF: Thank you, Mr. Chairman. Yes, I'd like to ask Mr. Lange a question. AAMA recently made a proposal to NHTSA to cooperate on advanced air bag development through the Motor Vehicle Safety Research Advisory Council. I wonder what GM's commitment was to that proposal and if he can describe briefly how he envisioned that effort would move forward?

MR. LANGE: Yes, thank you, Mr. Bischoff. GM, like I think the other member companies of AAMA is deeply committed, both intellectually and financially, to doing research on advanced air bag technology. We have been in the business of doing that for literally decades.

I think given the current status of the public policy debate concerning air bags, we believe that the way we ought to be proceeding now is to work very hard to complete the matrix that Mrs. Petrauskas spoke about yesterday afternoon, that is to try and identify those cells that represent an intersection between a certain kind of accident and a certain kind of occupant, both in terms of occupant size and occupant position, that are troubling us today; focus on the identification of remedies for those particular cells that are troubling; and determine what interactions there may be between those remedies and surrounding cells, so that we don't create new problems by trying to fix existing known problems.

I think we have a great opportunity here to leverage one another's resources, that is the resources that the NHTSA and the JPL can bring to a program like this, and our resources, the resources within the American Automobile Manufacturer's Association and the resources within the supplier community, to really very, very quickly deal with those issues and devise the best solutions that are likely to be practicable within the next one to two, to three, to five-year time frame.

Our interest is in getting through this very, very quickly and establishing a time table for rulemaking that would be consistent with your public desires in terms of the policy side of the equation, and also consistent with the likely availability of technologies that manufacturers will have in their tool box to roll out over time.

MR. BISCHOFF: Question for Mr. Parker, NHTSA published its final rule last week, allowing depowering of air bags. I was wondering what your member companies had in the way of plans for depowering and if you could talk briefly about how that might permit them to optimize air bag performance for a wider range of occupants?

MR. PARKER: I don't have all the details of what our members have in mind with regard to depowering, but I think, essentially, all of them plan to depower most of their models. I think there's some platforms that probably have gone pretty close to optimizing air bag performance levels because of uniqueness of the particular platform within the current regulation. But beyond that, I would say the majority do plan to depower most of their platforms.

I guess, one concern is the sunset data. I realize it's four years in the future, but there may be some platforms that are scheduled for phase out, and it may be possible to do depowering, but it may not be possible to do the optimization of the total restraint system. That wouldn't be possible if there was a belief that the 30 mile an hour, unbelted barrier crash test was not going to come into play again. And, I think, yesterday there were comments about the effectiveness of depowering, and there was a believe that stated that depowered air bags have benefits across the board, societal benefits, and that the 30 mile an hour, unbelted barrier test should not come back into play. So that's something I think we'd like to discuss with the agency.

I'm sorry, give me the second part of that question, again, Don?

MR. BISCHOFF: How you think depowering would permit optimization of air bags for a wide range of occupant sizes and performance.

MR. PARKER: I think it does give an opportunity to do that. In some respects, if you optimize the total system for whatever range of occupants or other position conditions that you can with a sled test, the sled test does give you that ability to do that optimization, and it doesn't exist with the test that it replaces.

MR. BISCHOFF: One final question, if I might, for Dainius. Based on the research that you've done so far with the 5th percentile female, do you have any specific recommendations, at this point, for what test procedures that you would adopt to judge performance?

MR. DALMOTAS: I'm not sure if we're ready to make specific recommendations. We're looking, essentially, at two dynamic performance strategies. One is simply substitution of the 5th percentile female in a 48 kilometer an hour crash. The other possibility is substitution of 5th percentile females in what we've come up with is, essentially, a low speed of a barrier crash test.

Of the two strategies, personally, I like the low speed crash test more. I think we already have or we're proposing to introduce a 48 kilometer an hour crash with 50 percentile males, so we got average person, hard crash represented in our performance index. Substituting 5th percentile female in a low speed crash basically gets you assurance of protection in low speed collisions, assurance that the air bag will not overpower a 5th percentile female in either a low speed or a high speed crash, and it addresses the whole issue of how air bags are designed and optimized for soft pulses.

So with basically just two tests, you seem to cover sort of the four cells, I think, reasonably well. Obviously, in regulatory environment, you try and minimize how many tests you're going to pose to evaluate a system, so basically we like this high speed, low speed combination with different dummies.

CHAIRMAN HALL: Could I ask, who asked questions to identify yourself, for the stenographer.

MR. BISCHOFF: Sure, I'm Don Bischoff with the National Highway Traffic Safety Administration.

CHAIRMAN HALL: Right. And now, at Table Two, if you would, please, so that the stenographer, for the purpose of the record, can be sure they have the individual asking the questions, I would appreciate it. Table Two?

MR. VOS: Yes, Tom Vos from the AORC. I have a few questions. The first one, I'd like to direct to Dr. Lund. In related discussions regarding the safety matrix that is to be put together, it was suggested than an effort be run in parallel to intensify an analysis of field data as the depowered product starts getting into the field. I believe it was suggested this study go for about 12-months. I guess, your organization does a lot of field analyses and so forth. Do you feel that a sufficient amount of data can be accrued in that period of time, that it would enable the industry to make any meaningful decisions on where to go from here or the effectiveness of depowering?

DR. LUND: I think we can learn an awful lot from the field data and evaluate where we're going with depowering. Now I'm not sure I captured exactly where you wanted this to end up?

MR. VOS: Well, simply that I believe that as we start producing as early as the 1998 models, we will be putting vehicles into the field with depowered units and that there is an interest in creating a data base which will enable us to observe and determine the effectiveness in depowering and help to understand the urgency for bringing forward, ultimately, the intelligent or smart types of systems in the future.

And the question is, is that a reasonable expectation. Based on some of the comments mentioned yesterday about how long it takes to collect data and to process data, will we be able to do that in 12 months.

DR. LUND: In the 12-month period, you can do some things, and it's going to depend on how much information one has about the variability in air bags that are put into the cars. Do we know to what extent the air bags have actually been depowered, and then you look for those kinds of things.

But the bottom line is that for certain important questions, there's a great deal of controversy over what exactly the effect of depowering will be in the more severe crashes for the larger adults. Those kinds of effectiveness analyses will not be available in a year. Frankly, we will not be able to know whether the overall effectiveness of air bags has gone up or gone down.

The kinds of things that you can know in the first year, if you know which air bags have been depowered, and by how much, and in what ways, you can look to see if you do get bad instances, if we still see instances of out-of-position children being harmed by those bags, that would be information. If you don't see those instances, unfortunately, that's not enough data to reach a firm conclusion, not in that time.

MR. LANGE: Mr. Vos, I'd like to comment, as well.

MR. VOS: Yes.

MR. LANGE: The follow-up part of your question presumed a condition by which advanced air bag technologies would supersede and replace depowered air bags. That is not the case. I think everybody is really aware that as we move forward, we'll want to make permanent the depowered levels, because those will provide the maximum protection for the maximum number of occupants.

With advanced technologies, what we'll want to do is add features that will, under some conditions, perhaps suppress the deployment of an air bag or modify the deployment of an air bag somehow. In those suppression events, what we have to keep in mind as we go forward is that an unbelted child will receive the protection neither of the belt, nor of the air bag in such an event, and we must work hard to minimize the frequency with which those events occur, that is we've got to make sure everybody is belted, everybody is properly belted, and children are in the right kinds of restraints systems. But it's a false premise to believe that with advanced technologies, we will want to increase inflator powers again for most occupants. I think that will not be the case.

MR. PARKER: If I can sort of follow up with a question to Dr. Lund. As I recall, analysis you did of the NASS data, I don't think you found a single case where the air bag bottomed out in a high speed crash, is that correct?

DR. LUND: That is correct.

CHAIRMAN HALL: Could you tell us, Mr. Parker, what bottomed out is?

MR. PARKER: Well, that means that you no longer get protection from the air bag. In other words, if you're in the driver's side, that you hit the steering column or the steering hub because there's no more protection from the air bag.

DR. LUND: What Mr. Parker is referring to is the question of is there any sign that, at this time, air bags are near the limits of their performance, given the crash situations in the real world.

What we saw from the review of the 25 cases that were of frontal crashes, that were available in NASS and we go to the National Accident Sampling System because it has detailed crash information, and for those drivers who were fatally injured and their crashes investigated, we found no instances where the cause of death appeared to be a lack of adequate air bag restraint. What we found, instead, was that if the crash was the cause of the fatality, it is more likely that the overall structure of the car was simply overwhelmed. What we saw was disintegration of the occupant compartment. There wasn't room for air bags or any restraint system to save those drivers.

We also found in that study, five cases where the air bag was actually the source of the fatal injury—or the most likely source of the fatal injuries that those drivers received.

So I am concurring in this respect, we feel very strongly with, I think, my fellow panel members and Mr. Dalmotas's comment that the first and most important thing that's going to happen with air bags is depowering. And we think that you're going to see not just a benefit in some of the low speed crashes with the tragic harm that we've seen and the reason for this hearing, but we're going to see an improvement in air bag effectiveness across the board.

CHAIRMAN HALL: Do you think everybody will depower or do you think some won't? I know that's just guessing.

DR. LUND: Yeah, for me, that is just guessing. I don't really know where manufacturers are, but I think we've heard from the manufacturers here and you can pretty well predict that there will be different amounts of depowering that are going to occur, depending on where an individual vehicle's platform is.

MR. LANGE: Chairman Hall, with respect to your question about will everybody depower, I think the answer within the industry is—is, yes, there are some products that currently have air bags sold here in North America that do not satisfy the requirements of FMVSS 208, for unrestrained occupants, because they are not yet mandated for those products. And among those products, some of those air bag systems already are—have been engineered for a more modest inflation characteristic. And it may be in those kinds of products that we don't see a subsequent change and—and decrease in the inflator output for those.

But by and large, most products that are sold here in the U.S., that are engineered for the current—I should say the past level of Federal Motor Vehicle Safety Standard 208, we will see some modification, some reduction in inflator output on most of those products.

CHAIRMAN HALL: How many different countries does General Motors sell automobiles in?

MR. LANGE: How many countries? I don't know. A lot.

CHAIRMAN HALL: Worldwide?

MR. LANGE: Yes.

CHAIRMAN HALL: And how much of your fleet that you sell is with this bag and how many do you use a depowered bag, today?

MR. LANGE: GM manufactures about 5 million cars and trucks here in the U.S. annually, a little less than that—we wish it was more—but it's a little less than that. And that's a little more than half of our worldwide production.

Most of the other products that we build and sell outside the U.S. are not equipped with air bags, there's not the same kind of societal demand in many of the markets that we sell our products in for an air bag device.

We do have air bag systems in Europe. Those are designed differently than they are here in the United States because there never has been an unbelted adult male very severe crash test established as the requirement to be satisfied for that product.

And, as you are well aware, the Holden Company, a subsidiary of GM, is selling a product in Australia with an air bag system that is tuned to be optimized for a belted occupant. And one of our employees is here with us today and will share some observations with you about our experiences with that air bag system and the rationale that was utilized in developing that air bag system.

CHAIRMAN HALL: Good.

MR. VOS: Yes, we have two more quick questions.

DR. LUND: Mr. Vos, before you go on, I'd like to just follow up on your first question, there was one other aspect. I think the second part of your earlier question was should we wait to do things until we have a year's worth of data, and I think the answer to that is an absolute no, there are things we need to do in the meantime that must happen.

In particular, while depowering of air bags is a step in the right direction and probably a big step, I think there is universal agreement among the engineers that it is not going to solve the key problem that has brought us here today, the out-of-position child is still going to be at risk.

We need to move forward quickly to reach agreement on what kinds of test devices we are going to use to assess the likelihood of injury to out-of-position occupants. If they're out-of-position when the air bag deploys, what is an unacceptable level of risk. We need to make those definitions and we need to make them quickly in order to provide the manufacturers with more guidance as to exactly what is the target.

MR. PARKER: I think I agree with Dr. Lund about that, except that I expect that there would be substantial benefits to depowering. I think it's not going to fully solve the problem, and but I think we have to be careful that we don't apply solutions using advanced technology to problems that are either disappearing or have disappeared.

On the other hand, as I said, I do agree with him that we do need to address the remaining problem for out-of-position children, especially.

MR. LANGE: I hate to be redundant, but I'd like to weigh in, in favor of those comments as well. And that is why in the AAMA petition for depowering, there was an inclusion of a petition for rulemaking concerning development of out-of-position occupant test protocols for out-of-position occupant injury criteria.

MR. VOS: By the question, I had not intended primarily to suggest that we should be waiting for anything. One of the reasons for the question was there has been a lot of controversy over the issue of trade offs, and lacking data and we're relying heavily on some supposition and some good analysis work, but, nevertheless controversy. And I was trying to set the issue straight on, you know, we should have the right expectation as to how quickly we will know whose side of the argument is—is supported.

The second question I had is for Mr. Dalmotas regarding the single child fatality experience in Canada. Could you give us the circumstances associated with that? Was it an unbelted child or threshold level crash? We don't have that information.

MR. DALMOTAS: It was a threshold level crash and the child was a four-year-old male. The child, to the best of our knowledge, was lap belted—well, was lap shoulder belted with the shoulder belt behind the child. The child was leaning, playing with the radio. We believe that actually distracted the father and he crashed into the rear end of another car, and I believe there was prebraking involved, so he actually realized he was going to do it, so you have basically, the worst case scenario that you can envision. It had all the elements, low speed, prebraking, child with shoulder belt behind them, out-of-position to start with, etc.

MR. VOS: Thank you. The last one I have is for Mr. Parker. Recently, in the last couple of weeks, the domestic automakers have reported their willingness to consider retrofitting manual turn-off switches. Have your member companies taken a position on such a matter?

MR. PARKER: Well, the Association's position is that it's against doing that for all the reasons that NHTSA discussed in its final rule on cutoff switches. Whether that's something that the Association would revisit with its members, I can't tell you now.

MR. VOS: Okay, thank you. That's all we have.

CHAIRMAN HALL: Okay. We'll move to Table Five.

MS. ROEMER: Yes.

CHAIRMAN HALL: If you could please identify yourself?

MS. ROEMER: Yes, Jane Roemer with the National Safety Council. We have four questions. First, for Mr. Lange, we continue to hear about how advance technology will provide protection for a wider range of occupants in different kinds of crashes, belted and unbelted. Today, two manufacturers have a system in place that deploys the air bag at different crash severity for belted and unbelted occupants, a lower severity for unbelted and a higher severity for belted occupants who do not need the air bag for protection at the lower speeds.

This system has been in place in Mercedes since 1987. Why are these systems not in place more widely and what do you see as the impediments to this system?

MR. LANGE: I think that's a good question and the reason that you're not seeing them more widely utilized, at this point in time, was that it was not clear and, I think, still is not clear that such a technology application would necessarily provide any improvement with respect to the condition of the potential for fatal air bag injury to an unbelted, out-of-position occupant.

The deployment thresholds for the unbelted occupant in those two systems are virtually identical to the deployment thresholds that are utilized by other manufacturers, not using the two threshold speed strategy.

So with respect to the reasons we're here today, to talk about fatal injuries to out-of-position occupants, you wouldn't see any change in that regard. I think that the other things that we need to keep in mind with respect to potential air bag inflation induced injuries, it is possible that a higher deployment threshold for belted occupants could have some positive effect, some favorable effect with respect to the likelihood of upper extremity, arm injuries. Dr. Huelke spoke some yesterday about what he has seen in terms of his studies of—of air bag equipped vehicles in crashes, and if we deployed fewer bags for belted occupants, you might see a reduction in arm injury.

The other thing that I would have to say about that issue is we really anticipate that depowering will have an extremely beneficial effect for reduction of belted occupant upper extremity injuries, as well.

MS. ROEMER: Can you also explain why dual-stage inflators, under development in the late 1970s, are not in production today?

MR. LANGE: Yes, Dr. Mertz began to speak about our experience with dual-stage inflators a little bit at the end of the day, yesterday. And he correctly observed, and many people have correctly observed, that in the air cushion restraint system that GM utilized in the period 1973 through 1976, the passenger side air bag was deployed using a two-stage inflator system. That inflator system was a cold gas storage system with a pyrotechnic charge to heat the gas on deployment. The technology that was utilized in that product was applicable uniquely to cars of that size and configuration, and not applicable to the current motor vehicle fleet that we have today.

Further, the two-stage inflator that was developed at that period of time was developed with the intent of mitigating the risk of inflation-induced injury to out-of-position child occupants. It turns out that our experience with that system was that it was not effective in achieving that goal. We have records of about 250 deployments of that system and we have 2 fatalities, one on the driver's side, one on the passenger's side, associated with injury insult by the air bag system. The one that was on the passenger side was to an infant that was lying on the seat of the car at the time of the accident and that infant sustained a fatal injury from the air bag door as it was opening.

Subsequent to the suspension of that program, the next time GM undertook an air bag program in the late 1970s, it examined a dual-stage pyrotechnic inflator and found that it did not work. And so we, instead, transferred our attention to a single-stage pyrotechnic inflator that developed an inflation curve, a so called S-curve, that mimicked the inflation characteristic of the dual-stage inflator in the GM ACRS system in the sense that it had a very shallow onset and then a modest arise, and then a modest tailing off to the peak pressure. It was that S-shaped curve that we thought was the desirable characteristic of the original ACRS system, not necessarily that there was a dual-stage inflator utilized to obtain that curve.

Further work on that system was suspended with the occurrence of the second Arab oil embargo and the imposition of more stringent CAFE standards. Basically, the kind of product to which that air bag system was applied was no longer viable in this market with more stringent CAFE requirements. It was too big, too heavy, and too consumptive of fuel, it wasn't sufficiently fuel efficient.

Over the last decades, GM has continued to consider the application of dual-stage inflators. We have had experimentation work being done with some of our suppliers as recently as late last year. And with respect to pyrotechnic dual-stage inflators, we have yet to see a production capable system be demonstrated. That's why you don't see them in GM cars today and that's why you don't see them in other manufacturers cars or trucks today.

What we do see, though, is the continuation of the S-shaped curve that was the desirable characteristic from the original ACRS system, and you see a whole variety of additional inflation-induced injury mitigation technologies, bag tethers, dent patterns, bag fold patterns, load force, opening deployment doors, I-tear patterns, recessed modules, and so on. We may see, as part of our efforts to devise more advanced air bag technologies, a return to dual-stage inflators. If we do, I think it likely that the lower stage would be about where we are or where we expect to be with depowered air bags, and the higher stage, if it's necessary to have one, might be there to accommodate larger, unbelted occupants in very severe crashes.

MS. ROEMER: For Mr. Lange or anyone else who would also like to comment, given the importance of position with regard to air bags and the difficulty shorter people have achieving proper position, would telescoping steering wheels and adjustable pedals be likely to reduce injuries to those drivers? If so, are these going to become available or more widely available?

MR. LANGE: I'll take a crack at that, but I think you probably want to get comments from others, as well. I think that what we're going to find is that depowering air bags will largely solve the kinds of concerns that we have for diminutive occupants and particularly diminutive drivers.

CHAIRMAN HALL: Excuse me, Mr. Lange, will you be able to establish that in your test? If you do these sled tests, will you be able to establish whether the depowered bag is going to provide that level of protection?

MR. LANGE: Yes, thank you, Chairman Hall. What I was about to explain was that in devising the proposal that the AAMA made to the National Highway Traffic Safety Administration in its petition for rulemaking in August of 1996, the sled test pulse was developed based on some research that—that we had done, that showed that an air bag depowered sufficiently so as not to inflict an injury measure above the injury assessment reference value, the so called IARV, for a 5th percentile female, even when the dummy was placed right adjacent to the deployment module, either chest on the module or neck on the module, could be achieved. We think that the sled test will permit us to depower to that level.

We were not so successful at reducing the three-year-old or six-year-old child dummy IARVs to something below their threshold levels that close to the air bag. What we were able to do is reduce the zone of danger for those dummies from about eight inches away from the module at deployment, to about four inches away from the module at deployment.

So we think we've done a really good job with respect to the 5th percentile female. We think we've done a really good job, but not quite so successful, with respect to the child, with the sled test proposal. And that's why we know that we need to continue to work on other kinds of technologies that might eventually do a better job of dealing with the out-of-position child occupant.

MR. PARKER: I certainly agree with what Mr. Lange said, that with depowering it's probably not necessary to have the telescoping steering wheel and the adjustable pedals. On the other hand, there certainly is a wide range of occupant sizes and I know that some vehicles do have telescoping steering columns just for purposes of comfort for the driver, but not necessarily for extra protection from the air bag.

DR. LUND: Let me also jump in here. I'm not quite as convinced that depowering is sufficient. I think that it would be, in fact, beneficial to have more adjustability in the steering wheels and in the pedals for different size occupants to use. What Mr. Lange and Mr. Parker pointed out is that with depowering of air bags, again, a properly positioned short person can probably be well-protected by the air bag. I would venture to say that that person, properly seated, a short person is currently well-protected by most air bags.

The problem is that the short person is near enough to the steering column that they can get out of position pretty easily with unusual circumstances, so that even with depowering, they may get close enough to be in some danger. So I think that in addition to comfort and convenience, there will still be some safety benefit from greater—

CHAIRMAN HALL: Could I ask you, Mr. Lund, how far should a driver be seated from the air bag? I mean I dare say that most drivers out there don't know whether they're in position, or out of position, or think about it when they're driving along the highway. Is there any information you can give to consumers so they have some idea of how close? If I'm within six inches, I am too close, or four inches, or is it the usual depends on the model and all the other stuff?

DR. LUND: Well, Mr. Chairman, I think it does depend on the model, but as a general rule I think that any occupant who can get their chest as much as ten inches away—obviously, the further the better—but ten inches away from the hub of the steering wheel can be confident that they're not going to be injured, except in a very unusual kind of circumstances. So we're pretty confident that that is a safe distance and we are also pretty confident that most people can achieve that distance.

The problem is that, as Mr. Parker said, there are short people who, although they can achieve that distance, they can't drive that way for very long because it is uncomfortable. They need to be closer. And when you get that close, it's not that the ten inches is a problem, but you've got to ask yourself if you start ten inches away, where do you end up at in the crash, at the time the air bag deploys, and we think you want them to be at least four to six inches away from the air bag, at that point.

CHAIRMAN HALL: Let me ask one thing and then I'll get—I apologize for butting in here. Are pedal extenders something that is a solution today I've never seen a pedal extender, to be honest with you. If I needed to go get one, where would I go get one?

DR. LUND: Well, there is an organization, that does offer pedal extenders. I don't have that name right at the tip of my tongue, but we can make that available to you.

But it is kind of a cottage industry. There are a lot of these different providers and they have existed primarily for people with special needs in driving cars to deal with. The Institute has been recommending to shorter statured drivers who have phoned in with concerns, that they investigate the use of pedal extenders. Those people we have subsequently learned have had varied success with it. We've had some people who put them on, and they used them, and they are pleased with them. We've had others who have ended up taking them off because the pedal distance wasn't their only problem. You can also have short arms, and you still have to get close, and they found that even though the pedal extenders allowed them to get back, they still couldn't drive for an extended period of time in that way.

CHAIRMAN HALL: Now are those put on permanently or do you take them on and off, depending on who the driver is?

DR. LUND: Those are pretty permanent.

MR. PARKER: I'm sorry, excuse me, Chairman Hall. Something that Dr. Lund mentioned reminded me that I read something recently about whether shorter drivers are more concerned about pedal location or steering wheel location. In other words, it seems to me it's logical that they'd be more concerned about pedal location because that's absolutely essential for driving. Now whether you have pedal extenders on and you'd want to pull the steering column or steering wheel closer to you because you do have short arms, if you're a short person, may negate the effect there. And I recall reading that recently. I'd be happy to find it and supply it to the NTSB.

CHAIRMAN HALL: Thank you.

MS. ROEMER: Yes, we actually have two more questions, if you can permit. First, for Mr. Dalmotas, have you conducted crash tests with 5th percentile female dummies in vehicles without air bags or with the air bag disabled and, if so, have you seen the same type of variability as in air bag equipped vehicles?

MR. DALMOTAS: Sorry, can you repeat that? Did we do 5th percentile female tests in non-air bag equipped vehicles?

MS. ROEMER: Right, and have you seen the same kind of variability as in air bag equipped vehicles?

MR. DALMOTAS: The test that we did, we also disconnected the air bag at its deployment threshold, so, yes, we reran the test with essentially only the belted occupant there. And the neck loads were certainly lower in those tests.

Now did we achieve the same variability, I suspect that it would be over a much lower mean value of response. But, certainly, neck loads would have been below injury assessment reference values in the belt only test. Because, remember, we're running a very soft, low speed collision.

MS. ROEMER: Okay. And also for you, Mr. Dalmotas, the safety belt use rate in Canada is a model for the United States. Can you describe the key elements, annual costs, public and political support, and the role of periodic, high visibility enforcement in the success of your program?

MR. DALMOTAS: Well, I think you did a good job summarizing it there already for me. I'm speaking way out of my league now, because, I'm not involved with various programs, promotional programs, etc.

I'm sure there is a cost, as you mentioned, from all the activity that's associated with promoting the seat belt use. I mean that's certain not a cost, just at the federal level. That's applied by provincial people, police forces, etc., etc., and, no, I do not have a dollar value for that cost.

The other issue you mentioned was selective traffic enforcement programs and, yes, they were a very high priority within Transport Canada and our provincial authorities to get the rate up to that level. And, basically, a step program or selective traffic enforcement program tries to increase awareness of the need to wear a seat belt, and also advertises the fact that the police are going to be out there trying to get as many tickets as possible on you, so you don't have a chance of being out in the road for five seconds without getting a ticket. So it works. Various jurisdictions have run various type programs, modeled after that, to promote and get the use up.

I think one of the theories, of course, that, you know, if you can convince people for a two week period that they should wear their seat belts, it becomes habit forming and they continue on, and that's essentially what we found. We had this sort of 10% increase, it would drop by 6%, you know, 6 months later, and then you go in, bring another program, increase by 10, drop by 5, and eventually you get up to 95. But it's a jagged way of getting there, but it gets you there.

CHAIRMAN HALL: We're going to have a panel tomorrow on what is experienced with air bags in other countries, and Mr. Dalmotas, what you might do, if you have a chance to talk to anybody tonight, is find out specifically what you all do, if anything, with your teenagers, because I think one of the things that Dr. Martinez has said and one of the most difficult trade-offs here is a large number of our unbelted population are young males. I don't know if there is anything you can look at and let us know on.

MR. DALMOTAS: I think in Canada we have a high risk driver problem, and certainly young males are part of that problem, but they are not entirely that problem. As you can imagine, as you get to 94%, everything converges so, right now, just about everybody is wearing seat belts at a very high level, including young males. I think they are only about six percentage points below our average, but they are over represented in the serious accidents, so it's not just getting belt use up in that group, it's getting belt use in the high risk group up.

CHAIRMAN HALL: Okay, thank you. Let's move to Table Six.

MR. DITLOW: Chairman Hall, I'm Clarence Ditlow from the Center for Auto Safety. Mr. Parker and Mr. Lange, both of you have testified that there will be and is a wide range of power levels in inflators, and the auto companies know this. As we move to depowered bags, how will consumers be informed about the relative power levels in air bag inflators in the cars that they purchase?

MR. PARKER: I guess I'm a little bit concerned that that information gets passed on to consumers. I think it's going to take a lot of thought on whether you want to do that, because I'm concerned that that would send the wrong message with regard to wearing safety belts, you know, if people feel that their air bag has been depowered to a level they don't need to worry about being out of position, that they'll quit wearing their safety belts.

MR. LANGE: In many respects, I would concur. I think that the most important thing that we can do here, collectively and individually, in considering that particular issue is to assure everybody that the best thing they can do to keep themselves and their families safe is to wear seat belts, put your kids in the back, never use a rear-facing infant seat in the front seat of a car or truck with an air bag.

With respect to how we convey information to consumers about highly complex technical issues like this one, I don't have a simple answer. I think our Marketing Division people are going to press the engineers for some statement of what we can tell people, and I think we'll have to devise something that will be both meaningful and helpful.

But the fundamental message before depowering, after depowering, after the smartest air bags we can conceive of get into the fleet, is that everybody, to be safe, has got to wear seat belts, kids ought to ride in the back seat, and you should never use a rear-facing infant seat in the front seat of a car or truck with an air bag.

MR. PARKER: I think the same question can be asked with regard to advanced technology systems and that's why I think I agree with Mr. Lange, that this is going to take a lot of thought on how you convey that message.

MR. DITLOW: Mr. Lange, the NHTSA intensively investigated the child death in the dual inflation system air bag equipped car in the mid-1970s that you referred to. A NHTSA investigator's conclusion was that the infant was unrestrained, on the seat of the car, and during pre-impact braking, the infant went under the air bag and was killed by contact with the structure of the vehicle under the dash. How do you—what information does GM have that conflicts with the NHTSA investigation and did you contradict the NHTSA, at that time?

MR. LANGE: I think that that was also the wishful thinking of the engineers at GM that began the investigations of that accident. As Dr. Mertz indicated yesterday, as we began to look at that more closely, it became apparent that from all the physical evidence, that child fatality was associated with the air bag not with the condition of the accident.

MR. DITLOW: Well, I mean, I think that this is an important point because the dual inflation air bag is one of the technologies that shows such promise. I mean would you put that on the record for us?

MR. LANGE: I just did. And Dr. Mertz published—there was an article in ’77; there’s an SAE paper, 880400, that talks about the results of our investigation. It’s been well-known for a long time, part of the problem and perhaps one of the reasons we’re here today talking about these kinds of subjects is that within the community discussing these public policies, there had been for a long time a significant reluctance to accept objective fact and I think that our air bag engineers, for some time, were in denial. We didn’t believe that that air bag system killed that child for a long time. On further reflection and a real detailed investigation, we determined that it did.

MR. DITLOW: Mr. Parker, a number of your member companies are moving to top-mounted air bags which are recessed back from the edge of the dash, say five to six inches back from the vertical line at the front of the dash. Could you discuss the reasons and the advantages of moving the passenger side air bag to that location?

MR. PARKER: Well, I’m not sure that I’m qualified to talk about the companies’ reasons for doing that. I know some of them have moved them to top-mounted bags and I think I recall some research that NHTSA even did some time ago about that there was a lessening of problems with rear-facing child seat, but it didn’t get rid of it. Maybe Mr. Lange, who is closer to the product, would have some comments on that.

MR. LANGE: Thank you, Mr. Parker. GM, I think, probably has a broader range of product in service with top-mounted passenger side air bags than any other manufacturer I’m aware of. We utilized top-mounted bags on our entire passenger car product line—not every single entry, but from small cars up to our largest luxury cars. I wish it were true. I wish what you said was true. I wish what Ms. Claybook said yesterday was true. I wish it was the case that the way to solve child inflation-induced injuries was to mount the bag on top of the dash. That is not the case. If it were the case, I think you would see every manufacturer utilizing that design.

The motivation for doing that, for using a top-mounted bag is largely package-related. Where do things fit in a car consistent with the styling theme. It’s a convenient place to put it. It does require a somewhat larger bag geometrically. It does require a somewhat more aggressive inflator in terms of the inflation characteristic. But it also provides some potential opportunity to not have the immediate inflation insult of the bag directed to some proportion of potentially out-of-position children. Those are trade offs that have to be taken into account in making decisions about where to mount air bags.

Top-mounted bags, as I say, we probably use more of them than anybody else, but they’re not the solution. I wish they were.

MR. DITLOW: But when you look at companies who have moved to top-mounted bags, however, they do it from one model year to the next and there's seemingly no styling reason why they would do that, and it's the—and the flat dash is there, so I mean there must be an engineering reason, I would believe, for doing this.

MR. LANGE: Well, Mr. Ditlow, I can't speak about the generalities that you just encompassed in your question. What I can tell you is that GM has been using top-mounted air bags at least since 1992. In our current product line, J cars, Cavaliers, and Sunfires, W cars, C cars, H cars, K special cars, and G cars, utilize top-mounted bags. We've had top-mounted bags in those products since they were new. Oh, and the W car will have them.

MR. DITLOW: All right, I won't pursue that any further, Mr. Lange, but I also would like to point out there is a difference between top-mounted bags that are remote from the edge of the dash, and top-mounted bags which are right at the edge of the dash.

MR. LANGE: All of ours are remote from the edge of the dash.

MR. DITLOW: Mr. Lange, I have one of your cars and it's not remote from the edge of the dash.

MR. LANGE: Which one?

MR. DITLOW: A Geo.

MR. LANGE: Actually, that's a one of our captive imports and you're right, it's a GM car, but that's not one of the ones that I utilized in my list.

MR. DITLOW: Okay, another question on another issue, Mr. Lange. GM acknowledges that you use a range of test dummies, including the 5th percentile, the 95th percentile male, and children 3 year old and 6 year old. Shouldn't NHTSA use these such test dummies in their sled tests, in depowered air bags, and in 208, itself, and what reasons are there against using these dummies in the test programs?

MR. LANGE: As I had indicated earlier, in the AAMA petition for rulemaking of August of 1996, we proposed that air bag inflation pressures be governed in part by out-of-position testing and had suggested some ISO configurations that might be appropriate.

As Dr. Martinez indicated and as Dr. Mertz indicated yesterday, the industry and NHTSA are now actively engaged in trying to certify those dummies for application in such devices. I would expect that as we move forward in research on advanced air bag technology and should we manage to execute a proposed research program between AAMA suppliers, JPL, and the foreign manufacturers, that we will see aspects of rule-making related to utilization of those additional dummy family members in out-of-position testing.

CHAIRMAN HALL: But you've got the rule now to depower. Now can you only use a 50 percentile dummy in terms of those tests for the sled test?

MR. LANGE: Yes, Chairman Hall, that is correct.

CHAIRMAN HALL: Well, now how long have these dummies been around? This dummy thing just gets to me, you know, I guess I need to ask NHTSA, but here we're depowering but we're still tied to the 50th percentile dummy for the sled test?

MR. LANGE: The hybrid 3 dummy was, as I recall, new in 1987, I believe. The family of hybrid 3 members from the 5th percentile female, to the 95th percentile male, and the child dummies, were scaled up and down from that dummy over the course of the next several years.

They've been commercially available and have been used by manufacturers for some time in development.

CHAIRMAN HALL: Well, we'll ask NHTSA when they get to that. I'm sorry.

MR. DITLOW: Mr. Lange, a number of the members of the parents coalition have had children who have been killed in crashes where at least—where the seat belt has been used. And maybe in some of the instances, the shoulder belt was behind the child. Would you expound on your position on using the Mercedes type system to separate out the lower Delta V crashes, what's GM's position on that?

MR. LANGE: Well, clearly, if a belt is used in the passenger side to indicate to the computer center diagnostic module that the bag should be deployed only in a higher speed collision event, there is the potential, depending on what the severity of the event is to not deploy the bag clearly. You know, most of the children that we know of that have been fatally injured from air bags, were unrestrained, or, if restrained, were so close to the deploying bag that they sustained a fatal injury insult from the deploying bag.

MR. DITLOW: Well, as you have pointed out, there's no magical solution to this, but it would seem that the suppression of the air bag in the low Delta V crashes where the seat belt is buckled, would prevent a number of the fatalities of the children. Is there a technical problem to doing this, and, if so, could you explain it?

MR. LANGE: Well, it wouldn't prevent any of the fatal injuries to unbelted children or any of those to children in rear-facing infant seats. As I had indicated in my earlier answer, there is that potential for those few who had a belt on in a crash that was read by the sensor as being not greater than the threshold level, that the bag would not deploy. That's what I said.

MR. DITLOW: But is that your position, that it's technically feasible to do that?

MR. LANGE: Well, Mr. Ditlow, it seems to me it's pretty obvious that if a manufacturer, or two, or three, or five, are using a particular technology, it's hard to argue that it's not technically feasible.

MR. DITLOW: Mr. Lund, is any Intelligent Transportation System money being used in advanced air bag research, and what recommendations would you have for utilizing ITS money for advanced air bag research, if it's not being used today?

DR. LUND: I think that's a very good question. There is certainly a lot of money that's being spent right now to develop what are called more intelligent vehicles, and the goal of that expenditure is to develop collision warning systems that help people to avoid crashes.

That's actually a pretty tall order. That requires some very sophisticated technology. It is, however, not quite such a problem perhaps to use some of that technology for the amount of advanced collision warning you need to deploy an air bag. And to my knowledge, there is zero of that money currently being used to apply these advanced warning systems to the issue of air bag deployments, that is sensing a crash, being able to tell sooner whether or not an air bag should deploy. And that is really the primary determinant of how aggressive an air bag has to be. If you have more time to deploy it, then the air bag doesn't have to be aggressive, at all. It would be, I think, a very good use of Intelligent Transportation System dollars to put some of that research onto the issues of air bags and crash sensing.

MR. PARKER: I think that there is really quite an overlap there because the sensors that are being developed, for example, crash avoidance, crash warning, if you will, certainly have the application to deploy air bags earlier. But since I spent a lot of time at NHTSA, one of the ideas that I had way back when, maybe 20 years ago when NHTSA was thinking about a collision avoidance system and collision warning systems is that these would be used not to warn 100 feet ahead that there is somebody in front of you that you need to slow down for or automatically get braked for, but right before the crash, brakes are applied, fully locked, and the air bag is deployed. It gets the Delta V of the crash down to a lower level and you have the protection right there.

I think the sensor work that's being done, is fully applicable there and it's not that much of a stretch to apply it to this area.

CHAIRMAN HALL: Well, thank you. Let's move on, if we could then to Table Three.

MS. CISCHKE: Yes, Sue Cischke from Chrysler Corporation. This question is for Mr. Lange. During development of depowered systems, won't you use the 5th percentile and the 6 year old dummy to verify out-of-position performance, even though they're not required by regulation? In other words, the difference between development testing and certification.

MR. LANGE: Yes, I'm sorry I wasn't clear on that earlier. That will be done, certainly, by us and I'm sure by other manufacturers as well.

MS. CISCHKE: Okay. And this question is for Mr. Dalmotas. You mentioned that the 5th percentile test results are more variable than the 50th percentile male. Is this variability due to test procedure, the vehicle, the dummy, or all of the above?

MR. DALMOTAS: Well, given the number of tests I've done, I don't think I'm going to jump in and quantify that one. We're trying to sort out the level of variability that you're getting right now. Obviously, we don't have that big of a data base.

One of the things, of course, that the closer you have the dummy to—to the air bag during deployment, the more complex the environment is. You know, in some cases, for example, the air bag has not fully inflated but is crowding itself or shrouding itself underneath the neck. Now whether you could replicate that type of bag unfoldment in two tests in a row, I doubt it.

We're running very soft pulses, which means that the vehicle acceleration signal is just at the threshold and, I suspect—we haven't confirmed it because we haven't done enough tests—that in one test, the air bag may deploy and it may be 40, in another test it could deploy at 60, a third test it could deploy at 80. That is going to introduce variability.

So I'm not trying to suggest in any way that the 5th percentile female dummy is more variable. What I think is the test environment that we're working in is more variable than a 50 percentile rigid barrier crash. And that's why I think it's critical to have something like a low speed test.

A rigid wall test, to begin with, doesn't exactly press industry into developing sophisticated algorithms. Anybody can develop and algorithm for a rigid wall test. That's the simple thing. The hard thing in sensor technology is to capture everything from soft to hard, and that's where the advances have to be.

Now going back to the earlier comment that Clarence Ditlow made, I'm the leading proponent of upping thresholds. But one of the reasons why back in February of '96, you know, Transport Canada basically wrote to the industry requesting depowering, at that point in time, is that we felt it certainly was preferable to depower first and then up thresholds later. Changing power levels can be done quickly, and can be done properly, and evaluated properly. I'm not sure if we have the technology to make sure that thresholds are increased in an orderly and safe manner. That's the problem. Because it's going to involve more than just crashing a car at 26 kilometers into a rigid wall, that's the last thing you want to do.

MS. CISCHKE: Okay, this question is for Mr. Lange. Just for clarification, did AAMA say that monitoring for 12 months is sufficient to measure the effectiveness of depowering or is it 12 months after the last vehicle is depowered, which would be about two and a half to three years from now?

MR. LANGE: My recollection from what we said and what Ms. Petrauskas tried to describe yesterday was that we would anticipate to continue to collect data for a period of time extending beyond the time at which the last vehicle was depowered for at least 12 months. So I would expect that the two and a half year period is closer to where we'll actually end up than just a excuse me, a one year period of collecting data. I think we all pretty much acknowledge that it's going to take some time and that's the minimum amount of time that we ought to devote to that task.

MS. CISCHKE: And finally for Dr. Lund, what recommendations do you have in the long run for improving the robustness of accident data collection and analysis techniques?

DR. LUND: Mr. Parker just said it, it's more money. It takes money to do these kinds of investigations. It's quite expensive to run the National Accident Sampling System, as it is now, and—and you need much more data and you need it faster. I mentioned earlier that our evaluation of the effectiveness of air bags or how air bag protected drivers were being killed was based on 25 drivers in frontal crashes. It required from 1989 through 1995 of NASS to acquire 25 fatalities in air bag equipped vehicles in frontal crashes, so you can see, if that's your rate of acquiring data, that's not fast enough. So we need to have more concentration, and I think the NHTSA has committed to that, that NASS is now more focused on getting crashes with air bag equipped vehicles.

MS. CISCHKE: Okay, thank you.

CHAIRMAN HALL: Okay, Table Four?

MR. HUTCHINSON: Phil Hutchinson, from the Association of International Automobile Manufacturers. One question for Mr. Dalmotas. Do you foresee any type of air bag requirement in Canada?

MR. DALMOTAS: Certainly, there is no immediate plan that I am aware of, and I can't obviously talk for the government of Canada on the issue, but there is no immediate plan to mandate fitment of air bags in Canada.

Having said that, we have a set of performance requirements that are going to kick in very, very shortly, and of the vehicles I tested probably in the past decade, the only vehicles that have consistently met those performance criteria that we apply, and that will be applying in this test, have been air bags. So, I guess, in a nutshell, what we are doing is trying to regulate performance, we are trying to not regulate hardware. The only hardware I know currently that will probably meet it are air bags, but that certainly doesn't prevent other technologies from being developed, inflatable shoulder belt systems, pretensioners, there are other things obviously that will meet it.

Whether that'll happen, of course, in an integrated industry like we have in North America, given that the U.S. has mandated air bags, is another issue.

MR. HUTCHINSON: Thank you. Thank you, Mr. Chairman.

CHAIRMAN HALL: Thank you. We'll now move up to the Board of Inquiry. Mr. Osterman?

MR. OSTERMAN: Mr. Lange, you had mentioned that many of the vehicles currently on the road today are not covered by 208. Do you know or would you explain which types of vehicles and what the population of the fleet is in this country?

MR. LANGE: Yes, I'm sorry, Mr. Osterman, I probably wasn't particularly clear. What I think I said was that there are some vehicles equipped with air bags on the road today that are not required to have air bags and be tested to the unbelted test requirements of 208. Those are really pickup trucks, single-seating row vehicles. There are a number of them that have passenger side air bags that are not yet required, and some of those products are designed with—with a more modest inflation output characteristic than they would need to satisfy the unbelted test requirement of 208.

MR. OSTERMAN: Are we aware of any 5th percentile or child fatalities in these types of vehicles with the more modest air bag?

MR. LANGE: We are not. But I have to say I think that our exposure period is very modest on those vehicles and it would be premature to make much of that fact.

CHAIRMAN HALL: Is that a depowered bag that's in the pickup truck?

MR. LANGE: Well, it's not a depowered bag in the sense of having one inflation level and then a deliberate development effort to lower it, it's a depowered bag in the sense that it was never intended or designed to satisfy the unbelted requirement of 208 and, therefore, has an inflation output characteristic that is more modest than it would have been had that product been designed with that original objective in mind.

MR. OSTERMAN: Do we know what part of the driving population actually rides with the driver's seat in the full forward position? What percentage, does anybody?

MR. LANGE: I don't know that we have data on that. I know that if we look at our package drawings, in most of our products the seat track probably extends a little bit further forward than that which would be required for a 5th percentile female to comfortably manage the pedal and steering wheel position.

MR. OSTERMAN: Okay. And I had one other—oh, Dr. Lund?

DR. LUND: I would make this one further comment on that, in looking at trying to see what size drivers could get far enough away from the steering wheel, and as I mentioned earlier we found that, in fact, most short drivers can get away from the steering wheel, but we also discovered that many of the short drivers, in fact, don't even normally put the seat in its most forward position, but rather are further back than some of the tests that we have done.

MR. OSTERMAN: And I had one other question. Mr. Parker had previously talked about depowering and optimizing the restraint systems. Depowering alone does not equal optimizing the restraint system. Could you just explain that again a little bit?

MR. PARKER: Well, that's correct. Certainly, manufacturers have optimized their systems to the extent possible for the existing test requirement, which now, of course, is replaced with the sled test. If the sled test stays in place for a long time or the unbelted test gets fully eliminated, manufacturers, I think, can do some additional things to the total restraint system. The safety belt might have a lower level of force limiting. That's not necessarily the case, but it could have. You could change the characteristic of the air bag slightly, maybe less volume—same area but less volume, that's a possibility. There are just a host of things, I guess, that could be done, it's really tuning of the system differently, slightly, for an air bag that doesn't have the power of the existing air bags.

CHAIRMAN HALL: I'm going to ask the rest of the panel here, the three of us, that we give our one best question, because, otherwise, we're running out of time.

MR. ARENA: For Dr. Lund, I'll ask you the question about data bases at the break, but my question applies to children in current vehicles. Do the small cars that are out there today have more aggressive air bags and is it possible that the zone of danger is more than eight inches from the air bag panel, perhaps ten to fourteen inches, in those small cars that have more aggressive air bags?

DR. LUND: Mr. Lange can probably address that more specifically than I can, but certainly with small cars and the shorter crush zone in the front, those air bags have to come out sooner and faster in order to protect the unbelted. So I would suspect that they are slightly more aggressive, that's correct.

CHAIRMAN HALL: Mr. Sweedler?

MR. SWEEDLER: We've heard a lot about the variability of the performance of different air bags in different cars, different manufacturers, some come up from the top, some from the front of the dashboard, some are tethered, they come out at different thresholds and different speeds. Is it possible or even probable that for certain types of individuals, say the small statured adults or even drivers or child passengers, that certain vehicles are more suited to these people who have special needs? I know that's a can of worms, but maybe that's something that should be considered by certain individuals before they purchase an automobile.

MR. LANGE: I think it's almost impossible to identify all of the variables that would intersect between a vehicle and an occupant that would permit somebody to answer a question such as that. It is, however, a fundamental law of physics that bigger vehicles are safer. Bigger vehicles will be safer for smaller people, as well as bigger people. And that's has been true for decades. It will always be so.

MR. SWEEDLER: Dr. Lund, do you necessarily agree or would accident investigation and data analysis help us here?

DR. LUND: Well, I think that with all that variation, some vehicles I would expect are better for certain occupants than others. Unfortunately, I don't think we know which ones are which right now. One of the reasons we need to move forward, as I was saying before, was good specifications of out-of-position tests is perhaps to get a handle on which vehicles will be most forgiving for people who are close to the air bag, at the time. Right now, there is not universal agreement as to how to assess that.

CHAIRMAN HALL: Dr. Ellingstad?

DR. ELLINGSTAD: Mr. Dalmotas, you mentioned on a couple of occasions a set of performance standards or a matrix of performance standards as opposed to a single performance standard such as an unbelted 50th percentile male. Does using multiple criteria create a certification problem and how do you handle that?

MR. DALMOTAS: Well, hopefully, I understand what your question is. For example, if we incorporated two tests, a high speed and a low speed into a regulation, would that cause us a problem, no. That's certainly what we're working with. Certainly, you want to reduce the number of tests and you cannot do an infinite number of tests. In research applications, it's obviously ideal to be as diverse as possible when you're coming up with the regulation. The final regulation, you hope, is the minimum number of tests that achieves your objective.

I think in the case of air bags, just by their very nature, because they essentially release energy, proximity is a critical issue. I think you do need a minimum of two tests or at least two dummies and high speed, low speed, or soft/hard type environment.

Sure, it'll be harder for the manufacturers to satisfy variability across all four tests, but I think it is achievable.

DR. ELLINGSTAD: Mr. Lange, does this present a problem for the manufacturers to meet that kind of a multiple criterion standard?

MR. LANGE: I think, conceptually, the answer probably should be that it would provide an additional burden to manufacturers, but one that should be manageable, and we'll attempt to work with the regulatory bodies to devise a set of criteria that makes sense for motor vehicle safety and is achievable.

Theoretically, if you were to envision the construction of a motor vehicle with an air bag restraint system as a partial differential equation and you apply too many boundary conditions, you may find that you've constrained the solution to such an extent that there is no solution, and that's obviously what we want to avoid.

But, I think, fundamentally, the industry recognized that there is merit, from a safety standpoint, to add criteria to the existing regulations that would control air bag inflator output, and that's why in the petition for rulemaking from August of last year, included in that was a proposal that we add such criteria in laboratory tests. We thought that was a good idea and I think we need to work on getting those specific criteria established.

DR. ELLINGSTAD: Thank you.

MR. PARKER: Could I address that question, because I think it's a critical question. What's been mentioned the last couple of days are dummy size, test speeds, seat location, etc. You can actually certainly take that too far, very easily. NHTSA mentioned yesterday a number of issues for the driver and passenger, and test conditions and dummies, and if all those were independent conditions, you end up with 1,000 additional tests for the driver and the passenger, and obviously you can't get to that point.

We would support, certainly, adding to the standard, a range of occupants, out-of-position tests, for example, additional tests for advanced technology performance, but I think you have to be very careful and pick the critical ones that should be in the standard and not get carried away and add too much to it.

CHAIRMAN HALL: All right, well, let me get into the final question here and then we'll see if any of the panel have any comments. This is something both Elaine and I have an interest in, and I may want to defer to her. We're going to have depowered air bags, and I know that we just had this rule announced Friday before this event, so that maybe there's things that need to be flushed out there. But I'm kind of interested in, if I go down and buy a suit and it's the wrong size, I can pretty well look at myself in the mirror and know it's the wrong size. Now, clearly, the title of this panel is "Is a One-Size-Fits-All Approach Appropriate for Today's or Tomorrow's Passenger Vehicle Population," and I'm not sure that I know exactly what the answer is. Assuming that the answer is no, should consumers have the right to know about depowered air bags, so that we don't repeat the situation that we had in the past that only through accident investigation and only through finding out the facts do certain segments of the population know that either specific models or specific types of vehicles are not safe for them? Now I just come down on the side that, all the NHTSA research, all these salaries up here are paid for by tax payers, most of the profits of General Motors or any of the automobile companies come from the sales, and what do you think is the consumers right to know about the depowered air bag? Assuming you're going to do the sled test, which automobile manufacturers were interested in, and NHTSA going to get us, hopefully, if we ever have a situation again, the first dummy that will be developed is a child dummy, not the adult male dummy. What are we going to know this next model year in regard to what type of air bag is in our vehicle so we can get the level of confidence back up with the public on air bags? Because, I think, we all agree it's an important safety device.

MR. LANGE: Chairman Hall—

CHAIRMAN HALL: I'll pick on Mr. Lange, because he sells 5 million a year.

MR. LANGE: And we wish there were more. Chairman Hall—

CHAIRMAN HALL: Well, Saturn does an outstanding job in Tennessee of selling product. They should have kept that second plant in Tennessee, but that's okay.

(General laughter.)

MR. PARKER: So does Nissan, I think.

CHAIRMAN HALL: That's right.

MR. LANGE: I appreciate your comment and I'll take the feedback about it. Chairman Hall, I think you ask a really important question and one to which there truly is not an easy, straight-forward, technical answer. The distinctions between vehicles that have air bags configured for the old 208 test and those that have air bags configured for the new, more field-relevant 208 test are going to be extremely difficult to explain to consumers, and we're going to have to find a way to do that.

Consumers do have a right to know, and we'll have to satisfy that right. But, I think, fundamentally, more importantly and what we must not lose sight of, and what I think a forum like this is so important for, is to make sure that we go away with an understanding that what all owners and occupants need to know are the simple, basic things that they should do to keep themselves safe, no matter what power level of air bag inflator they have in their car or truck, or even if they don't have an air bag in their car or truck, or what kind of advanced air bag technology they might have in their car or truck in three years, or five years, or ten years down the road.

Today, yesterday, and tomorrow, the answer is the same for all of those conditions and that is we must work harder, more diligently, and, I think, with a real rededication to get everybody here in the United States to wear seat belts, to properly restrain children, to use child restraints that are age and weight appropriate for the child, put children in the back seat, and to not use rear-facing infant seats in the front seat of a car or truck. I think that the work you're doing here is extremely important to us in that effort. I am looking forward with great anticipation to the initiatives that the Clinton Administration is going to undertake to increase seat belt usage here in the United States. I think that Administrator Martinez and Secretary Slater have just a tremendous opportunity to have a bigger, more positive effect on motor vehicle safety here in the United States than any prior administrator or secretary, if we can reach the goals that President Clinton is setting out. And as an industry, we are extremely interested in working hand-in-hand with the NTSB, with the NHTSA, and with the DOT, to see just how far we can go in that regard, and we think we can go as far as we need to go.

CHAIRMAN HALL: Mr. Parker and Mr. Lund—Mr. Parker, I do acknowledge that Nissan has a very important facility in Smyrna, Tennessee.

MR. PARKER: Thank you. I'll say the same thing, slightly differently. If you look at the estimates of depowering that have been supplied to the docket in response to Depowering Notice of Proposed Rule Making, the biggest benefits are for a belted occupant. So the message is wear your safety belts. The biggest disbenefit that's been identified is in higher speed crashes to unbelted occupants. You fix that by wearing your safety belt. So I endorse entirely what Mr. Lange has said, you must wear your safety belt to get the biggest benefit from the occupant restraint system that's in vehicles, and I would say that to promote the most effective part of the occupant restraint system, we need to continue to educate, to improve safety belt use laws, and to increase enforcement of those laws.

CHAIRMAN HALL: And would you go so far as to say it might be the responsible thing for government if we're going to require the air bag in the vehicle, to require the seat belt to be fastened and buckled?

MR. PARKER: Yes, yes.

CHAIRMAN HALL: Now, Mr. Lund?

DR. LUND: Mr. Chairman, I think you start out your question by going back to the title of this session. I think that's a good place to go, does one size fit all. And I think it's important that we recognize that, in fact, all sizes of people, with the exception of children, have been benefiting from the air bags that are in their cars. So that's the first thing to keep in mind.

Short-statured drivers, some of whom have been injured by their driver air bag, nevertheless, there are others whose lives have been saved as a result of having air bags. So in that sense, one size is fitting all.

I think the particular problem with the title to this session that I have is it implies that somehow if there had been regulations all along, that 208 test with the 95th percentile, the 50th and the 5th percentile, that somehow air bags would be dramatically different than they are now. I'm not convinced that's true, because the key thing is not the size, it's location. It's like real estate, location, location, location, those are the three most important things. Where is the occupant when the air bag deploys?

In that sense, a small statured occupant can do things for themselves now in the real world market. If they're in the market for a new car, they should sit in that car, if they're the driver, and see does this car have enough adjustability for them to get themselves a reasonable distance away from the steering wheel. If they wear their seat belt and can adjust the seat, and the pedals, and the steering column so that they can drive comfortably, they will be protected by that air bag in serious collisions.

CHAIRMAN HALL: Well, your organization can probably do more than any organization in terms of helping get that message out and I know you're beginning to do that, because, the main reason, people always like to impact their insurance rates. If you're going to give a credit, for an air bag and a credit for a kid to have good grades, you can get people's attention.

So any other comments from the panel before we go to break? Has everybody had their full say? Mr. Dalmotas, we tried to make you the Prime Minister of Canada there. Do you have any closing things that you want to say?

(General laughter.)

MR. DALMOTAS: No. I guess, commenting on the title, I think we can do better than one size fits all, at least the next one size fits all with depowering, I think, we view as a better one size fits all. Safety is an evolutionary process.

We had essentially one-size-fits-all seat belts for a long time. We're still trying to improve them, today.

I agree with some of the earlier comments. From a Canadian perspective, obviously, the thing that the Americans are doing wrong is that you just can't get your seat belt use rates up to the right spot, and the sooner you do that, the happier Canadians will be also, because we like to have a nice, harmonized market and, obviously, it's hard to do that when your seat belt use rate is low and ours is very high.

CHAIRMAN HALL: Well, I compliment you on that. I greatly thank this panel, we will take a break and reconvene at the top of the hour, at 11:00.

(Whereupon, a short recess was taken at 10:40 a.m.)

Panel 2

Complexity of Implementation of Depowered Air Bags, Switches, Suppression Devices in Newly Manufactured Vehicles and Cars In Use

CHAIRMAN HALL: On the record. And we'll ask Mr. Downs then to begin this next panel, which is on the subject of the complexity of implementation of depowered air bags, switches, suppression devices in newly manufactured vehicles and cars in use.

MR. DOWNS: Thank you, Mr. Chairman. For the benefit of the record, gentlemen, you should please state your name and corporate affiliations. We can start with Mr. Camp.

MR. CAMP: Yes, I'm Lou Camp with the Ford Motor Company, Director of Automotive Safety and Engineering Standards.

MR. DAHLE: Dave Dahle, Morton International, Automotive Safety Products, Vice-President of New Technologies.

MR. GREENHAUS: Douglas Greenhaus. I'm Director of Environment, Health, and Safety for the National Automobile Dealers Association.

MR. HAENCHEN: Dietmar Haenchen, Volkswagen of America. I am Process Leader for Vehicle Safety and Testing.

MR. NUSHOLTZ: Guy Nusholtz, Chrysler, Technical Specialist.

MR. DOWNS: Thank you. We've heard a number of references to air bag depowering. For the purposes of those who may not be familiar with this, can you tell us what this is all about, and can you summarize the key advantages and, most importantly, the disadvantages? I'd like to start out with Mr. Dahle.

MR. DAHLE: With regard to depowering, and we've had considerable discussion over the last day and a half to me it means a less aggressive air bag deployment, at a slower rate or a lower total pressure, and, again, from a supplier, you can look at that in different ways, how to achieve it, by reducing output of an inflator and/or by making some geometrical or mechanical changes.

Even though it was addressed quite a bit in the previous discussion, I'd just like to say or echo the standpoint that from a consumer, it is going to be difficult to understand because you have a wide variety of vehicles and a wide variety of air bag performances, and when you depower some, you still may not be at the level of others. So, I think, we do need to proceed with caution.

I think a pro is that it will reduce the potential for injury to occupants who are too close, and particularly out-of-position occupants. You have maybe more opportunity to optimize a system with this depowering approach and it can be accomplished the most quickly of anything that we know, that we can participate in, in order to reduce the aggressivity.

A con would be that, certainly, I think, for unbelted, in high severity crashes, you're going to have some loss of protection. My biggest concern with a con would be that people would think that depowering will prevent, in particular, out-of-position injury or injury to out-of-position children. It will reduce that potential, but will not prevent it.

And, again, I just want to echo our support from the standpoint of continuing the education about air bags and safety belts, to get everyone to buckle up and to put children in the back seat. And I think we need to emphasize that there are a lot of vehicles out there which do not have air bags or passenger air bags. The buckling up and putting children in the back seat applies just as well to them. And that we do need primary seat belt laws enacted and enforced.

MR. DOWNS: Thank you. The next question I'd like to address to the manufacturers. The question is can you give us a summary of what's involved in order to accomplish depowering, and I mean without getting too technical, step-by-step what a manufacturer goes through in order to implement this? And I'll start with Mr. Camp.

MR. CAMP: Well, thank you, and I'm glad to be able to explain this in a little bit more detail. Because, really, the first step that we undertake is using computer models and out-of-position kind of testing with the 5th percentile female and the 6 year old child. Even though they're not regulated, as we discussed before, we use those as the first screening of how much we can depower and how we can achieve the intended goal of having a 5th percentile female essentially being on the bag and a 6 year old being within 4 inches of the air bag in those out-of-position situation. We model and use out-of-position dummy testing to get to a depowered air bag that will achieve acceptable injury acceptance values, as we discussed. The dummies are intended to measure those.

Then, we go back and verify, using the sled test, that level of depowering will still provide the unbelted 50th percentile male the kind of performance that we believe we need to comply with the regulatory requirements.

So there's a two-step process there, looking first at the out-of-position, the depowering intent, and then to go back and verify that the unbelted 50th percentile male is still in compliance with the governmental requirements. And all this is aimed at coming out with a safe, effective, and reliable air bag system, when put into production.

MR. DOWNS: What might be the implications, for example, on the larger size occupants, 95th percentile male, for example, if you're going to be depowering—removing some of the gas—does that mean you might not have enough reserve gas in the higher speed collisions for the larger size?

MR. CAMP: Well, again, the sled test that we have, with the addition of the neck criteria that has been an added requirement, we believe will ensure that the air bag remains powerful enough to provide the protection in the situation you mentioned, along with the high speed belted testing that we comply with. As Adrian Lund mentioned earlier, there is really no field data that would indicate that current air bags are not powerful enough. We do not believe there's a significant downside risk to the larger, unbelted male as a result of depowering.

MR. DOWNS: Thank you. The next question I'd like to address to Mr. Nusholtz. Can you offer any estimate of what proportion of the automobile fleet might be expected to be depowered?

MR. NUSHOLTZ: By when?

MR. DOWNS: Short term and long term, I'll let you define the dates.

MR. NUSHOLTZ: I really can't speak for the whole industry. I can only give you my estimate on what I think most of the manufacturers are going to try and do, and I would expect that there will be several levels. It will be an on-going process, it won't stop. And that there will be continual tuning, trying to improve the system, and the systems will advance continually at each year.

The original proposal that AAMA put in indicated that at least the first pass of what we're calling depowering, or making the bag more friendly, would probably occur within two years. Some vehicles will start to appear out in the field as early as six or nine months after the final rule, which was on Friday.

MR. DOWNS: And is that your long term—say two years, that's your long term expectation?

MR. NUSHOLTZ: Well, let's sort of go back to a definition of what depowering means. Depowering is related to the rate of transfer of energy to the occupant. And if I come over and I punch you real hard, that could hurt. But if I just push you out of the way, you might be just annoyed that I've done that. And I could have transferred the same amount of energy to you with either the punch or the push. So what can happen in depowering is you can keep the same amount of gas in the bag, but change the rate of the gas going into the bag, or you can change the temperature, and so you've depowered the bag but you've still kept the same amount of gas in it.

Right now, the fastest way to depower is to just remove some of the gas, so you're doing both, you're removing gas and you're changing the rate. But, as we develop procedures for analyzing and figuring out how to make the bag more friendly, we could potentially come up with bags which have the same amount of gas as the bags today, but actually transfer much less power. And so I would see that there would be a continual process of trying to improve the bags under the new standard to meet the conditions that we set forth to try and make the bag more friendly.

MR. DOWNS: Even given the timing circumstances of some of your higher speed crashes, where you have to get the bag out and in position well in advance of the occupant translation?

MR. NUSHOLTZ: We don't have to do that anymore because of the sled test.

MR. DOWNS: I'll relate back to the sled test, is the sled test representative of real world crashes?

MR. NUSHOLTZ: It depends on how you want to define relates to. We evaluated some test data that's currently in the literature, in which they looked at average acceleration for a number of crashes. And what the sled test represents is a 30 mile an hour crash and the average acceleration for that 30 mile an hour crash. Now that seems to actually be a little bit more severe than most of the crashes that occur, but it's much less severe than a 30 mile an hour barrier.

The question will be is it soft enough so we can depower the air bags far enough so it will be basically benign, and by benign, I mean not introduce any fatalities. Is it really soft enough so that we can make the air bag benign enough and still meet the conditions of the sled test, we don't know yet. We would still take a considerable amount of work to find that out.

MR. DOWNS: So what you're saying, I'm taking, that there's going to be a certain learning curve involved here for the next several years before the sled test is fully implemented, and comparing that against real world data, is that a fair assessment?

MR. NUSHOLTZ: Yeah, it'll definitely be several years before we find out what the effect of changing to the sled test is.

Our estimate would be that it'll definitely be an improvement, and I think a previous panel has also indicated that.

MR. DOWNS: Thank you. Moving on to our next subject, which I'd like to have Mr. Haenchen address, is that of cutoff switches. Can you give us a brief review of what's involved for a manufacturer to install cutoff switches?

MR. HAENCHEN: Well, first of all, let me say that we do not favor cutoff switches for vehicles that have rear seating positions where child seats can be used. We believe that there is a lot of potential for misuse and actually would be unfavorable in the accident statistics.

I don't think we plan to have cutoff switches installed in such vehicles that have rear seats that can be used, unless it is somehow required.

There is some demand in Europe for either deactivating or using cutoff switches because, especially in Sweden, there is some need for using—or some more demand for using rear facing child seats in the front. For the U.S. market, I see really more of a problem, that has to do with the responsibility that is expected by the user of the vehicle. In Europe, there are obviously belt use laws, but also in many countries laws to put the children in the rear seat. I think that if you use cutoff switches for vehicles where child seats can be used in the rear seats, you are kind of giving the wrong message and you're really making it available to people who intend to do something that's not very committed in the first place. And those people might not really be the best people to always put that switch in the right position.

I would think that for vehicles that don't have rear seats, that those switches might be appropriate and we have seen them. But we don't have any such vehicles right now we don't have any system for retrofit, at this point in time.

MR. DOWNS: Okay, thank you. I'd like to jump that same question over to Mr. Camp, from an American automobile manufacturer's perspective. Again, what do you envision would be the problems to implement such a device?

MR. CAMP: I guess, the problem depends on how widespread the deactivation and the potential for switch use is. If the deactivation continues, as we believe it should be, to be limited to those cases where there is a medically-demonstrated need to deactivate, we think those kinds of situations are relatively low volume and fairly easy to deactivate, if you will.

Now there's several ways you can do that. In the short run, we're allowing deactivation—or we're accomplishing deactivation where allowed by the use of a shunt, if you will, that would replace electrically the air bag and allow the diagnostic module not to be flashing a light. We think that kind of an approach is preferred to simply disconnecting or, a worse thing, going in and cutting an air bag, for example.

MR. DOWNS: That's the system that you have in the Ranger, I believe?

MR. CAMP: No, no, I'm talking now if a person comes in with an approval letter from the U.S. Government saying they're allowed to deactivate because of a medically-based need, either driver or passenger air bag. So I'm talking about the retrofit issue.

MR. DOWNS: I'm going to get to the retrofit in a moment.

MR. CAMP: Oh, you're talking about future models?

MR. DOWNS: Yes, The OEM problems with implementing the switch, for example?

MR. CAMP: Well, again, there's no physical problem with doing it, in terms of the technology. Our concern, as Dietmar mentioned, is primarily the perceived disbenefit of air bags now being not in proportion to reality, and too many people, we believe, would disconnect, if there is a switch available, that shouldn't be and they lose the opportunity that the air bag provides.

MR. DOWNS: And it would be better to have a switch, for example, if it was installed by the manufacturer, to have it automatically cycle upon the re-ignition of the engine? In other words, it can be manually shut off and then have it recycle back on automatically every time the engine is turned back on.

MR. CAMP: I think that would be a classic case of a misuse of the switch, because say a mother goes into a store with a rear facing child seat in her vehicle, she had the air bag disabled, goes in and shops with her child, comes out, puts her child back in that seat, turns the car back on and the car automatically was reactivated. That would be terrible, because, at that point, the rear facing child seat occupant would be in danger because the air bag would have been automatically reactivated. That would be a typical kind of scenario that we would not want to have occur. So these switches should remain off, when switched off.

MR. DOWNS: So purely a manual device rather than an automatic device that would bypass the human problem of forgetting?

MR. CAMP: Yeah, we believe the switch that's in place on our pickup trucks, for example, is an appropriate example of a system that does work and work well in those cases where you can't place a child in the rear seat.

MR. DOWNS: Right, thank you. Our next question, I'd like to address to Mr. Greenhaus. If it was required, what would be involved to retrofit cutoff switches in the used vehicle fleet?

MR. GREENHAUS: Well, I can't tell you exactly what will be required, but what I think is important, that NHTSA, and we've recommended to them that they do this, that they set in effect a performance standard that outlines, at the very least, some basics of what should be involved in a deactivation using a cutoff switch. That's what we like to call it. And we think, by the way, that that is the preferred option for deactivation.

Of course, deactivation in any circumstance should be limited to just those few circumstances where clearly the benefits of turning off an air bag, even temporarily, outweigh any risks.

But, certainly, some of the technical issues that we've already talked about, whether or not the bag should be on or off and should there be a default on or not is something that's got to be addressed. Also, that the check light for the remaining bag, if one is just having a switch for one bag or deactivating one bag, the check light obviously has got to be fully functional for the other. That's important.

We believe there should be some clear diagnostic protocols so that a dealer or other service facility can tell whether or not all these lights and switches are functioning properly on a routine basis.

But, again, you know, I can't tell you exactly what the best option is. I've discussed a little bit with some of the technical folks, with the manufacturers, and there seems to be several different approaches that one could technically use to deactivate a bag.

MR. DOWNS: Can you give us a few examples of what was indicated to you?

MR. GREENHAUS: Well, again, Ford Motor Company, I believe, General Motors, and perhaps Chrysler, in the future, are planning to have these switches in new motor vehicles. If it can be done in a new motor vehicle, it can be done in a used motor vehicle, not necessarily all across the board with all makes and models, I suppose, but with kits properly supplied by the manufacturer and with proper instructions, complying with whatever NHTSA outlines should be involved in a retrofit, you know, the dealers will be prepared to install them.

One thing, also, I would mention is that I don't know if they already exist, but one could easily imagine that the after market will also be interested in supplying switches to have an on/off capability for air bags, and that's something that should be, of course, equally regulated.

MR. DOWNS: How will the NADA, for example, handle deactivation, if somebody has a letter from NHTSA?

MR. GREENHAUS: Well, like I said, the most important thing is that NHTSA sit down, especially not only with the existing fleet, but with the fleet that will have depowered bags, and look at both of those fleets, and probably look at them separately, to determine where the benefits outweigh the risks. Certainly, I think it seems like, from what's been said already at this hearing, that a rear facing child seat in any circumstance where you don't have any rear seat is going to be a candidate for deactivation. Serious medical conditions, a bit undefined, I think, right now, could have better definition and maybe some of those conditions will be, if you will, addressed by the depowering, whether—not necessarily addressed with the existing air bags. So there may be a different universe, I think, is one point to focus on.

Dealers right now are getting and have for some time been receiving requests from consumers with the letters that NHTSA has already issued, and they have, on a case-by-case basis, decided whether or not they want to exercise their option to go ahead and deactivate the bag. NADA, when a final rule finally comes out with deactivation, will let folks know what the rule says and what the procedures are that one has to comply with, and then ultimately it will be the dealer's individual decision.

MR. DOWNS: Thank you.

MR. ROBERTS: Mr. Greenhaus, have all dealers received information from the manufacturers as to how they should deactivate a bag, assuming one comes in with that request?

MR. GREENHAUS: It's my understanding that relatively few manufacturers have provided their dealers with a formal procedure on deactivation, at this point.

MR. ROBERTS: Is that causing a problem for dealers now?

MR. GREENHAUS: Well, it makes them, I believe, a little more reluctant to perform a deactivation than they might otherwise be, if they could follow a step-by-step process. Perhaps, also, if they were supplied with labels—again, labeling, procedures for transfer of a motor vehicle, procedures to help encourage reactivation were all things that were discussed in the pending rule making, and we'd like to see those become part of the process.

MR. ROBERTS: Has NADA asked the manufacturers or given thought to asking the manufacturers for explicit directions on how one should deactivate, if that was deemed necessary?

MR. GREENHAUS: We've discussed the issue with manufacturers, yes. And I—I think once deactivation is allowed and the scope is clearly set, that you'll see manufacturers, to the extent that they want to allow deactivation or they want to provide that to their customers, supply their dealers and the after market repair industry with clear direction.

Remember, this is not—this will never be a mandate. The way it works, of course, is that NHTSA has the render inoperative prohibition and what they're working on is to make it clear what will not constitute rendering inoperative—make it clearer with respect to deactivation or retrofitting cutoff switches. And the way that works is it will always be the manufacturer and dealer’s option. So I can’t say with certainty what the manufacturers will do.

MR. DOWNS: Thank you. Moving back to inflation, I’d like to address Mr. Dahle on this question. Multi-stage inflation, maybe you can describe a little bit about that, it’s tie-in perhaps to the sensing system, various inflation/suppression systems have been described over the years, and so on, prospective new technology and so on. Can you give us any insight as to what this is all about?

MR. DAHLE: Do you want to keep it to more on a depowering option, as opposed to an advanced, or smart, or adaptive air bag system?

MR. DOWNS: Well, we have a separate session this afternoon on advanced technology. I want to maybe review a little bit what’s currently available or what had been available in the past, and not so much dwell on why it’s not implemented now but what it’s all about.

MR. DAHLE: With regard to multi-stage, you can look at it a couple of different ways. One, that you can have two separate chambers with two separate ignition sources and send two different signals at different times, so that you can get a whole variety of inflation rates which will cause the bag then to deploy at different rates and to different maximum pressures. Or you can have one type where you might have a built in delay, if you will, that can be mechanical, a pyrotechnic delay, or a even chemical type that you can get a lower performance at a predetermined point, predetermined before it’s assembled into the vehicle, and then the inflation rate will increase and you will get a higher level performance. You have the different options.

MR. DOWNS: Would these be tied in, for example, to an occupant sensing system, to become even more sophisticated?

MR. DAHLE: To me, that’s where they are most beneficial, because if you look at pros and cons in that, there are probably two types of out-of-position injuries that one has to be concerned with, and one is certainly if you have an occupant, a child or adult, in close contact or right against the module as the air bag deploys, you could have a punch out force which has the potential for imparting injury.

You also have a potential even if you are back and that occupant is moving forward, that even if you have with an S-shaped curve, depending on the rise rate in that second part, that a membrane force, if you’re just moving into it, that you would then be able to impart still some injury. It would work for those out-of-position occupants directly against it, but you still have that potential for imparting some injury.

And I agree with Dr. Mertz from yesterday that if you have a situation, particularly with children, where they are out-of-position or getting out-of-position, it’s best to not deploy. And that’s why I don’t see that particular application without proper sensing being the solution. It can certainly help in some situations, maybe make it worse in others.

MR. DOWNS: Well, it sounds to me then, by all this discussion over the last couple of days, occupant positioning sensing is becoming more and more of a critical element to the entire system performance. Would that be a fair assessment?

MR. DAHLE: I think that's true. In order to try and do the most for the wide range of population and still having some concern for the unbelted and higher speed applications, although again our position is if you look at a hierarchy, belted, out-of-position, then unbelted, proper sensing, with a modulated inflation, can give you the best chance at providing protection to the whole range of accident situations.

MR. DOWNS: Okay, thank you. The next question I'd like to address again to the manufacturers. I'll start out with Mr. Nusholtz. What's involved to implement the inflation suppression or the multi-stage inflator technology from a manufacturer's perspective?

MR. NUSHOLTZ: Let's start out with a multi-stage and what that's about. I think Mr. Lange tried to explain that what's really important is the curve or the generation of the curve, what comes out of the inflator. The inflator can be viewed as a black box and it doesn't matter whether it's multi-staged or single-stage, as long as it produced an output which is appropriate for the conditions that you are trying to meet.

MR. DOWNS: And by the curve, you're referring to a standard inflator tank test, SAE tank test?

MR. NUSHOLTZ: A tank test would be one way of characterizing the response. And you may be able to have a multi-stage, and we've already in a certain way, you can view that we've already got a lot of multi-staged out in the field now, they've just been primarily tuned for the FMVSS 208 vehicle crash. Some of the hybrids basically have two cylinders and—internal cylinders, and, therefore, you can ignite one, which will then trigger the other, or you can have one trigger and then later ignite the other. But it depends on how that curve is generated and how it comes out and fills the air bag, which is really what's important.

If you can do that with a pyrotechnic, a single-stage, then that's the same thing as a multi-stage, and you cannot tell the difference as far as the occupant is concerned.

There's a couple of ways to look at it then. You may take the approach that we sense the occupant, and if the occupant is within a certain distance, and we haven't defined what that distance is, then you just shut the air bag off and you don't use it.

And if he's past that distance, then you just trigger the air bag with whatever curve that you have in there, and that may turn out to be the best option that you have.

CHAIRMAN HALL: Distance from what?

MR. NUSHOLTZ: Distance from the air bag, center of the air bag.

CHAIRMAN HALL: Do you agree with the ten inches?

MR. NUSHOLTZ: Well, it depends on how you want to define it. Ten inches is not a bad estimate. We've done a lot of basically computational studies and some experimental studies, and it looks like that ten inches should handle most cases, but we are able to find some configurations in which ten inches doesn't quite work, and the question will then be do those things ever really commonly occur. So you really can't define what—that if you're ten inches, you're okay, if you're at nine inches, you're not okay.

CHAIRMAN HALL: But you will have to, at some point, if you're going to have that type of system?

MR. NUSHOLTZ: If you're going to have that type of system, you're going to have to—we're going to have to figure it out. We're going to have to go through the process and determine what type of risk are we willing to take with what type of distance.

So one approach would be just shut the system off when the occupant gets too close, and then just have one inflator curve or one output energy, and that would be designed to minimize the risk past, say, a certain amount of distance, in this case, ten inches.

Another approach would be to add complexity to the system, try and figure out what type of crash the vehicle is going through, and if it is going to a certain type of crash, you deploy the air bag in a certain way, you fire maybe one chamber; if it is going to be another type of crash, you maybe fire both chambers; at which case, you have to know what is the crash severity and, two, where is the occupant at each point in time.

The difficulty here—one of the difficulties that we run into is what is the cycle rate, what is the update. A lot of systems now that are being looked at are 100 to 400 milliseconds type of cycle rate. But an occupant can move a huge distance, can move all the way to the panel or all the way to the steering wheel, in 100 milliseconds. Right now, some of the studies that we've done indicate that we may need a cycle rate as little as a millisecond and we also have to predict the velocity of different parts of the body. So now you have to sort of get an entire image of where the head is, where are the hands, where is the torso, what is the velocity of those places and where are these things at each millisecond.

So this then becomes a high level of complexity that we somehow have to address if we want to figure out all those things, as well as the crash severity. The crash severity is another thing which is very complicated to figure out because the sensors right now can only tell what has happened and what is happening at that moment. They don't know what's going to happen, sort of like predicting the stock market. You know where you are at a certain point in time, but you don't know where it's going to go. You know, you may guess and you may be 50% right, and that may be okay for stock markets, or you may even be 80 or 90% of the time correct, and that's much better, and that's fine for a stock market, but for knowing what the severity of the crash is, that's probably not acceptable.

So those are the type of levels of complexities and difficulties that we're going to have to address in trying to implement the new advanced technologies.

MR. DOWNS: Okay, great. Thank you very much. That concludes my questions, if anybody else on the panel has anything.

CHAIRMAN HALL: Well, we'll move to the tables. Table Six, and please identify yourself.

MR. DITLOW: This is Clarence Ditlow from the Center for Auto Safety. Mr. Greenhaus, what information about depowered air bags will be conveyed to consumers by dealers and what information would NADA recommend dealers supply to consumers?

MR. GREENHAUS: To be honest with you, we haven't really thought about that issue. As you know, the rule just came out at the end of last week and there are no vehicles that are being sold currently, that I know of, that are—were specifically designed in compliance with that new rule. Obviously, it's only a few days old. So I think we will work with the manufacturers to see if there is some useful information that should be provided to customers that will not, at the same time, risk interfering with a very important effort that we're all involved with, to make sure that there are no mixed messages, that everybody understand, as has been repeatedly stated, that the most important thing, no matter what your air bag system is, is to wear those belts, to have the kids properly seated, preferably in the back.

MR. DITLOW: Mr. Nusholtz, GM earlier testified that it already uses lower power inflators in trucks and vans not subject to FMVSS 208 unbelted test. Does Chrysler use a similar design philosophy and use lower power inflators in its trucks and vans?

MR. NUSHOLTZ: I'm trying to recall whether we do—I do believe we may have a few cases where we have lower powered inflators in trucks and we then certify with a belt.

MR. DITLOW: Okay. Mr. Dahle, what is the comparative lead time for dual stage inflation, and the other alternatives under consideration, such as the more optimized depowering discussed by the auto companies?

MR. DAHLE: Let's take depowering. We, along with many of our customers, the auto companies, have been looking at what is depowering, how do we depower the various technologies, for several months now, and that we have been providing samples and will continue to do that, so I think the lead time will be for some vehicles, that we would be able to support certainly the beginning of model year '98.

It probably can't be done, even from our standpoint, across the board, due to the wide variety of inflator technologies and the limits on how many different samples we can provide at any one time, and change drawings and specifications, but we can certainly support the introduction on a number of models for model year '98, and then as we go we continue to provide those models.

If you look and, again, from our standpoint, in dual level or multi-chambered inflation, I think we can only speak from a suppliers standpoint and that'll be probably addressed more deeply across the board this afternoon in advanced technology, but it is probably in the model year '99 that we have available the multi-chamber, multi-level performance. Now when I say model year '99, when we're available, there still has to be integration into a vehicle, so it's a couple of years away, from that standpoint, and production ready.

CHAIRMAN HALL: Table Five?

DR. LUND: Thank you, Mr. Chairman. I'm Adrian Lund, representing Table Five, and I'm with the Insurance Institute for Highway Safety. I think we have three questions. The first one is for Mr. Greenhaus. I'm curious about the emphasis on switches as opposed to say some sort of reversible deactivation of air bags for those who are particularly concerned. I understand there is a lot of resistance to deactivation per se.

If I had a very short wife for whom I really was concerned about air bag deactivation—take that however you want.

(General laughter.)

DR. LUND: I would want that inflator deactivated.

CHAIRMAN HALL: People might have short husbands, too, so—

(General laughter.)

DR. LUND: I don't have one of those, though. But I wouldn't want that inflator to have a switch that might get reactivated without her knowledge, if that was truly a concern. If I were carrying a rear-facing infant restraint in the right front passenger seat, I wouldn't want another user to reset that switch without my knowledge and have me make a mistake when I then put the rear-facing infant restraint in the front passenger seat.

The point is, I'm an average consumer. I think most of us are fairly average. We all make mistakes. And I think if you put switches in, people are going to make mistakes with them. So I'm curious, why the emphasis on switches as opposed to deactivation?

MR. GREENHAUS: Well, NADA has come down to a decision that essentially when all is considered, and there is, I would probably admit, some unmeasured risk of someone doing the wrong thing for the situation, but I guess we have a little more confidence in our customers and the American motorist to take advantage of the option and to maximize protection of the air bag depending on who the occupant is. Obviously, that's the advantage that a switch has over and above a complete deactivation.

If your brother-in-law is driving that car in the driver's position or your sister is sitting in the passenger seat at a time when you're not using it for your infant, then you might want to have the benefit of that air bag for those particular people.

Also, when you have a switch installed, you don't have to worry quite so much about the issue of what do we do when that vehicle is transferred, because assuming the switch is still operating correctly then the benefits of that switch will follow the vehicle, whereas if the vehicle has been deactivated and the purchaser doesn't necessarily want that deactivation, unless they know and there have been precautions put in place to ensure that they'll know that the bag has been deactivated, we could have some problems.

DR. LUND: A follow-up question for Mr. Camp. Ford has said that they have seen no evidence of misuse or abuse of the switches that are already in their pickups and I'd like to understand better what that means, that is it's really kind of a three part question. A, What kind of data is that decision based on; B, when you look at pickups, and I don't know how you're doing the survey, but do you find that the switches in pickups are usually turned on or turned off when you see them; and how do you decide whether that's abusive or not?

MR. CAMP: We have not done any major surveys on that. As a part of some early customer surveys, however, we looked at vehicles that came into our surveys and looked at which position the switch was in when the people got out of their truck and went over to answer some other questions. We then observed whether or not, for example, there was a rear-facing child seat in the front seat.

What we found was that in some cases, perhaps maybe 10% of the cases, the air bag was turned off even though there was no child—rear-facing child seat or other child seat in the front seat. Now whether, you know, that would be termed as abuse or not, I guess, is relative.

It could be that the child seat or there was only one passenger in the vehicle, the driver, for example, which is usually the case, and the owner chose not to have the possibility of the air bag deploying if there was no one over there and maybe incurring the insurance costs. There may be some of that feedback from other customers in terms of liking a switch.

In the most cases, though, where the air bag was deactivated, in fact, there was a rear-facing child seat there. So we are very encouraged with the fact that that was the case. And in no instance did we find a seat that was there without the air bag being deactivated. So all in all, we were extremely pleased in that one relatively small survey with the use of the switch.

DR. LUND: Did you see instances where there were adult passengers with the switch turned off?

MR. CAMP: No. No, we did not see that. That would truly be misuse.

DR. LUND: Okay, one more question, Mr. Chairman. For Mr. Dahle, you said early on, Mr. Dahle, that depowering will reduce the effectiveness of air bags for unbelted in high severity crashes. Now do you mean by that, that it will reduce the effectiveness for all unbelted occupants or just properly positioned, unbelted occupants?

MR. DAHLE: I certainly meant no intention of saying that for any out-of-position occupant, be it unbelted adult or child, that it would reduce the level of protection. I happen to agree with your position and that of Mr. O'Neill, that for unbelted, out-of-position, depowering is right. And, again, I would agree that depowering is the right thing to do, at this time, and could be most expeditiously accomplished.

DR. LUND: Thank you.

CHAIRMAN HALL: Yes. Table Four? It's fine if you have no questions.

(General laughter.)

MR. PARKER: George Parker, Association of International Automobile Manufacturers. I have a question about the cost of retrofit cutoff switches, would that be a costly procedure and difficult procedure? Maybe Mr. Camp could address that?

MR. CAMP: In the comments that we submitted to the rule making, we outlined a range of costs of potential deactivation scenarios ranging from a simple shorting via removal, up to the shunt that I talked to earlier, on up to the most customer friendly, if you will, switch scenario. In that possibility, the range of costs were around the $100 to $130 cost range.

When we talked about cost in our response, we were talking about the variable cost and material cost to the Ford Motor Company, if, for the switch, and the wire, and the harness, for example, with no profit, for those components, plus the labor that it would take a dealer to install the switch for the customer. So, if you will, that's what we called the cost, which is really just the dealer labor and our material costs, that would be in the range of upwards of $150.

MR. PARKER: Could you imagine a situation where an owner might want to have the cutoff switch removed at some point in time?

MR. CAMP: That's possible, but with the switch, we believe its main advantage is the flexibility of being able to turn it back one way or the other, and then it seems like it would be less likely to be—wanted to be removed. Although, that's possible and if it were, it could be easily removed by simply disconnecting it and reconnecting the wiring harness that it basically went in series with.

MR. PARKER: That's the only question we have.

CHAIRMAN HALL: Okay, Table One?

MR. BISCHOFF: Don Bischoff, National Highway Traffic Safety Administration. Question for Mr. Greenhaus. Why are some dealers reluctant to deactivate for letter recipients? If they have liability concerns, why not have the customer sign a waiver of liability drafted by your lawyers?

MR. GREENHAUS: Well, the issue of liability is a real one and it does play a role, and I think on a case-by-case basis as to whether or not a dealer decides to go ahead with deactivation after the customer has shown them the letter. But I don't think it's any more or less a concern than it is generally speaking.

Certainly, it's kind of hard for dealers to understand how, all of a sudden, they should be disabling a safety device, especially since there is a law that says that normally you shouldn't be doing that. So even with a letter saying that we will not fine you if you disable this air bag, there are still some concerns.

Can there be a waiver, can there be a statement which the customer would sign which says I promise to indemnify you for any and all liability arising out of this deactivation, I promise to hold you harmless, I waive all rights, you know, however many lawyers in this room would draft such a thing, sure there can. Will that keep a dealer from getting sued if, unfortunately, there is an accident, probably not, not withstanding the fact the dealer might ultimately win that lawsuit. It's really up to each dealer's decision. I've heard as many stories of the dealer going ahead with the deactivation as those that haven't. And I think most customers will find someone to deactivate their bag, once they've gotten that letter.

MR. BISCHOFF: Question for Mr. Camp and/or Mr. Nusholtz. How long would it take to develop cutoff switches for retrofit application, if deactivation were permitted?

MR. CAMP: Well, I'll answer that for Ford, at any rate. We're in the process of designing the switches that would be put in place, if there were a deactivation, either abroad or continued to be metered by NHTSA. The decision in which way to go tooling wise is really the critical issue. The design of that, we're in process of doing. The decision on what volume to tool for is yet to be made, depending on what kind of deactivation is permitted.

If it becomes on-demand, which we don't particularly like because of we believe the misapplication and the frequency of that occurrence, there would be a very high volume potentially. If it continues to be metered on an as-required by medical conditions, we'd be able to do that relatively quickly, because of the low volume.

In any case, the design work is going on to permit those switches being available in the very near term.

MR. NUSHOLTZ: We're in somewhat of a similar situation. We're going through the process of evaluating the design of the switch, what we need the switches to do, and then we'll have the same questions depending on the volume.

MR. BISCHOFF: Question also for Mr. Camp and Nusholtz, in Mr. Lange's remarks on the previous panel, he indicated that a depowered air bag moves the danger zone for children from eight inches to four inches. Do you concur with this statement and do you feel that other changes can be accomplished which further reduces this danger zone? I note that the title of this session included suppression devices, but I've heard very little thus far about them.

MR. CAMP: I'll go first. It was the first I have heard that it moved it from eight inches. I'm not sure what today would be viewed as a safe range. I think that, much like the driver's side, depends on all sorts of different kinds of factors.

Nevertheless, we do agree that the objective is to be able to move a six year old dummy within four inches and still sustain acceptable levels of injury reference values.

As far as the suppression, if you get closer to that technology, I think we've been talking about earlier, involves a whole next generation of occupant sensing that has a whole series of concerns which, you know, we will address this afternoon in more detail.

But the depowering piece of it, we probably depowered it about as much as we can without suppressing and the four inches may end up being about the limit with simple depowering.

MR. NUSHOLTZ: I'm not exactly sure where the limit currently is. There is some indication that it's more than eight inches. Certainly, we should be able to depower the bag, so as far as the four year old or the three year old is concerned, it's relatively benign at four inches.

There is still a lot of work that can be done. Once we're given the option to use the sled test or not to design for an aggressive type of pulse, and we have a much larger time budget, it is possible that through development we could even bring that down further. We won't know that until we process through our analysis either with testing or analytical models.

You had another part of your question about suppression?

MR. BISCHOFF: Yeah, what technology for suppression is on the horizon?

MR. NUSHOLTZ: Are you talking about dynamic suppression? I think we sort of discussed that previously. The type of technologies that I've seen are an imaging type of technology that locates the position of the occupant. But, like I mentioned, it probably is going to have to know the position and the velocity of several components of the body. Then we have to determine what is the minimum aggressivity we're going to have in the air bags and still meet whatever other requirements that we have. And there's a lot of other tests or a lot of other conditions that we have to address.

Once we have those type of technologies available, and right now the ones I've seen are infrared, ultrasound, capacitive coupling or electric fields, microwaves. And one or a combination of those may be used to try and image the subject. Generally, you have to have multiple arrays of sensors trying to detect it, crossing it through some sort of imaging device or a neural-network that makes the decision of whether you're going to suppress it or not.

Currently, I haven't seen a device which meets any of the requirements that we would have, but certainly a lot of work is being done and, potentially, sometime in the future one may exist.

MR. BISCHOFF: Thank you, Mr. Chairman, we have no further questions.

CHAIRMAN HALL: Thank you, Mr. Bischoff. Table Three? Any questions, Table Three?

MR. LANGE: Thank you, Mr. Chairman. Bob Lange from General Motors Corporation. The first question is for Mr. Dahle and I think it's a fairly simple—I hope it's a simple question. In response to Dr. Lund's question about depowered air bag effectiveness, I may have misunderstood your answer, but I have the impression that you gave an answer that contemplated a condition in which an unbelted occupant would stay in position throughout the duration of a collision event. You did not mean to imply that unbelted occupants remain in fixed positions during collision events, I don't think?

MR. DAHLE: No, I did not. And, again, I think what I was trying to convey was that if you have an unbelted adult and that unbelted adult either is out-of-position at the beginning of the event or translates into an out-of-position during the vehicle crash and prior to the air bag deployment, then that adult will be benefited by a depowered air bag.

MR. LANGE: Thank you. Mr. Camp, this question is for you, please. We've had some discussions about whether or not depowered air bag modules might be suitable for retrofitting into other vehicles that are already on the road with bags that are currently powered to satisfy the unrestrained segment of FMVSS 208. Can you comment on whether or not such a thing would be possible?

MR. CAMP: In some cases, as we, I think, heard yesterday, it may be possible in that the parts may literally fit. I mean the first thing you'd have to do, for example, on either the driver or the passenger side, would be able to fit the depowered bag, if you will, into the instrument panel or column of the other vehicle. You know, they have to literally fit together. If that were possible, then you'd have to go back and assess the performance of that new combination. And, obviously, the vehicle originally would have been developed and tested and proven out in the field with the original air bag in place. The question would be what is the performance of the resulting system with the depowered bag.

Unless there was a literal A to B in that manufacturer's production, where the only thing that had literally changed was the air bag so that they had run test with the full powered as well as the depowered, and know that it worked in the real world, was safe, reliable, and effective, if that very small possibility occurred, then maybe you could retrofit in the real world. But, otherwise, we'd have no assurance that the depowered matched system would in fact work well as a system, including the vehicle structure, the restraint system, the instrument panel, and the air bags in total. So it would be a very unlikely circumstances that all those things would allow a retrofit.

MR. HAENCHEN: I think that certainly, technically, you could come up with a possibility to retrofit, but it's also a question of the cost, and I totally agree with what Mr. Camp said, that obviously you have to find out whether the parts fit, and, if not, what kind of parts can be made available. But certainly the customer would have to pay for that, and I don't know what the cost would be but I would expect that it is fairly high, if you replace two air bag units in a car.

The other issue that wasn't mentioned here is that, right now, it wouldn't be allowed because the vehicle has to meet the requirements of the standards at the time that it was produced, so it would require a change in the standard. And I think that might be able to be done, but certainly that needs to be addressed as well.

MR. LANGE: Thank you. This is a question for Dr. Nusholtz. I think there may still be some confusion about the ten inch spacing between an air bag module and a driver chest placement as to whether or not that's a static measure and how that might change during the dynamic event of a collision. Can you comment, please, to clarify the significance of the ten and four inches?

MR. NUSHOLTZ: The ten inch measure is primarily designed to give some sort of understanding to an individual, primarily a short-statured person who will sit close to the steering wheel.

The basic recommendation would be is to sit as far away as you can from the air bag. If you can have you hands outstretched or your arms outstretched and still be comfortable, then that's the type of thing that you would want to do.

If you get more than ten inches or twelve inches, or whatever number that you are using, from the center of the hub, that would be a static measurement. Where do you sit when you're driving, are you closer than ten inches, are you two inches from the center of the hub? If you're two inches and that's the only place you can comfortably drive, then perhaps you might want to have it deactivated. However, if you're ten inches away and you're wearing your belt, the risk is probably minimal.

MR. LANGE: We've had some discussion yesterday and I think earlier today about the complex characteristics of some collision events, like pole collision events, where the pulse may first be read as a soft pulse and then, all of a sudden, become more severe. Would any of the manufacturers care to comment about the complexity of setting threshold limits concerning those kinds of crashes?

MR. NUSHOLTZ: Do you want me to start?

MR. CAMP: Go ahead.

MR. NUSHOLTZ: Okay. This is an extremely complex type of problem and it's similar to the analogy I was using previously with the stock market. The sensors currently do not know what's going to happen, and you can have two events which are identical up to a certain point in time, and that time might be your decision point, and then you decide, well, I should fire the air bag, and that might be the decision based on that history. But you could have an uncountable infinite number of changes to that crash pulse after that point of time.

The only thing that we can do is try and run a series of crash tests, some into a barrier, some into poles, some into stuffed animals, a whole range, curbs, we go over rough roads, we try and figure out what are going to be some of the crash pulses. There is no possible way to figure out all of them. And we make the best estimate, and you can only make the best estimate that you can of what's going to happen. And that's in the current system.

Now we're going to try and figure out higher level complexity. We're going to figure out is it not and then fire, but it's going to be do we fire this and do we fire that. Right now, there doesn't seem to be enough information to really make that decision on a reliable basis.

We could probably design a test, like a barrier test, in which we could run 12 miles an hour into the wall and it will make the decision every time, and then we run 17 miles into the wall and it'll make the decision every time. But if you go to a pole test and the pole test strikes the right side of the car, it may give you a different answer than if it strikes the left side of the car. And if you get hit from the side and get hit from the front, it's going to give you a completely different trajectory, and right now we don't have the logic or the understanding of how to make that decision.

MR. CAMP: I'd like to expand a little bit upon that because the crash-sensing issue is, to me, the first order of requirement. The systems today, which I prefer to think of as very smart as they are, have a very reliable crash sensing system that's electromechanical. As you probably know, in a typical system, there is a ball retained by a magnet that only under certain deceleration rates does that ball break free and close an electrical circuit. That fairly simple electromechanical system that we have today is very reliable in terms of its mechanical and electronic reliability, but what it has to do when it tries to determine whether to fire an air bag or not, again, as Guy mentioned, has to address a whole series of real world kinds of occurrences.

In the case of a pole, for example, the deceleration as sensed by a crash sensor is relatively soft in terms of a crash test, but it's still very severe in terms of a real world deceleration. And I think all of you have experienced slamming on your brakes as hard as you can, or going around the corner as fast as you can. The physical limits there are in the range of 1 G. Well, 1 G you know, in the real world, that's very severe. As you probably know, unbelted, you will end up being thrown forward in a severe brake stop.

A pole test, a pole impact is a little bit more severe than that, yet the crash sensor, which has to make sure it works in a very aggressive, maybe 17, 18, 20 G barrier crash test to be able to get the bag up in time before the occupant gets into the bag, this sensor has to do both those things. It has to get the bag up, in the case of a pole test, before the occupant moves into the bag.

So these initial kinds of sensors are relatively simple but have to do a whole broad range of spectrum. So, as a result, we have relatively low thresholds that have been talked about here to address some of these real world possibilities in terms of soft, hard pulses, and also in the case of people who don't wear their belts. So that really established the floor of the threshold with today's devices.

Future devices, as we move forward, we're just getting to, what I think, is smart one in terms of sensors of having an electronic sensing of the acceleration rate in deciding whether or not to deploy the bag, let alone something that says how severe is it to drive a variable rate inflator. The threshold sensing in terms of accident severity, to me, is the first challenge in smart air bags, in terms of driving variable rate inflators.

The occupant sensing question is even more difficult, which I think you're going to hear later on, and the risk of it being tripped are extremely high. So when you talk about sensors later on today, try to differentiate between crash sensing in terms of severity and occupant sensing in terms of how robust they are in preventing problems.

The worst thing we can do is have unreliable systems out there. They need to be reliable and virtually absolutely reliable. And our worst nightmare is having a system that is not reliable. And, therefore, we're very prudent in the way we verify performance, monitor it, and change it, if necessary.

CHAIRMAN HALL: Okay. We're going to move on, if we can, to Table Two, and—

MR. LANGE: We have no more questions.

CHAIRMAN HALL: We're going to have some discussions this afternoon, a panel on deployment thresholds and advanced air bag technology, so do we have any questions for the panel on the topic that we have?

MR. JARBOE: Pat Jarboe, Autoliv North America, question for Mr. Nusholtz. What about the addition of additional proximity sensors, would that allow for improve crash detection, for example pole, and allow for higher thresholds for the central electronic sensor?

MR. NUSHOLTZ: One of the problems, as you add more information to the system, you increase the ability to make a decision because now you've got multiple sensors coming in, multiple pieces of information.

The downside of that is that you now have a higher complexity of system. Most of the manufacturers, or my understanding of what's happening is that you're going to a single type of sensor primarily to reduce the complexity and to increase the reliability of the system. So you're making some sort of trade off, and exactly where that's going to do and how much benefit that'll give us is very difficult to say, at this time.

CHAIRMAN HALL: Other questions? If not, we'll move to Mr. Osterman, any questions?

MR. OSTERMAN: No.

CHAIRMAN HALL: Mr. Arena?

MR. ARENA: Mr. Nusholtz, we're hearing a lot about the variables with respect to occupants in crash sequence. What are the manufacturers doing about designing, perhaps, a comprehensive recording device that would be within the sensor, to record all these events so in a post crash examination, we can look at the events that took place and better understand the technology, and make some improvements?

MR. NUSHOLTZ: There has been some work done with recording actual real world crashes. It's very limited. The problem that I think we're going to face in trying to do that is privacy. People really don't want to know what happened or they don't want it to be made public in exactly what happened during the crash. You would have things like you could automatically register whether they're wearing the belt, what their velocity is, and they, perhaps, don't want to have that to be made known. So that's going to be one of the problems that we'll have to face in doing that.

MR. ARENA: Thank you.

CHAIRMAN HALL: Mr. Sweedler?

MR. SWEEDLER: No questions, Mr. Chairman.

CHAIRMAN HALL: Dr. Ellingstad?

DR. ELLINGSTAD: Just very quickly. Mr. Camp has made it very clear that he opposes a cutoff switch that would reset itself. I'd just very quickly like to ask Mr. Nusholtz and Mr. Haenchen if they agree?

MR. NUSHOLTZ: Go ahead.

MR. HAENCHEN: Well, I do agree with Mr. Camp that a switch that resets has several problems. I mean he mentioned as one scenario where a mother comes out and the child seat is being put in the vehicle again, or maybe it is even left in the vehicle and she just goes and does something, and then goes back into the car and switches the ignition on, and then she has an air bag that's activated and she is unaware of it.

It could be even worse in situations where, for some reason your car stalls and you try to restart it, and then you are faced again with the situation where the air bag is activated and the driver, in that situation, is unaware of it.

So even with somebody who is very conscious about resetting the switch every time, you will find situations where he or she might not merely remember to do that. And I think that's a very critical item and, therefore, I would agree that the switch should be in the position that it was manually set.

MR. NUSHOLTZ: It appears that there are more—there's always—trade offs in this type of situation with the automatic versus the manual switching, and it would appear that there is a little bit better condition if you are able to turn it automatically and not have it—or turn it manually and not have it automatically set.

CHAIRMAN HALL: Okay. Any other questions up here? If not, I've got one or two questions and then we'll see if the panel has any closing comments. Mr. Greenhaus, does the Automobile Dealers Association make available a list of their member dealers who will deactivate an air bag, so if a consumer could get a letter from NHTSA, they don't have to run from dealer to dealer, looking for somebody?

MR. GREENHAUS: Well, Mr. Chairman, right now we do not have such a list. It's possible in the future something like that could be put together, if, indeed, each dealer sits down and decides he's going to have a policy across the board that he's going to either not deactivate across the board or deactivate across the board.

CHAIRMAN HALL: Do you all give them any guidance in that area or—

MR. GREENHAUS: Well, our guidance, again, is focused primarily on what the law requires and—and give them best guidance we can on how best to comply with the law. Obviously, the law is very simple right now. We have these letters and we don't have any of the protections with respect to labeling and transfer notice, and etc., etc. There is no waiver on the street.

When the new regulation comes out from NHTSA, again, we'll probably give them guidance specifically how to comply with it, so that the deactivation is correct. But as far as ultimately whether or not they should or shouldn't be deactivating, that's left up to each dealer to decide.

CHAIRMAN HALL: Okay. Mr. Dahle, you're an air bag manufacturer, your company?

MR. DAHLE: That is correct.

CHAIRMAN HALL: Now is there technology that's available today that's not in these automobiles, that would solve these problems? You know, I keep hearing people say, well, the air bag manufacturers say they have this technology, but they won't fess up to it because the manufacturers don't want them to. So I thought, we've got a public meeting here, is that correct or not?

(General laughter.)

MR. DAHLE: I can speak for what we have and we—

CHAIRMAN HALL: How many air bags do you make a year?

MR. DAHLE: This year, we'll probably—including both driver, passenger, and some side—about 24 million inflators.

CHAIRMAN HALL: That's a fairly large number.

MR. DAHLE: And we do not have developed technology that is not in a vehicle, at this time. We are working on multi-chamber technology which will allow us to support—and we would anticipate it in support of an adaptive system that would make decisions at the time of a crash. But we do not have developed technology. Others will say they are closer, or others will say that they have it. I can only speak from our company, and I think this afternoon, you will see for the automotive occupant restraint council, which is a broad representation, a discussion of technology and when it will be available.

CHAIRMAN HALL: Well, we've had a little experience recently with Mr. Pierre Salinger saying that we knew something that we don't know, and if you know something that we're not being told, this might be a good opportunity to do it. But there's no technology today to address this problem that we're having in terms of either a two-stage or multi-stage type of inflator that—

MR. DAHLE: Not that we have. And, again, it's my opinion that in order to do the job correctly, you will need some type of more sophisticated sensing to go along with that multiple-stage. If it's just preprogrammed, it will help in some situations, but it is no panacea, it will not correct all situations.

CHAIRMAN HALL: All right. Well, this has been an excellent panel and I appreciate everybody's participation. Do any of you gentlemen, would you like to make any closing comments or anything else that hasn't been discussed that you think would be a benefit to be put on the record? And I'll just start with Mr. Camp and we can go down the line, and there's no penalty if you don't want to add anything.

MR. CAMP: I just appreciate having the opportunity, and thank you for listening. I think all has been said that needs to be, at this point. Just buckle up and put your kids in back.

MR. DAHLE: Again, I would just echo what Mr. Camp said, that we believe that it is proper and right that everyone should be buckling. There has to be some individual responsibility in this and that comes back to the—and we don't make cutoff switches, but when it comes to a cutoff switch, if there is one, it should be limited and people should be able to accept some individual responsibility there.

We think the continued emphasis, the emphasis this will give I think this forum is good, that it gives emphasis, it will give more education, and we need to keep stressing that, that buckle up—everyone buckle up and put children in the back.

MR. GREENHAUS: Just one point, Mr. Chairman, regarding retrofit of technology which was discussed briefly with respect to depowered bags. NADA does have the position that it would be proper for NHTSA to remove any legal impediment to allow for whatever retrofittable technology conceivable that can be devised. We think that, obviously, there are serious technological issues and, perhaps, some cost barriers, but if something can come out on the street, including some of the smart technology, there could very well be a market for it. Obviously, I think everyone has seen people in pre-'96 cars driving around with high-mounted stop lamps. Now that's not a very good analogy because it's much different technologically, but folks interested in safety may well be willing to retrofit some of this technology.

MR. HAENCHEN: I would like to take the opportunity to comment on these advanced technology stage inflators and so on. Obviously, we have been talking to manufacturers and seen some promising solutions or some promising designs. However, we haven't really had a chance to test those ourselves very well. And, obviously, I do agree that they require advanced sensing systems. So we are not in a position to install those in the very near future.

And the other thing that needs to be considered, some technology that looks very promising sometimes turns out really to have some disadvantage somewhere that we didn't discover in the initial assessment.

But I do feel that there is a very good chance that advanced technologies will be coming forward in the future and will benefit and will improve the air bag performance in the field. And I appreciate to be here.

CHAIRMAN HALL: Thank you.

MR. NUSHOLTZ: A couple of comments primarily on depowering. It may turn out to be that even for the larger adult, that depowering won't have any negative effects. In other words, right now, it's hypothesized that when you reduce the energy or the mass flow into the bag, that that might be detrimental to the larger adult at higher velocity. But it could turn out that that may not be detectable and that it will be so small or it may not exist at all.

Another thing associated with depowering is we may be able to depower the bag or tune the bag, now that we have a less aggressive pulse to work with, in such a way that you won't need cutoff switches. We could—for the driver. For the passenger, that's a much bigger challenge. But for the driver, it looks more feasible that given a couple of years, we might be able to come up with a system in which the cutoff switch will not be needed.

So if you're wearing your belt and we're able to tune the bag to a much less aggressive pulse, I think you're only going to end up with a positive benefit.

CHAIRMAN HALL: All right, well, thank you very much. And this, again, has been an informative panel. We will now take a recess or a break for lunch, and return and begin promptly at 1:30.

(Whereupon, a luncheon recess was taken at 12:20 p.m.)

Afternoon Session

(Time Noted: 1:30 p.m.)

Panel 3

Discussion of Deployment Thresholds

CHAIRMAN HALL: On the record. This panel belongs to Mr. Roberts. We'll turn it over to him. If you like the panel, you can give him compliments or demerits after it's over. Vern?

MR. ROBERTS: Thank you, Mr. Chairman. This is what's simply known as the threshold panel, which is a simple one-word definition for something that is highly complex. I think if we could have two words to explain threshold, it would be crash discrimination, which is really what's more properly to be discussed here today.

I would like to ask initially for each of the panel members to introduce themselves, for the record, with their general background and affiliation in this area, starting with Mr. Breed.

MR. BREED: David Breed, Automotive Technologies International, which is a small research and development company specializing in sensors, occupant sensing and crash sensing, and formerly president of Breed Technologies.

MR. DALMOTAS: Dainius Dalmotas, Road Safety and Motor Vehicle Regulation Directorate. I'm with Transport Canada and I do crash worthiness testing.

MR. KALLINA: And I am Ingo Kallina, Vice President of Mercedes Benz, and I am responsible for passenger car structure and safety.

MR. SCHERBA: My name is Mick Scherba, and I am with General Motors in the Safety Center, primarily involved with air bags and seat belts.

MR. WERNER: My name is John Werner, Assistant Director of Research, Auto Technology, State Farm Insurance Companies.

MR. ROBERTS: Okay, thank you. We'd like to start this off with a discussion of crash sensing and specifically I'd like to ask Mr. Breed to briefly discuss what a crash sensor has to do, and the types of sensors. If you could do this, please, in language a layperson could understand but won't bore the technical people here, as well.

CHAIRMAN HALL: What he's trying to say is, can you get it down to the level the Chairman can understand it.

(General laughter.)

MR. BREED: I'm sure that will not be a problem, Mr. Chairman. May I have the first slide, please?

(Slide 1 shown.)

MR. BREED: We've all heard a lot about crash pulses and I thought I would just make a couple of comments about what a crash pulse is and how we analyze a crash pulse. This is the acceleration trace that you get when you crash a car. The car starts out, in this case at 35 miles per hour, and that's the velocity of the crash until it hits zero, at which point, it bounces off the barrier and is rebounding with this velocity. And the crush of the vehicle, how much the vehicle is crushing in a barrier is represented by this line.

And so when you're looking at the vehicle from a standpoint of observing the vehicle hit the barrier from outside the vehicle, this is the type of crash pulse that you get.

Could I have the next slide, please?

(Slide 2 shown.)

MR. BREED: When you're looking at it from the standpoint of the sensor designer, we turn the situation around somewhat and look at the crash pulse as if you are in the car, riding with the sensor, and the front part of the car is accelerating back at you. So we turn the acceleration around and plot it in the plus direction, and when we integrate it, then we get the relative velocity of the front of the passenger compartment, relative to the occupant, and we get the displacement—relative displacement of the occupant—relative to the passenger compartment.

And in the old days, the rule was you had to trigger an air bag 30 milliseconds before a person has moved 5 inches. So we would take this displacement out to 5 inches, subtract 30 milliseconds from it, and that would then give us the required firing time for a sensor.

Now, of course, this is all based on assuming where the occupant is. And in the future, as we get occupant sensors on cars, then we can take that into consideration and do a heck of a lot better job than what we're doing now.

One of the key factors, if you'll notice that the car has only changed its velocity by a few miles per hour at the time that the sensor has to fire. Sensors are predictive. They have to predict that the passenger compartment is going to undergo a significant velocity change before it happens. And as anyone knows and as Guy was saying earlier today, whenever you predict something, you're going to be wrong sometimes. So crash sensors are never perfect.

There is—can I have the next slide, please?

(Slide 3 shown.)

MR. BREED: There are really two pulses in a car, one where the car is crushed and one everywhere else in the car, and here it shows two places back in the car, one actually fairly far forward, which is the shock tower, and the other one on the B-pillar, and you can see the velocity is almost exactly the same up to the point that the crush hits the B-pillar—the car crashes back to the B-pillar. Can I have the next slide, please?

(Slide 4 shown.)

MR. BREED: In contrast, if you look at the forward part of the car, such as the radiator support, you'll see the velocity change, changes very radically at the radiator support. So there's really two places you can put a crash sensor in a car, one is where the car is crushing or in the crush zone, and the other place is anywhere else in the car because they all see pretty much the same crash pulse.

There is much more information, as you can see, that takes place in the crush zone, so potentially it's much easier to sense crashes in the crush zone, and most of the crash sensors that have been on cars over the years have been sensors that are mounted up front in the car.

There is a theory of how you design a crush zone sensor, which says that if you want to predict that the velocity of the passenger compartment is going to change by a certain amount—the threshold, basically. Then if you measure that that velocity is taking place somewhere else in the vehicle, then you use that to predict that it's only a matter of time before the front of the—or the passenger compartment changes.

When you start measuring the crash somewhere else in the car, it's very, very difficult to come up—in fact, I've never been able to come up with a theory that says how you design a crash sensor that works in the passenger compartment. And, basically, what people do is they try one thing after another, in kind of a trial-and-error fashion. And I think that you could probably come pretty close to proving that all successful crash sensors of the single-point variety are really subsets of what might be derived from a neural network. In fact, a lot of people have shown that neural networks produce, by far, the best crash sensors for the passenger compartment, even though there seems to be a reluctance to actually say that or to use that in vehicles.

MR. ROBERTS: Would you please define a single-point sensor or sensor system as compared to other types?

MR. BREED: Okay. When you're sensing only up front in a car, you usually need multiple sensors because the sensor has to be located in the crush zone. If you want to sense all crashes from one point in the car, that means you are located back out of the crush zone in the passenger compartment, and those are the electronic, single-point sensors that are based on algorithms that I contend are basically pattern recognition type algorithms.

MR. ROBERTS: Mr. Breed, what thoughts can you share with us from a sensor supplier standpoint as to the kind of interaction that goes on between the sensor supplier and the vehicle manufacturer? What kind of information do you look for from the manufacturer, what do they give you, what kind of give and take is there between the two parties before a final sensor design and placement on the vehicle is achieved?

MR. BREED: The car companies generally will give you a library of crash data of the type that we saw on the first slides, and ask you—and tell you when they want the sensor to fire, and ask you to design a crash sensor which will meet all of those criteria.

Now that library might have 20 or 30 crashes in it and as well as a variety of rough road and abusive data where you don't want the air bag to fire, and also a number of crashes that are below the threshold where you do not want the air bag to fire.

MR. ROBERTS: Is that primarily barrier crash type pulse data or you have a variety of other real world, pole, car to car, whatever, pulses?

MR. BREED: The crash libraries that I have seen have tended to be not terribly representative of the real world, but still reasonably diverse. For example, it's rare that you see a crash that does not involve the bumper. And yet if you go and observe crashed cars in the real world, about 40% of them don't involve the bumper.

MR. ROBERTS: I'd like to get Mr. Scherba's thoughts on the same general issue, as far as any additional comments that you could make, please, Mick, regarding sensor types, sensor placement, where you think the market is moving in an overall sense, general discussions on threshold, how it's set and all the factors that go into this, and what we're learning as time goes on?

MR. SCHERBA: Well, maybe at the beginning here, I'll take a few moments and try to explain the concept of thresholds, and what they mean, and how they are set, and then that might help lay the foundation so that we have a more uniform understanding of some of the concepts I'm sure that will be discussed later on the panel here.

I think, first off, it's important to understand that establishing thresholds is a very complex task. It requires a knowledge of structural deformation of the vehicle, a mechanical engineering understanding of that. It requires a—a biomechanics understanding of human injury tolerance. It requires an electronics understanding of crash sensors and a mathematical understanding of algorithms and so forth. So it's really a complex task that requires knowledge of all those different disciplines.

Secondly, I think I'd like to clarify what is meant by thresholds. Thresholds are not necessarily a discreet point, and we heard some earlier comments yesterday that they really occur over a range of crashes, and that range is dictated by the type of object you hit, whether it's a soft crash or a hard crash, it's a function of the vehicle structure, how long the front end is. It's also a function of the type of sensing systems, whether they are acceleration-based, or electromechanical, or whatever.

And that range really has an upper bound to it and a lower bound. That upper bound of the deployment range is sometimes called the all deploy threshold or all fire threshold, and then there is a lower bound which is the no deploy threshold.

That upper bound, that upper threshold, if you will, at least in our General Motor vehicles, is typically around 15 miles per hour into a flat concrete barrier. And so maybe I'll stop a minute here and just mention that crash severity is really what we're after in trying to establish threshold. They're often referred to as speeds, like 15 mile per hour into a concrete or flat immovable barrier, but it's really the rate of change of speed deceleration that a vehicle goes through, and that's a measure of crash severity and that's what we use to set thresholds.

I might also mention that when we say 15 mile an hour upper threshold, it may seem like a relatively low speed type of crash, but an analogous situation might be an athlete running at about 12 or 15 miles an hour and you tell that athlete to run into a brick wall. And that's basically threshold of human injury at which we begin to establish our all deploy or all fire threshold. So while it sounds benign, 15 mile an hour is a relatively severe crash.

Another element that needs to be understood, I think, is the timing involved with a crash. And, again, by reference here, a human being can blink their eye maybe in 100 milliseconds or 100 thousandths of a second, or a 10th of a second, so we're really talking about very short durations here. And in that 100 milliseconds, really 3 events have to take place.

The first stage of that 100 millisecond crash, the sensing system—electronic sensing system is recording information from the crash sensors. It's picking up that data, it's processing it through its algorithms, and it has to, in the first 10 to 20 milliseconds, make a decision—make a prediction, as the term that was used earlier—predict whether this is going to be a severe crash, deploy the air bag, or whether it's going to be a chuck-hole and you don't want to deploy the air bag.

The second stage of that 100 milliseconds is when you begin to inflate the bag, and you have about 30 to 40 milliseconds allowed to bring that bag to full inflation.

And then the third portion of the crash, the remaining 40 milliseconds or so, is really when the occupant comes into contact with the bag, begins to compress the bag, and the bag absorbs the energy in about 40 milliseconds.

So in 100 milliseconds, the blink of an eye, the crash is sensed, inflated, and ride down occurs, and it's all over in the blink of an eye.

And I guess the last concept I'd like to get across is when dealing with thresholds, the automaker attempts to establish that threshold point by balancing different categories of occupants. For example, if you were to raise the threshold, you may have less lower speed deployments and, therefore, potentially less inflation-induced injury at the lower speeds, but you could have put a different population of occupants at greater risk or provide less protection, and those would be occupants who are involved in what we talked about earlier, some of the soft/hard type crashes. So there's a large population of crashes, about 70% or so in the frontals, characterized by angles or offsets or car-to-car or car-to-tree, and in these crashes you would, by raising the threshold, potentially have late deploys, allow the occupant more time to get out-of-position. As the occupant moves out-of-position and then you deploy, obviously, you have an undesirable situation.

So I guess those are some of the concepts I want to get across and then maybe get back to your original concept, your original question here on sensing systems.

MR. ROBERTS: The line of questioning I'd like to pursue is what changes do you see, speaking in the big picture, going on currently? Are thresholds changing toward one end of the spectrum or the other, as far as crash severity, or are sensor designs changing, sensor placement, are we eliminating certain types of crashes from the deployment envelope that we maybe included a few years ago?

MR. SCHERBA: Well, I think the development of sensing systems has been and will continue to be an evolutionary process where I think, the industry is trying to reduce that range between where you have a no deploy and an all deploy, trying to tighten that up, if you can, with more sophisticated algorithms or more advanced sensing sensors, if you will. And also, I think you'll see over time, some of the early sensors years ago of the electromechanical type and I think there's a trend toward more acceleration-based sensors. And these acceleration-based sensors allow you to process the information more quickly. And acceleration-based sensors will also allow you to better determine the crash severity and possibly modulate air bag inflation based on crash severity in the future.

MR. ROBERTS: These would be the single-point electronic type sensors?

MR. SCHERBA: That's one form, but there are other types of acceleration-based sensors, as well. They don't have to be single-point. Single-point refers to the sensing system. The sensor and the electronics, all being in one location in the vehicle, you could have an acceleration-based sensing system with additional sensors elsewhere on the vehicle.

MR. ROBERTS: What changes do you see going on currently in the market in as sensor placement, as far as up front, back with the compartment of the car, etc.?

MR. SCHERBA: Well, as I mentioned earlier, the whole concept of establishing threshold is quite complex and I don't think, since there is such a wide variety of vehicle structures, anywhere from a large, long vehicle with a long front end with certain crush characteristics, all the way to the smaller vehicles with very short, blunt front ends, each vehicle's structure has a crash signature associated with it and placing the sensors in different locations on the car or truck can allow a manufacturer to better optimize the performance of that sensing system.

I guess to answer your question, I don't think there is any single optimized location on the vehicle that works for all sizes, and types, and utility vehicles.

MR. ROBERTS: Thank you, Mr. Scherba. Mr. Kallina, what thoughts could you add to this, from your perspective, in your products and what you've seen throughout the industry?

MR. KALLINA: Well, I'm the only not speaking member here on the panel, so we agreed that I give a written statement, so it's much easier for me to express what Mercedes-Benz thinks about this issue.

MR. ROBERTS: Please.

MR. KALLINA: We appreciate the opportunity to participate in this timely and important forum. Having been the first manufacturer beginning in '81 to introduce the air bag into serious production, Mercedes-Benz has seen measurable improvement to vehicle occupant safety from the introduction and on-going improvement of air bag technology. Nevertheless, the issues being discussed at the NTSB forum are real and must be addressed.

The area of thresholds for air bag deployment offers a partial opportunity to address many of the issues raised at the NTSB forum. To accomplish improvements in the short-term, will require serious policy determination by the United States Government with respect to the overall goals of Standard FMVSS 208.

Let me begin with a general description of the Mercedes-Benz threshold philosophy and conclude with recommendations that would address issues being considered at this NTSB forum. If during the discussion any of the technical terms require explanation—but he has done it already, Mr. Scherba, excellently—please do not hesitate to request clarification.

The first issue in threshold determination is the means by which the vehicle will sense the prescribed threshold for implementation of the air bag. Mercedes-Benz has always used electronic sensor devices as single-point sensors. These sensors allow reliable and more sophisticated trigger time evaluation than mechanical sensors. This technology allows comparison of the deceleration time history of the vehicle to actually deceleration, to be calculated through integration of various input factors.

For instance, as Mercedes-Benz has started to modify its vehicle structures to provide increased protection in the case of offset crashes, it was determined that in offset crash, the manufacturer must modify its system to avoid late deployment.

Electronic sensors allow us to differentiate a full frontal crash from an offset crash for purposes of tailoring air bag deployment. This function is accomplished through microprocessor technology which allows the vehicle sensor to determine, based on the shape of the impulse curve, whether the deployment strategy should be a full frontal or offset crash, discriminate between the two, and appropriately deploy the air bag technology.

Mercedes-Benz strategy is to deploy the air bag only when needed. Thus, in addition to differentiating between crash types, the Mercedes-Benz sensor also has built into it, dual thresholds. The lower thresholds for the United States is 12 miles per hour. Again, it's a range which is required in order to meet the unbelted portion of Standard FMVSS 208. The higher threshold of 18 miles per hour is utilized when the vehicle senses that seat belts are in use. A belt buck switch provides the information to the Mercedes-Benz sensing system, to allow the differentiation between these two thresholds.

As previously noted—

CHAIRMAN HALL: Excuse me, is that on the U.S. product?

MR. KALLINA: Yes.

CHAIRMAN HALL: So it's unbelted is 12 miles an hour and it's 18 if you're belted?

MR. KALLINA: Yes. So, again, it's a range, it's not just one value. Again, it's a range, so the upper value is 12 and 18, they all deploy.

As previously noted, the lower threshold would not trigger an air bag deployment, but for the existence of an unbelted test requirement in Standard 208. Indeed, the higher threshold has been determined based on Mercedes-Benz accident investigation to represent injury risk of less than MAIS 3 for belted occupants.

Mercedes-Benz accident analysis also clearly demonstrates that above this second threshold, air bag technology provides clearly superior protection, compared to similar accidents with only seat belt technology. It is critical, of course, in this type of investigation to clearly differentiate injuries caused by vehicle intrusion which cannot be adequately addressed through air bag technology and those resulting from vehicle contact that is restrained through the use of an air bag. Obviously, continued improvements in the area of structural integrity of modern cars will also help address and reduce injuries resulting from vehicle intrusion.

In conclusion, in terms of threshold activation levels, Mercedes-Benz believes that the following two options should be seriously considered to improve the situation in the U.S. First, consideration should be given to the elimination of the unbelted test requirement which would allow for a single-point threshold value, that would address many of the concerns presented at the NTSB forum.

Second, joint research efforts should be undertaken to identify what improvements can be incorporated into electronic sensor technology, to obtain more information during a crash and use that information to better control air bag inflation.

This is a critical factor in developing smart air bag technology. Mercedes-Benz looks forward to a discussion of these issues and to further improvements of air bag technology. Thank you.

MR. ROBERTS: Thank you, Mr. Kallina. I'd like to move to the experience in the real world and particularly go to Mr. Werner, who has, I think, some data that he can tell us about; the source of the data, please; and what type of observations that you have seen, looking at that data, as far as how differences may occur in the real world?

MR. WERNER: Right. And these observations are inclusive of our review of several other studies beside State Farm studies of field performance, and this includes Canadian field study, Australian field studies, as well as others in the United States.

There are several points I want to make about what we observe relative to field performance of air bag systems relative to thresholds. First, there are significant numbers of air bag deployments, generally speaking, across most cars manufactured for the U.S., in low speed crashes. For example, field evidence points out that 25 to 30% of the deployments occur below 10 mile an hour Delta V. Seventy percent of deployments occur below 15 miles an hour Delta V.

Field investigations also point out that current air bags are more aggressive than probably what is required in these low speed crashes. We have observed more upper extremity injuries, facial injuries, but we would also like to point out that the vast majority of these additional injuries that were seen at low speed are minor in nature, AIS 1, although studies have pointed to the concern with upper extremity fractures in these lower speed crashes, and again this relates to the aggressivity of the bag in these low speed situations.

Third, we have determined, in a review of our repair estimate data where we write estimates on damages that result from air bag deployment, we track the deployment rates among various makes and models by model year, and in this review we have found that there is a wide variation among different makes and models relative to the air bag deployment rates and, therefore, thresholds.

State Farm, in collaboration with the Insurance Institute for Highway Safety and George Washington University, have examined injury patterns between two vehicles that have extremes in air bag thresholds. As a result of that study, we determined that we really, although limited in scope, we only reviewed a few hundred cases, we found that there really wasn't any significant trade off in terms of seeing differences in the profile of serious injury between the two vehicles.

What we did observe was that for the lower threshold system, the lower threshold vehicle—and these two vehicles were in the same market class, had similar profiles with respect to wheel base, and their 30 mile an hour barrier performance force curve—what we found in the lower threshold situation, that because of the aggressive nature of the bag in today's environment, that we did observe, particularly for short-statured folks, females that have the opportunity of sitting closer to the steering wheel, are experiencing higher rates of upper extremity injuries.

Also, the field research has determined that the additional harm for not deploying the air bag below 12 miles an hour Delta V for belted occupants is low. Our field experience indicates that there is a wide variation, as Mick mentioned to us. There is a wide variation, we feel, in the Delta V range between the no fire and the all fire conditions. This is likely a function of the electromechanical sensor performance characteristics. As Mick indicated, we understand that is an extremely complex procedure in terms of tuning and locating the sensors in the vehicle to optimize the performance of these sensors—electromechanical sensors.

So, in summary, that's what field investigations has shown us, the answer to your question, Vern.

MR. ROBERTS: Thank you very much. It begs a lot of other questions, I think. The data and analyses that you have done to date, are these in the public domain, at this point, or will they be?

MR. WERNER: They are in the public domain. SAE publications, etc.

CHAIRMAN HALL: How old are they?

MR. WERNER: I'd say there's been very aggressive work in this area completed within the last two years, '96 and '97, there has been several papers published.

CHAIRMAN HALL: And when you say field, you all hire accident investigators or what do you actually do? How do you get your information?

MR. WERNER: What we most recently did was to review our—

CHAIRMAN HALL: I might want to contract my people out so—

(General laughter.)

MR. WERNER: Okay. Well, we're also settling claims out there. But what we do is we have a procedure in place where our damages to vehicles are estimated using electronic estimating systems, and what this does, it allows us to determine what the point of impact on the vehicle is. We also can determine whether or not there has been an air bag deployment.

Along with that comes information to identify the claim file in question, and what we have done is to either interview our claim representative that was involved in investigation and ask the pertinent questions relative to occupant injury, or, in fact, we bring that claim file in-house and do an internal review of the file contents.

CHAIRMAN HALL: Do you keep information of air bag injuries?

MR. WERNER: Only in a special study situation.

CHAIRMAN HALL: Have you done any special study situations?

MR. WERNER: Yes. Most recently was this two vehicle comparison, the one vehicle with a high deployment rate, another vehicle with a low deployment rate, and we zeroed in on those two vehicles because we really wanted to investigate the overall performance differences, if any, between the two vehicles. And, as I elaborated, we did observe that on an overall basis, that the performance of these two vehicles are very similar in terms of mitigating serious injuries, but in terms of minor injuries in the low speed crashes, we did observe, obviously it's been reported here probably extensively, that we did observe more frequent upper extremity injuries and facial injuries.

CHAIRMAN HALL: And one last question, do you have a way of sharing this information, either through the Insurance Institute or with NHTSA? For what purpose are you putting this information together and how do you use it?

MR. WERNER: Well, gee, we'll wave the State Farm flag now, but we do it for the purposes of just our general goal of improving, contributing to the evaluation of air bag systems or safety systems, and the open sharing of this data with the auto manufacturers and the safety community. So we don't have any restrictions. The only restriction is time, resource, it is a very labor-intensive process to review these claim files. The data are not in all electronic form. You have to do very in-depth investigation. Unfortunately, insurance is often perceived as everything's—you know, we have maybe some of the best sophisticated systems out there. But, unfortunately, when it comes down to this level of detail necessary to evaluate a particular design, you do have to dig in manually to obtain this information.

But, again, we publish in SAE and other venues.

MR. ROBERTS: What recommendation can you make, at this time, based on your analysis?

MR. WERNER: What recommendations we can make on what, specifically?

MR. ROBERTS: As far as crash discrimination, whether we need to have industry-wide changes in one direction or another; again, whether we need to have the bag going off, for example, only in greater severity crashes than what we are, is that the kind of recommendation that I infer from your analyses?

MR. WERNER: Well, you've heard some of the concerns relative to raising thresholds. There are systems out there in the field today with higher thresholds, namely a GM subsidiary, Holden, has the Commodore in Australia, with a no-fire situation, 12 mile an hour Delta V or lower. That particular vehicle in Australia, although belt usage is quite high, 93%, is performing very well.

So in a belted situation, I believe we can really live with higher thresholds. In an unbelted situation, I think we continue to have to look seriously at what the trade offs are, and even in a belted situation, a 10, 11, 12 miles an hour, the onset of facial fractures occurs in that range, and what we're finding, I think, is that, in part, we are seeing the higher belt usage in our data, we are seeing that the interiors of vehicles are more friendly, we are seeing that the structure of the vehicle is controlling the crush better—likely than it was 20 years ago, so there has been a lot of improvement in the vehicle structure, there's been improvement in terms of increase of belt usage, but for belt use, where you have belt usage, I think we can live with the higher threshold.

MR. ROBERTS: One more question, Mr. Werner, what can you tell us about repair costs, for example, with passenger bags deploying frequently with no passenger there, is that a major burden to society or societal cost, or what other observations can you make on your data?

MR. WERNER: I've been asked that question many, many times. And I was getting tired of being asked that question without having a solid answer, so we, in fact, did dig into the details on that.

It's our position that the additional costs are minimal with respect to the additional deployments that we're seeing or the additional repair cost associated with deployment. So let me try to summarize what some of those factors are that led us to that conclusion.

First of all, air bag deployments are a rather rare event. For every 1,000 vehicles running around on the road today, those policy holders that are paying premium, the likelihood of a deployment in one year is only four of those vehicles will have a deployment in one year.

The average cost of when you have a deployment runs around $1,500 to $2,000 for a dual system. That includes the labor, the components, and the sensors, whatever is mandatory as required by the auto manufacturer. So, we're running $1,500 to $2,000. I will say that there are some exceptions out there where the cost can run as high as $7,000.

The issue of collateral damage, I would have to commend the manufacturers for looking at ways to reduce the collateral damage. What do I mean by collateral damage? I mean damages that are caused to the dashboard, for example, due to the deployment. Again, we see exceptions out there. For the most part, the manufacturers are very sensitized to this collateral damage and are designing their IP's, instrument panels, to minimize that. We do see additional windshield damages. But, on the other hand, we see windshields damaged at those levels of severity, anyhow. We also see the IP, instrument panel, damaged at those severities because of occupant impacts.

The other point I want to make is that as the vehicle ages, the market value drops. And at the level that these deployments are occurring, these vehicle have a high probability of being totaled out for salvage.

Now one might argue that, okay, this deployment pushed it over into a total loss. I'll agree with that. But, it turns out that in this green environment that we're in, there is additional salvage value, even though that we've totaled out additional vehicles. So when we run all these numbers and look at the net result of additional cost, we just think it is very minimal—I'll just say this, it's less than 5% additional premium cost in the first year of operation and it goes down from there.

MR. ROBERTS: Thank you, Mr. Werner. I'd like to move to Mr. Dalmotas and ask what observations in the real world that you have seen, clinical observations, both in terms of real world crashes in the Canadian experience, and also tests—full scale tests that you have done, as far as crash discrimination, proper sensing, i.e., the threshold issue, if you will, and occupant positioning at the time of deployment?

MR. DALMOTAS: Okay. I think I'll be brief. I think we've already had some excellent presentations. I'm not sure how much I can actually add to all the discussions. In Canada, again, we have a 93% seat belt use rate, so we view a lot of the collisions where air bags deploying are unwarranted.

Essentially, what we observe is that at the lower end of the collision severity spectrum, essentially, deployment of the air bag either does not prevent any injury, since there was little risk of injury to begin with, or may simply aggravate it. At higher collision severities, there is no question that there is benefit gained due to deployment the air bag, most notably in terms of head injury prevention and facial fracture prevention.

I think from all the analysis that we've done, and we published several papers on this issue, we would like to see a system very similar to the one that was described by Mercedes. We would like to see deployment thresholds raised to about 26 kilometers per hour—I'm going to confuse everybody because I'm from Canada and I have a hard time converting now back to miles per hour—but 26 is about, I think, what is a fairly optimum type deployment threshold.

And what I'd like to do is, if it's available, we have an overhead that in very simplistic terms, I guess, summarizes some U.S. data.

(Slide 5 shown.)

MR. DALMOTAS: This is National Accident Sampling System or NASS data, and this is an overhead I prepared actually for NHTSA's workshop, which tries to look at the issue of injury production as a function of Delta V from NASS. And here we see an analysis in NASS for the years '88 to '95, frontal damage only as defined by NHTSA. And what we're looking at is the mean number of individual injuries being incurred. The yellow bars basically denote the mean number of injuries, given deployment of the air bag. The blue bars denote the mean level of injuries in the air bag fleet, independent of whether the air bag deployed or not. And the pink bar denotes the mean level of injuries if you don't have an air bag in your car.

And what you can basically see is if you look at the pink bars first, as one would expect, as injury severity increases, so do the number of injuries that occur for the belted population, essentially no surprise. If you look at the yellow bar, what you basically see is that every time you deploy the air bag, you do release energy. Every time you release energy, you may hit someone with the deploying air bag, particular if they are further forward than we would like, and that incurs the risk of injury, most of the time being minor. But you can see that, basically, you have essentially a baseline level of injury risk every time you deploy the air bag.

And what you can also see is that in terms of the trade off for a belted person at collision severities essentially below 29 kilometers per hour, deploying air bag works against you, and above that speed, deploying air bag works to your advantage.

So the secret is to somehow come up with a sensor that basically never fires the air bag at below 26 and almost always fires the air bag above 26 reliably.

Now I'm not a sensor manufacturer, but that's really who we should be, obviously, talking to. Some manufacturers seem to have accomplished this already. We don't see that many Mercedes collisions, but the ones we have investigated, they are interesting.

At one point in time, before Mercedes had an occupancy sensor, if it was a low speed collision and the person was belted, the air bag wouldn't deploy on the driver's side, but would deploy on the passenger side, much to the annoyance of the driver. However, they're very interesting collisions to look at because we can go out in the field, and, we've got a passenger side air bag deployment, this was a low severity collision, the driver's side air bag didn't deploy, and we've never seen an injury in those cases to the driver. Now the drivers have always complained to us that the air bag didn't deploy, but when you ask them, well, were you injured, we never have seen so much as a scratch. Actually, I'm misleading you, we had one reported case where a guy complained of noise pain from the deploying passenger side air bag. That's the only recorded injury we've seen so far.

So basically what I'm saying is that our mass accident data say that the higher threshold would be good. The anecdotal data that we are getting from firms that have raised their threshold is good, such as BMW, Mercedes. And so the challenge, as been raised earlier, is how to do this reliably and, like I said before, this is not a simple test, and what I'd like to do is perhaps you could have the second overhead shown?

MR. OSTERMAN: Before you take that off—

MR. DALMOTAS: Okay.

MR. OSTERMAN:—are these restrained occupants?

MR. DALMOTAS: Sorry, you have to remember I'm Canadian and whenever we do analysis, we only do analysis of belted people to begin with, so, yes, these are all belted people from NASS.

(Slide 6 shown.)

MR. DALMOTAS: Now we've had a lot of discussions about hard pulses, soft pulses, etc., but what I've simply done here is, in the blue, basically shown the maximum corridor for all of the 48 kilometer per hour, rigid barrier car crash tests that we've recently run with the air bag fleet, and I'm showing there a total of 17 tests. And what you can see is sort of the very abrupt nature of the collision severity spectrum that you're going to get. And all the traces that that corridor makes up is basically all the traces of the individual 17, but all of them will have a fairly high acceleration peak, some risk fairly early, which manufacturers can use to trigger the air bag.

The red one is the ones that we discussed earlier this morning, is basically the maximum corridor for my low speed, offset deformable crash test, which I show here are for 40 kilometers per hour, 40% offset. And what you can see is, basically, you have what they call the soft pulse, as some people have described, the marshmallow pulse or something. But you can see some of the challenges in trying to figure out when to deploy an air bag—if you're going to deploy an air bag, when to deploy it quickly. And that's the trick. Manufacturers tend to like to set low thresholds so that they don't end up frequently deploying here, although, in my experience, many still do.

But, clearly, you want to avoid deploying air bags anywhere around this region because by about 80 milliseconds into collision, that occupant will be—if she happens to be a 5th percentile female sitting anywhere near full forward position, she could be actually touching the steering wheel before the air bag deploys, and that's obviously what we would call an out-of-position situation that you want to avoid. So that is sort of the nature of the beast and the challenge that we are faced with.

One comment that I would like to stress is that I think that the solution is not necessarily just developing fancier algorithms or sensor algorithms. I think the solution will only come about when you've got not only good algorithms, but you're actually designing structures to give you the right signal as a function of the type of crash here. What I'm saying is, basically, there's a role for not only crash sensor manufacturers, but also for the structure engineers in the industry, and I think it's going to—okay, I stand corrected, it's actually a requirement and I will agree with that.

Again, the only other last comment I can make is that when we start to raise the threshold, I think we have to do it intelligently. At least we have now the opportunity to do it, which we didn't have before with the depowering. Mistakes will cost you a lot less with a depowered air bag than with a full powered air bag. That's all I can add.

MR. ROBERTS: One final question, Mr. Dalmotas, there's been some school of thought that, collectively, a guideline or even perhaps a regulation could be devised that would level the playing field, would normalize this go, no-go decision. I want to ask how feasible you think that is or ever will be?

MR. DALMOTAS: Well, I guess if I thought it was really feasible, being with the Canadian government, notwithstanding the fact I'm not the Prime Minister, we would have probably regulated it by now.

I'm not sure how—if you could actually ever regulate, quite honestly, the threshold value. Like I said, the only way I could conceivably do it is to force a manufacturer to drive the car into a brick wall at 26 kilometers per hour and tell them not to deploy the bag. And tomorrow I am sure General Motors could do that almost instantaneously. I'm not quite sure if I would get the right response in the field, and that's what we're all concerned about.

Like I said, trying to set an air bag threshold for a barrier crash is kids stuff, I could probably do it. Trying to do it the way Mercedes does it, I think is where the trick comes in. And, like I say, it's not that simple a task.

Again, being Canadian, we sort of get confused in Canada when we get all these questions and we tend to look at the system and say what we're trying to do is optimize belted system performance. We haven't even mandated air bags, so what we keep looking at is how you do it performance-based. And, like I said, one of the ways to do it that we think is feasible is since we already have a standard that basically regulates high speed occupant restraint performance, and if we had a standard that regulates low speed occupant performance, we at least have both—or the extreme segments of what they call hard pulses and soft pulses represented. And our thinking is, basically, what we need is a performance standard that says thou shalt not injure the dummy, regardless of what type of crash we do, from—from the softest one to the hardest. And it's the manufacturer to set, more or less, where the threshold is, but if he's going to set it too low and the dummy moves too far forward, then you can't sell cars in Canada.

MR. ROBERTS: Okay, thank you. Those are all the questions I have, Mr. Chairman. I'd like to ask if any of my associates have a quick question before we turn it over to the parties?

CHAIRMAN HALL: Very well. Rick?

MR. DOWNS: Thank you, Vern. I just have one question. Given the sensitivity—this is to the panel, although Dr. Breed might be most appropriate for this. Given the sensitivities of raising the thresholds and all the problems that we've looked at, it appears important that occupant sensing technology needs to interact with the crash sensing aspect of the air bag system. This is, again, follow up from my earlier session panel today. What are the possible occupant sensing technologies that can be successfully utilized with air bag systems?

MR. BREED: Well, there are a number of companies working on occupant sensors, including our own. I would like to take issue with something that was said earlier this morning. I think the reliability of these sensors now is extremely high, much higher than the reliability of air bag crash sensors, for example.

The systems that are being developed are based, sometimes, on infrared technology, optical technology, and, in our case, on ultrasonic pattern recognition technology where essentially four transducers that are about the size of your little finger are hidden in the headliner of the vehicle and, essentially, map what's in the passenger compartment, and can reliably determine what is in the passenger compartment, where it's located, and also do this dynamically. And the system was trained on about 200,000 setups, so it really sees practically every situation that you're likely to see in the real world. I hope that answers your question.

MR. DOWNS: Yes, thanks. Anybody else on the panel have any thoughts on that?

MR. SCHERBA: I might just clarify the concept of reliability, because I'm not sure if Dave, what you said, and what was said earlier about reliability were one in the same. I think what was said earlier about the reliability of the systems for suppression or occupant presence detection system was reliability of the decision being correct, that it make the correct decision reliably, time after time, after time, after time, each and every time, each and every child seating position, or out-of-position person.

The other concept of reliability deals with just the physical reliability of the electronics in itself, will the electronics break down, will they deteriorate over time, or change, or whatever?

So there's really two types of reliability you're talking here. One is the reliability of the physical hardware, the other is the reliability of the—that the decision that that sensing system makes is correct.

MR. BREED: Yes, I was speaking to the latter definition of reliability, not the earlier one.

MR. SCHERBA: Right.

MR. BREED: The earlier one, the electronics is a comparable reliability.

MR. SCHERBA: Yeah.

MR. KALLINA: We place our sensors close to the driver and the passenger, in the passenger compartment, and the sensor device experiences exactly what the driver and the passenger experience as a Delta V. It has many more advantages. It's safe. It's in a place where no deformation takes place. And, moreover, we can now easily integrate it in our system, so we can use many more parameters for a future smart restraint system, which really enables us and gives us much more information that as soon—as it's available, we only have to have access on it. So if we integrate it once in the electronic circuitry within the passenger car, it's very effective.

CHAIRMAN HALL: Okay.

MR. ROBERTS: No more questions, Mr. Chairman.

CHAIRMAN HALL: Okay. The technology then is available, basically, in terms of sensors if we go to this new depowered air bag?

MR. BREED: In terms of sensing where occupants are, yes. In terms of crash sensing, I think the answer to that is, yes, also.

CHAIRMAN HALL: Okay. So we don't need a lot of field testing or anything in terms of the sensors?

MR. KALLINA: But I believe we don't know yet the strategy how to depower. We talked about the female—5th percentile female, but we have to talk about a 95th percentile male, also. We get complaints if we depower too much. So we have to take all this into account. It's not so easy to do. It's easy to depower, but it's not easy to have a strategy, and we really have to carefully look at the whole picture.

CHAIRMAN HALL: Now what is involved in retrofitting cars to a higher threshold?

MR. WERNER: I just want to make a comment to that question. There's been quite a bit of discussion here about higher threshold, but I think the real point that should be made, that air bags should be designed to perform well over the complete range of crash severities, including low speed crashes. In other words, in these lower speed crashes, I think there are some advantages to deploying a bag, but let's make it benign to certain types of injury-inducing situations.

CHAIRMAN HALL: I'm still trying to get back, Mr. Werner, to the 27 to 40 million vehicles that are presently on the highways, that are then going to be sold to people in—what's the proper term here, lower socio-economic groups. What are we doing—what can we do, what are the alternatives and options about those, because I am very impressed with all the rocket science of the future, but I am concerned about the air bag out there today that might be a danger to somebody in the future years and what technology can provide in terms of a solution to that problem.

MR. BREED: If I can make a comment on that. I think changing the sensor threshold on vehicles in terms of retrofit might be a dangerous move. However, I do think the potential exists for retrofitting with occupant sensors and shutting the air bag off. It's not here now, but will be shortly.

CHAIRMAN HALL: Okay. Well—

MR. KALLINA: I would only advise to use a vehicle which has not been equipped with a certain sensor device, so it must have a very careful tuning between structure and algorithm. So I would never do a retrofit—take a car which was never designed for this particular sensor and make a retrofit. It's the biggest danger we could do.

CHAIRMAN HALL: Okay.

MR. WERNER: I might also add that the current cars out there that have their thresholds already established, a lot of engineering went into establishing those thresholds and they are not necessarily wrong, they are correct for that particular vehicle structure and inflation characteristics. So retrofitting to raise thresholds probably isn't the right approach and, as Dave said, there may be other technologies—advanced technologies coming on that would allow this to be added to the vehicles. But retrofitting for raising the threshold really isn't, I don't think, an appropriate approach.

CHAIRMAN HALL: Okay. We need to move to the tables, so we can keep moving. We'll go to Table One and the NHTSA?

MR. BISCHOFF: Don Bischoff, NHTSA, thank you, Mr. Chairman. Question for Mick Scherba. Mr. Werner has said that his field studies indicate that deployment thresholds should be raised for belted occupants. Mr. Dalmotas showed us some data indicating higher deployment thresholds for belted occupants are desirable. We have heard that Mercedes have sensors that detect and raise the deployment threshold for belted occupants, which can be used to optimize at least the protection for belted occupants. What is GM position on this and are they working on a similar sensing position?

MR. SCHERBA: Well, first of all there are a couple of questions there. Number one and number two, it is certainly a complex issue, but when you change the threshold depending on whether the occupant is belted or not belted, there are several factors that need to be considered. First is if you raise the threshold before the air bag deploys, the loads from the seat belt will be higher on the occupant. And so if you're an older person with more frail bones, in those moderate crashes—which about 70% of these are moderate crashes, if you don't have the benefit of the air bag combined with the seat belt and it cause all the forces to go through the belts into the torso of these elderly occupants, you could have severe flailing of the chest.

Secondly, I think many of the auto manufacturers are putting in what are called force limiting seat belts. Force limiting, as the name implies limits the force that the shoulder belt can place on the torso. It limits that load by allowing more excursion. So in a severe crash, the belt would tighten up and then reach a prescribed load, and as the occupant went further, the belt system has a torsion bar in there that actually yields absorbing energy, and limiting the loads on the belt below where you'd get those flailing bones, but that additional excursion allows now the head to hit the steering wheel hub if there is no air bag with the higher deployment speed, or hit the windshield pillar, or come into some hard contact with the interior of the vehicle.

So I'm not saying higher thresholds are wrong or, in fact, I think it's every automaker's desire to raise the thresholds as high as practical without increasing the harm to this other population of occupants. So it is a constant trade off, every engineer goes through.

MR. BREED: Simply to follow up on that with the steering wheel contact, you observed in your paper that the newer steering wheel designs and materials may allow unbelted drivers to contact the wheel at one to two mile per hour faster than the older designs, without threat of possible facial fracture. You, therefore, judged an increase of one to two mile per hour in the current all deploy threshold may be possible.

We also believe that current electronic sensors have a narrower spread between the non-deploy and the all deploy. So does this mean that you can and will be raising the no fire limit, as well?

MR. SCHERBA: Well, I think there are several things taking place here that may allow manufacturers to raise their thresholds. You saw from Dainius's slides, in a belted environment, it would be desirable to have a higher threshold speed, because more people are wearing belts and you can have a higher threshold as a result.

We also have our experience with our Holden vehicle in Australia, where with 95% belt usage, you can get by with a lower output inflator, and have higher thresholds at the same time.

So I think it's a misconception, I think all manufacturers would like to raise the threshold. And you mentioned the steering wheel, many of the manufacturers are using magnesium rims now in their steering wheel. Those magnesium rims are yielding energy absorption in their characteristics. Because they yield, they lower the loads and reduce the propensity for facial bone fracture. So that's another change that will allow manufacturers to potentially increase thresholds.

Another major change is depowering, itself. If you have now a depowered inflator, we have run tests where you can actually have a 5th percentile female up against the inflator, inflate the air bag, whether it be to the chest or the neck, and still be below the levels of fatal injury. And so the risk of a late deployment—in other words, if you raise the threshold and potentially have a late deployment in that red curve that Dainius showed there, the risk of injury goes down because the air bag aggressivity is now lower.

So I think there are several changes occurring in the environment here, lower output inflators, deforming steering wheels, I think higher belt use, you know, as time goes on, belt usage will increase in this country and that, too, will allow the manufacturers to shift the balance in—in moving those thresholds up. They've tried to optimize the thresholds given the belt usage rate in this country today and given the limitations of the technology. But as we put these other technologies in there, it may allow the thresholds to be raised.

MR. BREED: Thank you, Mr. Chairman, we have no further questions.

CHAIRMAN HALL: Mr. Scherba, just a quick follow up. Do you have any data that indicates that elderly are in a more danger from the belt alone in moderate level crashes or is that just common sense?

MR. SCHERBA: No, there is quite a bit of data that shows that as a person matures, their bone structure becomes more brittle, more frail, and the seat belt concentrates the load on the width of the webbing, so it's a very narrow load, high intensity load, over a very small part of the body. The air bag is a very broad device, if you will, and it distributes the load over a larger portion of the torso, reducing the unit loading on any one point, on any one bone. So the air bag distributes the load, allowing even an elderly occupant to withstand a crash more so than concentrating the loads from the seat belt in one location on the chest.

CHAIRMAN HALL: Now what's elderly?

(General laughter.)

MR. SCHERBA: I'll let you know when I get there.

CHAIRMAN HALL: I don't know, but I keep getting these letters from the AARP. It's got me upset. Table Two?

MR. MILLER: John Miller representing AORC. This first question is for Mick Scherba. Mick, what is your opinion of the technological feasibility of tying a distinct crash severity threshold to stages of a multi-level inflator?

CHAIRMAN HALL: Will you repeat that.

MR. MILLER: What is Mick's professional opinion of the feasibility—the technical feasibility of tying distinct crash severity thresholds to the stages of a multi-level inflator system?

MR. SCHERBA: I'd like to answer that two different ways—well, maybe just one way. I think in time, as technology progresses, it could very well be possible to have a sensing system reliably detect the severity of the crash. And once we have a sensing system that can reliably tell you whether this is a soft, a low speed crash or a very violent high speed crash, I think the tying that to the inflator will be a relatively easy task.

The two things that need to happen in order to have variable level, or multi-stage, or dual-stage inflation are—are two things. One, you need a sensing system that can detect the severity of the crash, and you need a two-stage or multi-stage inflator. I think the inflator technology is probably further along than the sensing technology, but you need both to make it work.

And the second thing I was going to say is that two-stage or multi-stage inflation, by itself, isn't a complete solution. We saw from Mr. Bischoff's slides yesterday, when he showed the driver concerns, there were about eight to ten or so, and the passenger, there were a dozen or so concerns with inflation-induced injury in occupants. Dual-level or multi-stage inflation will address a portion of those, but it will not address all of those concerns. So it's one advanced technology that I think a lot of manufacturers are working on, along with other technologies, as well.

I don't think we should put our eggs all in one basket. I think we need to pursue many of these advanced technologies, variable level or dual-stage being one of them.

MR. MILLER: Second question for Mr. Kallina. You talked about the Mercedes system and the fact that it senses the occupant wearing the belt and changes the threshold from—from 12 to 18. Would you please comment on how that system differs, both in terms of it's ECU or the crash algorithm, or the hardware—other restraint elements from the same vehicle that would be sold in Europe?

MR. KALLINA: Well, in Europe, we have a much higher usage belt, so I was upset when I saw, yesterday, the first slide, a German slide. It shows we are among the third world countries, and we have a belt usage rate below the U.S., and I was worried if, since I left Europe, this might have changed.

(General laughter.)

MR. KALLINA: But, meanwhile, so it was a fault in the chart, so we are as Canada in the—I would say in the mid-'90s, and it varies depending on the rural roads, or urban roads, and so on. So we based our decision, what system would be best for Europe, of course, on the belt usage rate. And we have good rationale because we made accident statistics, accident investigation, we carefully looked for where is the risk for unbelted and the risk for belted without the air bag, and that was a decision. And we have in Europe just one threshold, which means the threshold is identical with the upper threshold in America. So the lower threshold does not exist in Europe—well, it exists, but it doesn't deploy the air bag, it only deploys the pretensioners.

The pretensioner is fired at the lower threshold and the air bag threshold is only triggered at the higher threshold. So if a system is completely different and we accept more harm to the unbelted, but that's a trade off between high risk in out-of-position, as your unbelted, and be harmed in low speed crashes. And the general attitude in Europe is completely different. If you're involved unbelted in a serious accident and you suffer injuries, you are blamed for not wearing your seat belt and that's, I think, a different attitude.

MR. MILLER: This next question is for Mr. Dalmotas. You showed a nice graph that showed sort of a crossover point between air bag deployment and not deploying, and you said the air bag works to your advantage, I believe it was, above speeds of about 26 kilometers per hour. How would you expect that crossover point to change? Because what you were recommending was a higher threshold. Do you really need the higher threshold when that crossover point, presumably, shifts to a lower speed when we de-power?

MR. DALMOTAS: Well, I haven't had the opportunity to try and look at field data depowered. Certainly, you're right that the two are intimately linked. All that chart shows is that given a perfect go, no go deployment, where you would do it with current levels of aggressiveness. And that chart, I think, don't read more into it than you should. I mean that was mean number of injuries. There are other charts that go into AIS 1 injury production, 2, 3, mean level of harm, etc. I think the bottom line, when we came up with a recommendation for 26 kilometer an hour threshold, was related actually to an issue that was raised by Mick, and where is it that we would start to expect the elderly to start to benefit from load distribution with a fairly soft, non-aggressive air bag and soft seat belt, and that was our target area.

You're never going to have perfect air bag systems, and we will get to see what impact depowered air bags will have on upper extremity injury, but upper extremity injury is the one that really drives the harm model for particularly short-statured females in low speed collisions, and that's almost—well, I shouldn't say exclusively, but predominantly an under 24 kilometer per hour event, largely because that occurs when a person's arm is about 45 degrees across the module and, typically, your hand does not get into that position in any high speed events, but that's a position associated with low speed.

So the setting the threshold at 26 can really do a great job of getting rid of all those nasty upper extremity fractures. It is a serious problem because, right now, our data, and I believe NASS is still showing that the upper extremity problem will match, if not exceed, total lower extremity problem in terms of frequency.

MR. MILLER: Last question for Mr. Breed and anybody else who cares to comment. We've seen a lot in terms of occupant sensor proposals. The SAE Congress was a good indication of that. Generally, how do you recommend we should move forward with the methodology for determining the reliability of—of these systems? How do you measure the reliability?

MR. BREED: Our system is what's called a neural network based system—a pattern recognition based system, because we came to the conclusion very early on that the problem was so complex that an engineer could not sit down and write equations based on transducer output. And so as part of the process of developing the algorithm, we generate the data for proving its reliability. And, basically, right now we're training a system.

The way neural networks work is that you set up a particular set up in a vehicle, and you take data in that position, then you move—change the set up to another set up and take another set of data. This includes all types of child seats, for example, all positions, all angles, all positions of the seat, all different size occupants doing all kinds of things, reading newspapers with their feet upon the dashboard, windows open, feet out the window, anything you can think of becomes part of this data set, which we envision will total about 200,000 different set ups for a final training set for the car.

Now what we do is hold out a certain percentage of those—those data sets and don't train the network on those data sets, and then feed those back in later and test the neural network on whether it correctly analyzed those situations that it has not seen before. And we're running about 100% accuracy on situations that it has seen before and about 98% accuracy on those situations that it has not seen before. Now that's based on a one-shot test. As soon as you start taking two out of three, for example, then your reliability goes up much higher, and as soon as you factor in the probability of any particular situation actually being in a vehicle on the road, the reliability goes up higher yet.

CHAIRMAN HALL: I'm going to need to ask the panel to—to the extent they can, compress this—their answers. I don't want to cut anything off, but we're ten of 3:00 and we're just at Table Three. So, Table Three?

MR. LANGE: Thank you, Mr. Chairman. This is a question for Dr. Kallina, please. Dr. Kallina, you were kind enough to comment upon the mechanism that Mercedes utilized in selecting the deployment thresholds for your air bag systems here in the United States, one for belted and one for unbelted. You indicated that you had based that, in part, on an understanding of collision data. Could you explain to us, was that collision data here in the U.S., or in Europe, or is it are conditions sufficiently similar that you believe wherever you took the data from was universally applicable to both markets?

MR. KALLINA: I can show you the charts. And, of course, it's not based on—on Europe or Germany because we have the same—the same human beings, you are one the same as we are in Germany, so we could use the data—unbelted, look for unbelted and look for belted, and the injuries associated in crashes, and we look for the crash severity versus injury severity. We can show the charts, please?

CHAIRMAN HALL: Joe, are you back there?

(Slide 7 shown.)

MR. KALLINA: So from the collisions, unbelted drivers with air bags, and you see that was rationale we based on, so we said—here we have the ES, energy equivalent speed, which is equivalent to the damage in some estimate for the Delta V, and up to 30 kilometers per hour, we have no major injury severity. It's below a level of MAIS 3 and plus.

So this shows that 30 kilometers per hour and beyond would be—that would be a negative trade off for the unbelted. So that's why we set the upper threshold for fire and non-fire.

If you look for the passenger side unbelted, see again the same picture, and there is a number of cases where it's based on—of course, it's not very good statistics, but it shows and it correlates with other statistics as well. So next, please?

(Slide 8 shown.)

MR. KALLINA: So frontal collisions, belted drivers with air bag, and again there is a case—of course, we have many more cases with the new car lines, and it shows again under 30 kilometers per hour, there is no—so with the belted drivers with air bag—no, I'm confused, that's not the right thing. But you will believe we have good data.

(General laughter.)

MR. LANGE: I did not mean to suggest that you did not, I was just curious about whether it was U.S. or European.

MR. KALLINA: No, it's—we really carefully selected and distinguished between strictly unbelted or belted.

MR. LANGE: This is a question for Mr. Werner. We had some discussion today and some questions yesterday with respect to whether or not the insurance industry could become a partner in attempting to increase seat belt use here in the United States by the tying of damage claim payment to belt use, as is the condition evidently in some European countries. Would you care to—or would you comment, please, on the practicality of utilizing such a scheme here in the U.S.?

MR. WERNER: I think what it boils down to is confirmation of belt usage, and that's very difficult. And I think what we find, that our policy holders claim that they were wearing their belt maybe up to 80% and the reality of the matter is that belt usage might have been around 40, 50%. So I think what it boils down to is our ability to confirm belt—belt usage and I think that's always been our albatross in that area.

MR. LANGE: This is really for anyone on the panel who should chose to respond. This morning we had a question and an answer concerning the possible utility of a crash recorder, that is a device embedded in, perhaps, the diagnostic sensor of the air bag modules to record some collision related event data for later retrieval by either manufacturers or by Governmental entities for the purposes of crash research. Do you see advantages and usefulness of such systems and, if so, how might we collect and utilize such data? I see Dainius is shaking his head yes, would you like to begin, or Dr.—

MR. KALLINA: As an accident researcher, we would be very happy to have this in every car. But consumer refuse and there is much lately concern, so we have in Germany, every two years, the issue comes up very fiercely, and it's written in the papers, and it's a topic for maybe one week, and it drops in public interest, and there are leader people sitting together and discussing, and discussing, and discussing. So every time they report from their point of view, it's not feasible and not allowed to put it in the car.

CHAIRMAN HALL: What if you dropped the sticker price a couple of grand, do you think people would do it then, or cut their insurance rates in half?

(General laughter.)

MR. KALLINA: Well, could be. So we have not yet the solution for this.

CHAIRMAN HALL: Where there's a will, there's a way.

MR. LANGE: Dainius, would you like to comment or—

MR. DALMOTAS: I'm not sure what I can add. Again, from a researcher, it would be absolutely wonderful to have that data. I'm not sure how I'm going to pay for collecting and there are legal ramifications, as they said. We actually had a recorder once in a car which was involved in an accident. I don't think we'd want to go through the paperwork of that one, either. It gets complicated. It was a Government employee driving it, and probably was doing things that he should not have been. I don't know how to get around that problem.

MR. LANGE: Okay, thank you. Mr. Chairman, we're through.

CHAIRMAN HALL: Table Four?

MR. PARKER: Yes, George Parker, Association of International Automobile Manufacturers. We have two questions. NHTSA had some data, probably still has the same type of data, that relates to the publics perception of proper threshold levels. What they show is that there's, depending on the year and the vehicles that are in the complaint file—these are actually complaints to the Defects Office—an equal number of complaints that the air bag went off when it shouldn't have or—or it didn't go off when it should have. And it always seemed to me that if you had those equal, that's probably about where thresholds ought to be. Anybody want to comment on that? I mean does anybody have a feel for what the publics perception of what the proper threshold should be?

MR. DALMOTAS: I think we've got lots in Canada. I can remember probably about two or three years ago when we were going around and started investigating air bag crashes, we would go to a crash that's a fender bender, someone would have a broken arm and facial abrasions, and they would try and convince our investigator that the air bag saved their life. I think that was because the public had such a perception that the air bags were such soft things and were always going to protect them.

And I think the pendulum may have actually swung the other way, that I think nowadays if you break anything, you know, a 100 mile an hour collision, they're going to now blame the air bag. I don't think I'd like to rely on publics perception and complaints as a way of setting thresholds.

As I said, we've had lots of complaints over the years. I don't know, I've probably had, I don't know, I'd guess 100, and to the best of my knowledge, 99 weren't injured, of the people who wanted the air bag to go off, and, at best, I've had one complaint from an elderly woman whose sternum was fractured, but it was a moderate speed collision, so, you know, I guess I—like I said, I don't think we should rely on public surveys to set thresholds.

MR. PARKER: I guess I wouldn't suggest that. It was just always kind of interesting to me that you had equal balance on both sides and but probably it has changed, the perception I am sure has changed now and you would, like you say, people probably don't like it when their air bag goes off in low speed collisions. Ingo Kallina?

MR. KALLINA: Well, one more comment on it. It's a physical problem, also. People see the damage of the car and they arrive—from this damage, they arrive at the air bag should have deployed or not, which is physically not correct, because the sensor device always looks for a Delta V, which is completely independent of an ES. And what you see in some cases is huge ES, for instance, in a collision preferably at high speeds, the ES is very high, Delta V was very low. So when he comes to a stop, he says, well, the air bag didn't function. So he derives from the damage to the car, the necessity of having the air bag deployed, which is physically not right.

And you see the other thing. You have almost no damage, for instance, preferably in fender benders where hydraulic bumpers are involved, and the Delta V, because of the negative sign, is very high, the Delta V, but the damage to the car is very low, but there is never a potential for injuries.

MR. PARKER: Well, I think you see that sometimes where you have substantial undercarriage damage but not much sheet metal damage, and actually the Delta V may be pretty high in that case. Another question for Ingo Kallina. You've been discussing air bag deployment sensing, but belt systems with pretensioners also offer potential benefits and may even be needed if air bag deployment thresholds are raised. What are your views on belt pretensioners, sensor, and system design, in conjunction with air bag deployment threshold design?

MR. KALLINA: Well, that's completely independent. You can always use the pretensioner, and we put in our cars, in the front seats, on both sides, since August '84. We almost forgot that we always have pretensioners in all our cars. But it's very effective, so it always works.

You have wonderful occasion to use the ride down benefit with a pretensioner. As early as you are tightened firmly with the car structure, you participate in the deceleration. So whatever is done with the belt, it's okay. And now we have the extended version. We put in the belt force limiter, which is a wonderful device, and the belt force limiter now yields if a force level is exceeded. So the combination of the three devices, air bag, belt force limiter, and pretensioner, that's the best matched system which is available, and it's completely independent.

MR. PARKER: A follow up question has to do with deactivation. If an air bag is deactivated, what do you do with your force limiting system, is that also deactivatable or, you know, you have a potential for increased injury if you don't have the air bag but you have the force limiting system?

MR. KALLINA: Well, look at the system as a total, so this is one issue we certainly should talk about tomorrow. It's no more an SRS. We must rethink. It's no more an SRS and you cannot shut off easily the air bag, because we have a forward movement, the travel of the head might be too excessive and the person might hit the steering wheel. So it's you're not supposed to shut off the air bag. It's now a system approach and it's the best available system we can offer to the occupants, and allows us to depower and to do everything, and to use dual-stage inflators. There is only a strategy you have to have in your triggering, in your threshold.

CHAIRMAN HALL: Okay, can we move on or—

MR. PARKER: Mr. Chairman, that's all we have.

CHAIRMAN HALL: Okay. Mr. Werner, before we move on, have you looked at pretensioners over the years and know statistics—

MR. WERNER: No, we haven't—we haven't looked at field data regarding pretensioners. But it appears to be a good idea. I agree with Mercedes' comments.

CHAIRMAN HALL: All right. Table Five, any questions?

DR. LUND: Just one, Mr. Chairman. Adrian Lund with the Insurance Institute for Highway Safety, and this is for Mr. Kallina. A follow up on the issue of the higher deployment threshold in Europe. Has Mercedes had any experience in the European fleet with this higher threshold, are you seeing in your Mercedes vehicles any incidents of facial fractures in frontal crashes at speeds below the higher deployment threshold?

MR. KALLINA: Well, Adrian, I have not the data available, but I am sure it had an impact. But I have not the data available. And we did it in a common sense, and we agreed among the manufacturers to do it at once and to introduce it, and I think that's the best to do.

CHAIRMAN HALL: Okay, Table Six?

MR. BLOCH: Mr. Chairman, I'm Byron Bloch and I'm a crashworthiness consultant to the Parents Coalition for Air Bag Warnings. I have some brief questions to the panel. First, as a preface, when you go to depowered air bags, some manufacturers, for competitive reasons, may offer a safer system, and the preface to this is, as we I think discussed earlier, in the early '70s, because of their concern of the air bag inflation hazard to children, General Motors developed a dual-inflation system that had a softer inflated air bag in the 12 to 18 mile per hour crash severity range, and above 18 mile per hour crash severity, it was a firmer air bag inflation. That was in the early '70s. In 1980, a NHTSA report affirmed, quote, no children are known to have suffered more serious injuries because of the air bags and, in several cases, it is believed that the air bags reduced the children's injuries, and many examples were cited of either no injuries, minor injuries, or moderate injuries. The one fatality due to a poorly designed deployment door, was to a seven-week old child that basically either rolled under the instrument panel or otherwise fell.

CHAIRMAN HALL: Can we get to the question, because we pretty well discussed that accident to death.

MR. BLOCH: All right. That's quite so, I'm sorry. The question then is do you foresee, from your viewpoint, offering other than a depowered system, returning to a dual-pressure system, such as the staged inflation, for example, that Mercedes has used since, I believe, around 1982, where at, I think, at 15 milliseconds, you have one level of inflation, and then after 15 milliseconds, you increase that inflation pressure, I think somewhat analogous to what GM did with the S-curve, better softer inflation curve. Any comment from the manufacturer, Mr. Scherba, on whether you might return to a dual-pressure system rather than depowered?

MR. SCHERBA: Well, I think if the technology progresses, anything might be feasible. I think I stated earlier, though, that, you know, we looked at that dual-level system, we ran tests subsequent to that child fatality, with the three year old dummy, and that air bag system, the '73 through '76 system, did produce loads on the three year old in excess of our IRVs and, therefore, could potentially be lethal to a three year old child. So I want to reiterate that that was not a complete solution.

I also have to state that while I think many manufacturers are working with our suppliers on multi-stage or dual level inflation, it's unlikely that dual-level would have prevented any of those nine fatalities that occurred in the rear-facing infant seats in the field, for example.

So dual-level may address a portion of the problem, it certainly won't address the entire problem, and I think we need to look at all the advanced technologies and, as I said, not put our eggs in any one basket, but pursue all of them as vigorously as possible and apply those that are most effective.

MR. BLOCH: Thank you. A quick question on tethers. Both Holden of Australia—General Motors of Australia and Nissan have noted that they have added tethers—internal tether straps to the air bags to create a flatter-shaped air bag and also to keep the deployment distance further away from the occupant. Do you see a possible retrofit for owners who are concerned about the air bag danger, for example, to a shorter woman driver, by retrofitting a combination of a depowered air bag module that also has an air bag with internal straps? To anyone who can respond to the effectiveness of the internal straps?

MR. KALLINA: Well, we have tether straps here in the U.S., standard on all air bags, because they must be shaped according to the unbelted FMVSS 208 requirement. But I would not retrofit. It causes many, many problems. So we certain refuse and say this should not be done, because you might have problems—you might raise problems.

MR. BLOCH: I think the last question to Mr. Werner of State Farm Insurance. Does your claims data have any way to discriminate between different air bag systems in terms of either deployment threshold, or the use of tethers, or no tethers, in other words, a way to determine from your data whether there are safer air bag systems versus those that are, perhaps, needlessly causing some injuries that they otherwise wouldn't cause? And also, when we go to depowered air bags, will you be able to log in that data, as well?

MR. WERNER: To the extent that that information is available publicly, and I would say that we really don't have the best information publicly about what the designs are, what the thresholds are, what are the particular strategies. So what we're able to do, at best, is to review the literature that's available out there, and there have been a couple of situations, most notably when one manufacturer went from a high output inflator to a lower output inflator in combination with tethers, and in combination with a softer fabric, we were able to detect differences in air bag-induced injuries; in other words, there was an improvement.

We can't really say which one of those factors was the major contributing factor. We think it was the output and in combination with tethering. But those situations where we're able to actually evaluate a particular design are limited, just because the information is not readily available.

MR. BLOCH: Okay. Mr. Chairman, I am reminded there is one last quick question from our table?

CHAIRMAN HALL: Go right ahead.

MR. BLOCH: Okay, sir. With regard to what Chairman Hall even said earlier about the public's right to know, would either Mercedes or General Motors, or both, care to comment, please, on whether you will make your production vehicle crash test information—not proprietary but production vehicles with the various range of occupants that you test, the three year old, six year old children dummies, the 5th percentile female dummy, as well as the 50th percentile male, including any out-of-position tests, would you make that information available to NHTSA and the public so that we could become better informed about how air bags actually can perform?

MR. KALLINA: Well, now it's your turn.

CHAIRMAN HALL: Let's not fight over the microphone now.

(General laughter.)

MR. SCHERBA: I think from General Motors' perspective, we'll probably continue to share this information, like we have in the past. We have been very open with the NHTSA. We have worked closely with them, shared information where it was appropriate and possible, and, you know, we've provided test samples for them to evaluate in their laboratories down in Ohio, and so forth, so I think we'll probably continue that practice.

MR. BLOCH: Is that for the public, too, or just NHTSA? I mean, in other words, would it be available if you went to buy a car and asked in the showroom for that kind of information?

MR. SCHERBA: Well, I think with the depowered, we talked about that a little earlier, an earlier panel discussed it, and I the industry is going to have to decide how to portray that in a meaningful way for customers.

MR. BLOCH: Thank you.

MR. KALLINA: Well, I agree. So we should rather share it with NHTSA, because the public always sees accidents and accidents are completely different than the standard tests which we make in the lab.

CHAIRMAN HALL: Okay. Mr. Osterman?

MR. OSTERMAN: Just one for Mr. Kallina. Have you seen with the higher threshold at 18 miles per hour, roughly, in Europe. Have you seen an increase in the injuries caused by seat belts to older drivers?

MR. KALLINA: No, no.

MR. OSTERMAN: Thank you.

CHAIRMAN HALL: Mr. Arena?

MR. ARENA: No questions.

CHAIRMAN HALL: Mr. Sweedler?

MR. SWEEDLER: No.

CHAIRMAN HALL: Dr. Ellingstad?

DR. ELLINGSTAD: No.

CHAIRMAN HALL: I have one final question. Should we have different deployment thresholds for driver's side and passenger's side?

MR. KALLINA: No. Short answer.

MR. SCHERBA: The short answer was no?

CHAIRMAN HALL: I can translate that easily.

(General laughter.)

MR. SCHERBA: I think the two seating positions differ, certainly. On the driver's side, you have a steering column and wheel there, and you also always have an adult on the driver's side. On the passenger side, there is no steering wheel, obviously, but you may have a child or it may be unoccupied altogether. So in any given crash, while the loads may be higher on the driver due to the steering column, the driver is an adult and likely to be able to take slightly higher loads than, say, a child on the passenger side. So I think, on balance, it's appropriate to keep the thresholds the same between the driver and passenger sides.

CHAIRMAN HALL: Thank you. Well, let's ask our panel. First of all, again, let me thank each one of you for participating. I guess I really ought to thank those that came farthest from home, from Germany and Canada, for participating, and I have already admonished my staff for putting up incorrect information on our friends in Germany and we'll have to get that slide corrected and throw it up again before it's over. But I'd like to go, as we have previously, if anyone has any final comments. Mr. Breed?

MR. BREED: No final comments other than to express my gratitude for being a part of this panel.

CHAIRMAN HALL: Thank you.

MR. DALMOTAS: No comments and same.

MR. KALLINA: Well, for me, it's very interesting how the information processed does take place in the U.S. and it's very exciting. Really, it's very exciting, so you get the various input and it's very carefully addressed, and—and processed, and it stimulates me for further doing even more in the field of safety.

CHAIRMAN HALL: Well, thank you very much. That's very nice remarks.

MR. SCHERBA: And I'd just like to say that I think by virtue of everyone in this room, I think there is a deep concern about the air bag inflation induced injury concern, and I think the entire community, the supplier industry, the insurance industry, the automakers, are all trying to get as much information out and operate on that information. And I know from our own General Motors perspective, when we have an inflation-induced injury or fatality, we do follow up on those as completely as possible, and we look at the circumstances of the collision and the injuries, and, you know, it's kind of hard to separate the objective aspects from the emotional impact that those accidents incur. So I just—I wanted to relate that—that human element, I guess.

CHAIRMAN HALL: Thank you. And finally, our representative from Nationwide—oh, I'm sorry.

(General laughter.)

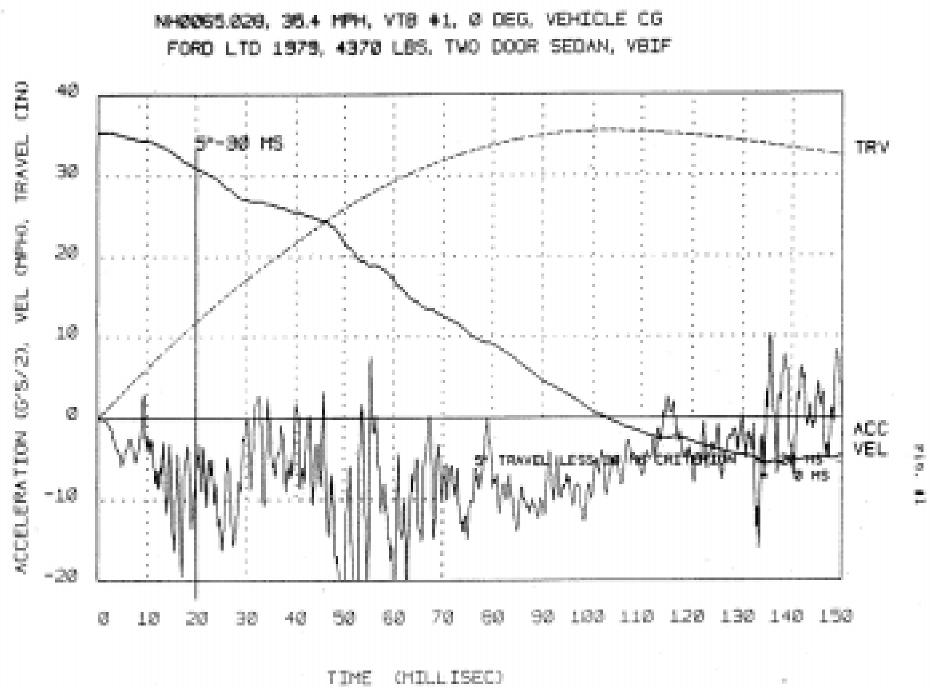
MR. WERNER: Well, I just want to say that State Farm is the number one auto insurer in the country.

(General laughter.)

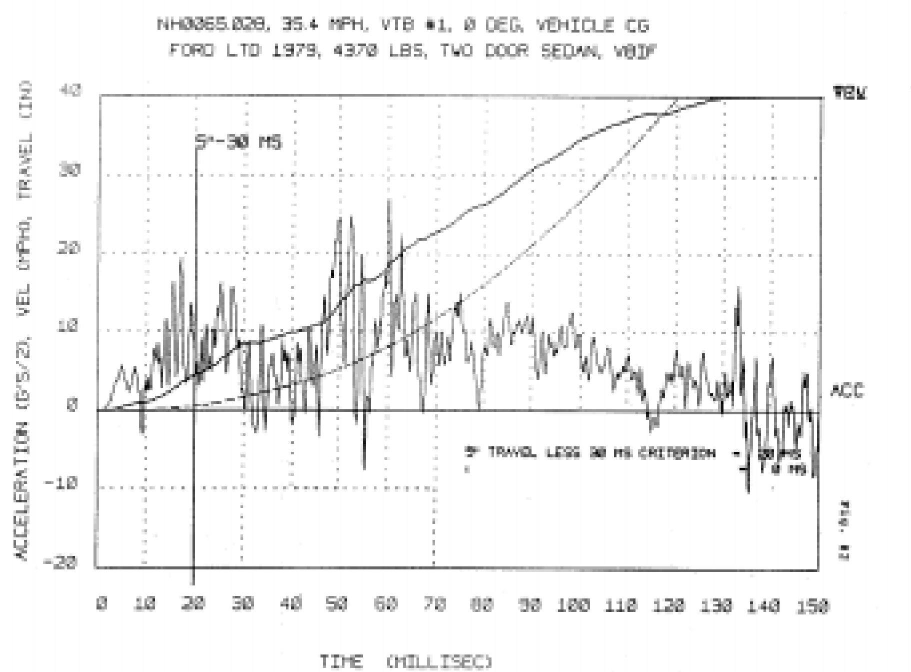
MR. WERNER: But I do appreciate the opportunity to sit up here, and I do also want—I also appreciate some of my associates that are sitting out there in the audience that have helped formulate some of the comments. So thank you, again.

CHAIRMAN HALL: Okay. Well, I'd like to thank this panel. We'll take about a 15-minute break, so we can stay pretty close on schedule, and come back here at 25 till. Thank you.

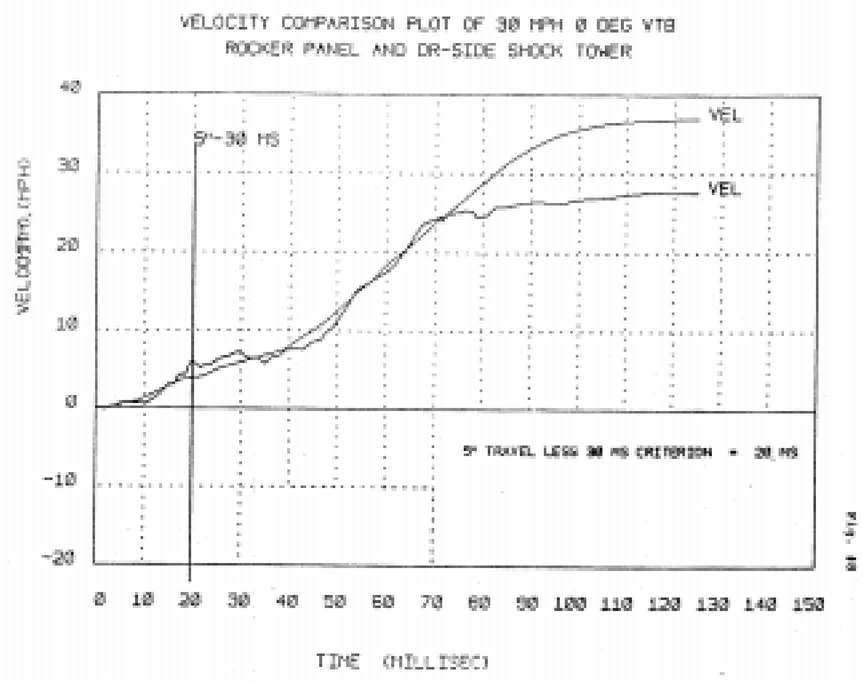
(Whereupon, a brief recess was taken at 3:20 p.m.)



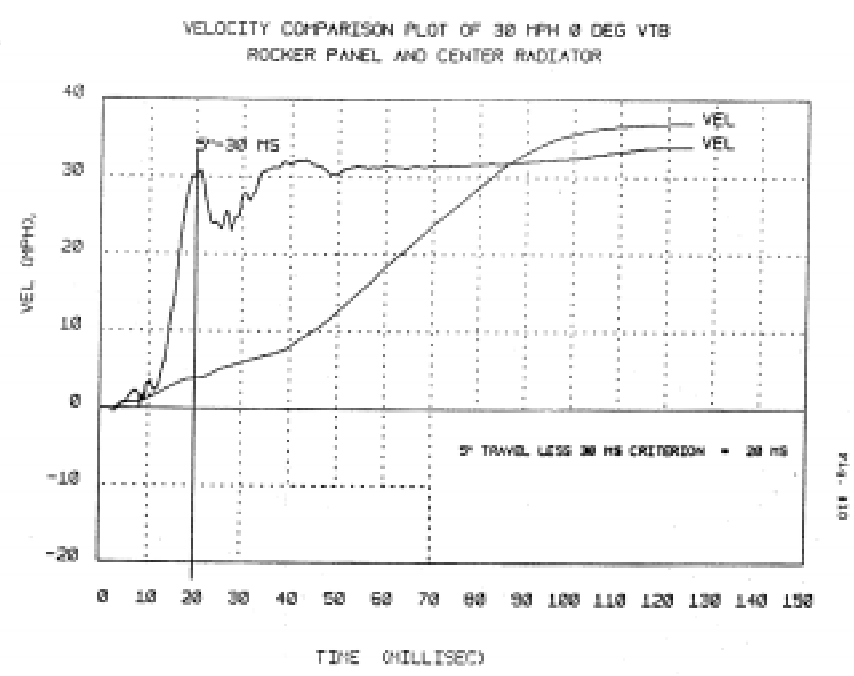
Slide 1. Crash pulse plotted from outside the vehicle. (From Mr. Breed's presentation, March 18, 1997.)



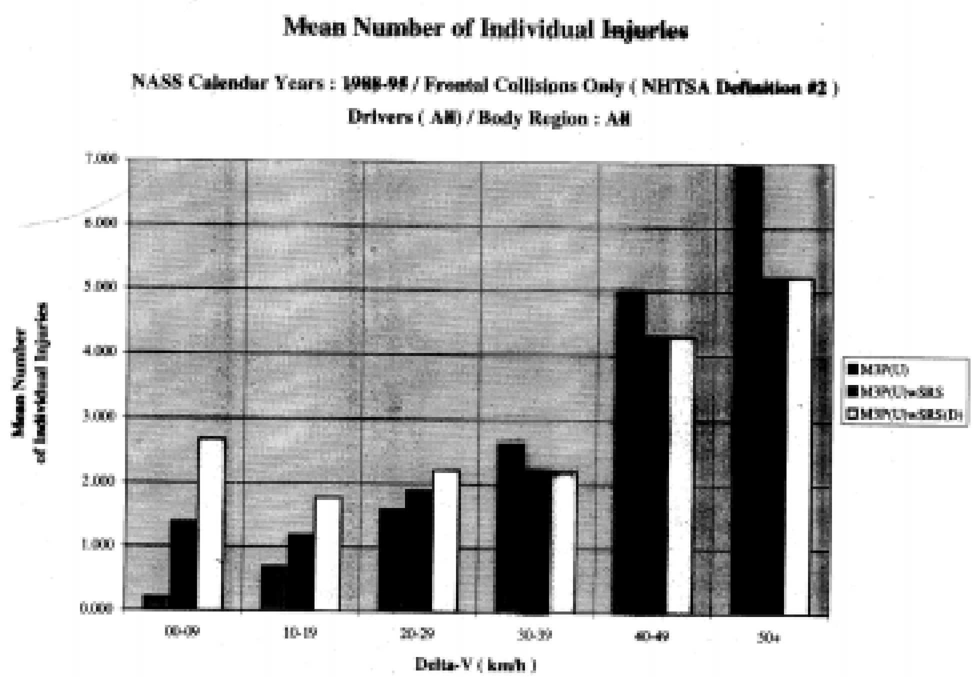
Slide 2. Crash pulse plotted from the passenger compartment. (From Mr. Breed's presentation, March 18, 1997.)



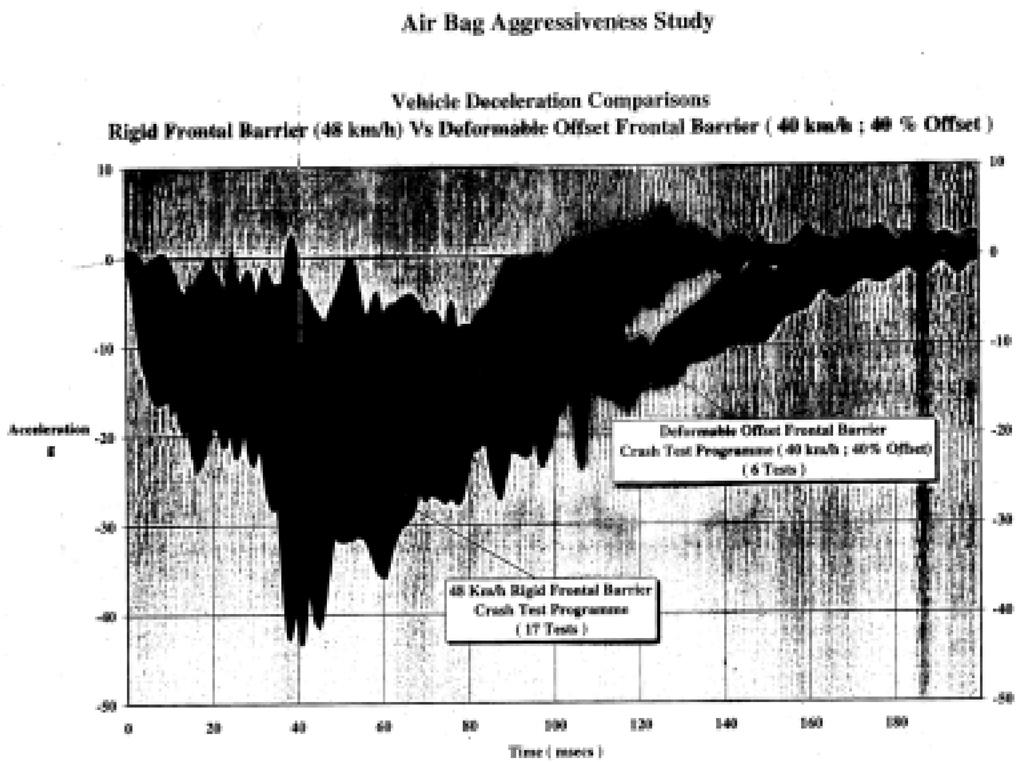
Slide 3. Crash pulse plotted at the shock tower and the B-pillar. (From Mr. Breed's presentation, March 18, 1997.)



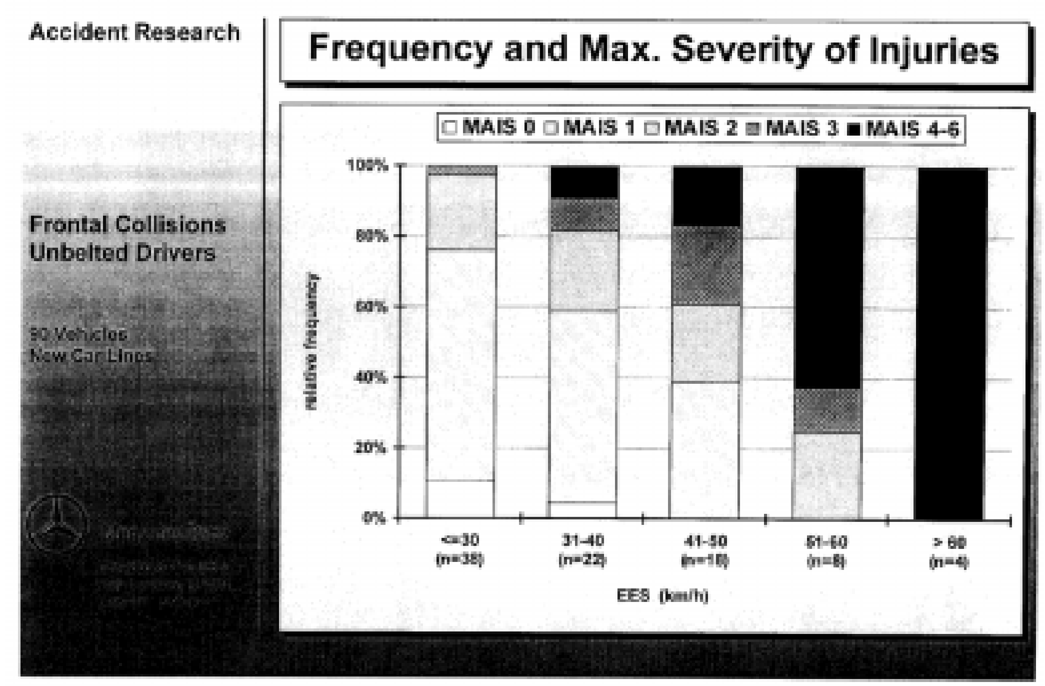
Slide 4. Crash pulse plotted at the rocker planel and the radiator support. (From Mr. Breed's presentation, March 18, 1997.)



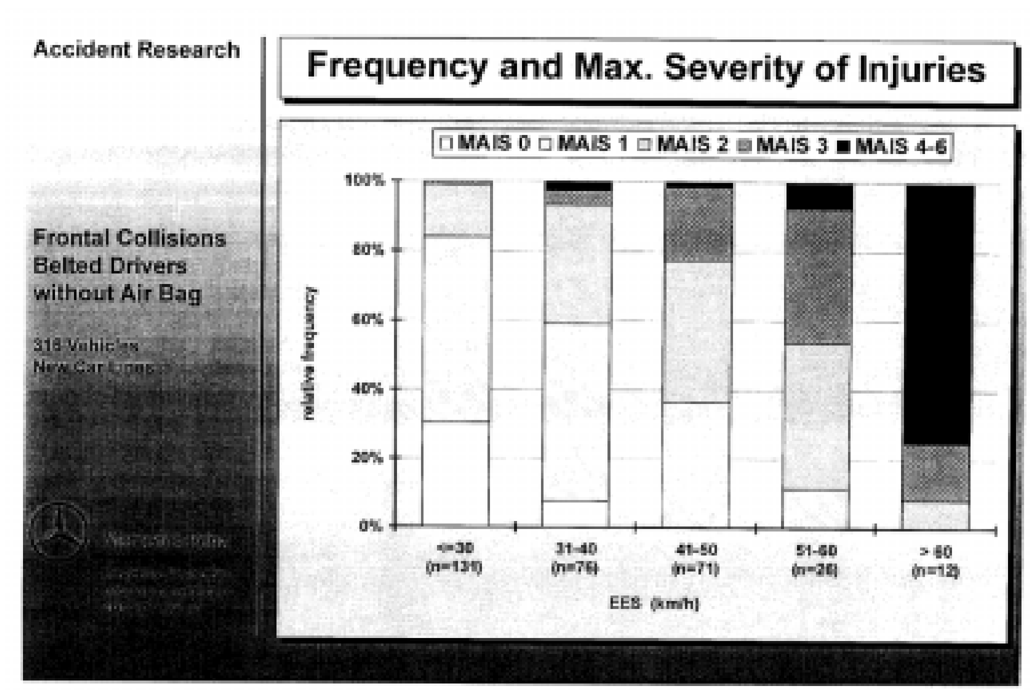
Slide 5. NASS data on injuries. (From Mr. Dalmotas's presentation, March 18, 1997.)



Slide 6. Vehicle deceleration comparisons. (From Mr. Damotas's presentation, March 18, 1997.)



Slide 7. Injury data: unbelted drivers with air bag. (From Mr. Kallina's presentation, March 18, 1997.)



Slide 8. Injury data: belted drivers without air bag. (From Mr. Kallina's presentation, March 18, 1997.)

Panel 4

Advanced Air Bag Technology: What is Available Now? What Will Be Available in the Future?

CHAIRMAN HALL: On the record. Last panel of the day, underway. We have the final panel of the day, “Advanced Air Bag Technology—What is Available Now and What Will be Available in the Future?” I guess I’ll be interested in finding out not only what’s available now, but what’s available in the future when we have a joy stick instead of a steering wheel where the air bag is going to come out of. So I’ll turn it over to Mr. Downs to introduce our very distinguished panel.

MR. DOWNS: Thank you, Chairman. And with that, starting with Dr. Hollowell, if you’d kindly introduce yourselves and your affiliations?

DR. HOLLOWELL: My name is Tom Hollowell. I am Chief of the Safety Systems Engineering and Analysis Division of the National Highway Traffic Safety Administration.

MR. JARBOE: My name is Pat Jarboe. I’m Director of Advanced Engineering for Autoliv North America.

MR. TINTO: My name is Chris Tinto. I’m Manager of Toyota Technical Center in Washington, D.C.

MR. VOS: My name is Tom Vos. I’m with TRW Vehicle Safety Systems, Incorporated, and I am Director of Applied Technology.

MR. WILBER: Good afternoon, I’m Van Wilber, and I am the Director for Vehicle Safety, International Affairs of the American Automobile and Manufacturers Association.

MR. DOWNS: Thank you. On the subject of advanced air bag technology, I have noted four elements that compose some of this technology, multi-stage inflators, crash sensors, occupant sensing technology, and pretensioners. By way of sophisticated crash sensing and how it relates to advanced or so-called smart air bag technology, if the crash-sensor determines deployment of the air bag, how does it discriminate a desired deployment from undesired deployment. And I’d like to address this to Dr. Hollowell.

DR. HOLLOWELL: Okay, thank you. Before getting to the specifics of answering the question, it might be a quick help to review what are the elements of the air bag system, including the sensors, the computer module which is used to process the information from the sensors, as well as to provide diagnostics of the existing sensors. The inflator technology which currently, as you are well aware, are the single-stage inflator but, in fact, now the suppliers are looking at providing multi-stage, whether it’s a dual-stage, a more than dual-stage, or, in fact, a variable inflation, the bag, itself, and the module cover.

With respect to the crash sensors, today we have basically three types. The first type generally is used for detecting that a crash has, in fact, taken place, that the severity is such that the bag should be deployed. The second type of sensor is, in fact, to determine whether or not a belt is being used and, therefore, using information about the speed of the crash and the severity, determine at what point to deploy the bag. And then finally we have sensors being used to determine if, in fact, an occupant is in the seated location.

With respect to sensors that are under development, we have variable—a variety of those, as well. The two general categories that are now being added to the available sensors are those that, number one, can be used to determine the occupant size and/or weight; and, finally, the sensor that can be used to determine the occupant position.

Now the reason I wanted to quickly summarize the elements of the air bag system, because according to what elements you have in place then determines how you use the information from the sensor to make the deploy, non-deploy type information. For example, if you have a simple single-stage inflator, as we currently have, whether it's the aggressive bags, as we now call them in the current fleet, or the depowered bags, the smart technology—or actually I like to use the term adaptive, from an engineering point of view, adaptive meaning taking the information and then making decisions based on that—the adaptive technology would simply do no more than make a decision as to whether to suppress the deployment or to deploy the bag, itself. Okay, and such that, for example, the occupant positioning sensors then could be used to determine whether, in fact, the occupant has entered the danger zone, the term that has been used earlier today and somewhat yesterday, as well. If an occupant has, in fact, been detected to enter into that danger zone, then with a single-stage inflator, you would simply suppress the deployment of the air bag, if, in fact, your characteristics of the bag dictates that you would probably injure the person just through the deployment of the bag.

Again, though, according to what type of technology you have in the other components, you could even become more sophisticated. Going back to the computer module, itself, the microprocessor that does the processing of the information, there are a variety of occupant sensors that can be used to dynamically determine whether or not the—the occupant is going to enter into the danger zone.

So, for example, a person may, in fact, be in a good position for the deployment of the bag, but if you introduce pre-crash braking, then that person starts traversing relative to the occupant compartment. and by the time the bag deploys, may be in an out-of-position location. And so in order to process information from the sensors, that means you have to have a microcomputer within the car that very quickly can take the information from the sensor and do calculations to determine or not, or project whether or not it feels the occupant is going to enter into the danger zone. So that's one example.

With respect to the occupant size and weight, okay, at this point, the sensors, in my humble opinion, are not developed well enough to distinguish whether or not we have a child who is belted down, where the belt is cinched very tightly, versus a 13-year-old plus, whose weight in that vehicle seat may be at the same level of a well-cinched down child seat. So there is some development needed there.

But if, in fact, we are able to perfect that type of system, again, we could use the sensor for suppressing the deployment of the bag, if we feel that it is deemed necessary.

Now moving on—and all—this discussion today is based on when you have a single-stage inflator. However, as part of the development that I know is available or is being made available, we are now seeing multi-stage inflators, particularly dual stage, and then also from the aerospace type technology of the variable-stage inflator. One example of that was discussed at the February workshop of the NHTSA. So if, in fact, you do have an inflator available to which you can now develop the gas flow into the bag at a variety of levels, then, therefore, using that technology, the occupant sensing sensors that are becoming available can be used now for an entirely different purpose. Rather than just entirely suppressing deployment of the bag, according to what the severity of the crash is, according to who the occupant is, according to where the occupant is located, then the computer module within the system can make decisions on whether, first, to use a first stage of a multi-stage inflator to provide a low amount of gas projection into the bag; or, if it's a higher severity, according, again, to whether the person is belted or unbelted, what the size is and all that, the information can be processed whether to introduce that second stage and, therefore, having different stiffness of the bag for that higher severity crash. And then for a third stage or higher type inflator system, again, the sensor information can be processed and probably that type of inflation would take place if, in fact, you had an unrestrained person in the vehicle and not out-of-position, in a normal seated position, and thereby requiring maybe even a third level of stiffness of the bag.

So very quickly, to summarize the points that I've just made, according to which different components you have in your air bag system and the level of sophistication of those components, then the sensors that are used within the vehicle can be used for a variety of reasons, by which, number one, you can prevent injuries just through the air bag deployment, itself; or, second of all, for the long term, not only reduce those air bag-induced injuries, but actually improve the overall effectiveness of the air bag system as compared to today's system.

MR. DOWNS: Thank you. The next question, I would like to move on to Mr. Vos and the subject of occupant sensing. What testing might be required by occupant sensing suppliers in order to bring this technology to market? And what I mean by that refers to the types of development testing that are in a development program in order to bring this product to the market.

MR. VOS: That gets a little bit into some of the questions that were discussed earlier with Dr. Breed. As you're developing some of these new technologies, clearly, the first step of that is to define what am I trying to prove here, what is the objective of this technology and, therefore, I need to thereby lay down a distinct set of performance expectations, complete with a methodology for establishing the ability of my invention to comply to that performance of that function, and a pass/fail kind of scenario.

That gets us into a little bit of the traditional horse and cart situation. We've been working on smart restraints for a number of years, and lacking a clear consensus within the industry of what those tests ought to be, we have just taken a best estimate, based on our experience in restraints over the past several decades, and what we understand to be certain trauma situations associated with various occupant positions.

If you actually develop a set or a matrix, which in fact we're going to work in concert with the automakers and with the Government, but as—in the broadest of senses, that matrix could start with what is in the seat; where is the seat, in other words, what is the seating position; where is that person within the seat, and a whole variety of things built upon that. And as you start cross multiplying all the factors, you end up with literally thousands of potential positions and conditions that you're trying to sense.

In the development of the sensing system, which at TRW is primarily based on ultrasonics in conjunction with a weight sensor, we have a set of screening tests that look at 27 various positions, and it largely tries to sort through the typical variety of commercially available child seats and infant carriers, in their normal positions, gets into occupants of a variety of sizes in both normal and forward scenarios, and we feel very strongly that in order for us to take any sort of position regarding the reliability of the system, one of those situations has to address the fact that the occupant is in motion and you have to be reading in real time the translation of the occupant into this zone of danger.

So it's hard for me to give you a very simple list of tests. We can make public at some later date, the list of 27 screening tests that TRW uses.

MR. DOWNS: These would be environmental parameters that you would subject the elements to?

MR. VOS: That's true. Oh, I'm sorry, the 27 conditions get largely into position tests and then built upon that are the normal environmental conditions that all of the restraint systems are typically required to function under, and then exacerbated by such factors as dark, smoky environment, high humidity environment, things that would affect the performance of some of the non-contact types of sensing systems that are being contemplated.

MR. DOWNS: Thank you.

CHAIRMAN HALL: Danger zone, they you refer to is that ten inches? Is that the famous ten inches? What is it, when do we enter the danger zone?

MR. VOS: I listen to all of this discussion trying to put down some finite distance back from the instrument panel, and you mentioned, in fact, Mr. Chairman, is it does this take us back to vehicle specific and all that, and I'm afraid it does, because depending on how severe is the crash pulse and how has the air bag system been tailored in its performance to perform to that particular crash pulse, that establishes the aggressivity of that particular system, and that gets into a work distance danger zone factor.

The other thing that compounds that assessment is, again, this issue of movement. And what you have to recognize is that despite the fact we're talking in millisecond increments, the occupant, even at 0.7, 0.8 g's, which is more or less associated with panic braking, a person is moving very quickly from, say, six inches to three inches away, and—and those have maybe different responses. And what you would want to do with some of our later evolutions of smart restraints, in the six inch out, if you could predict that is where the person is going to be at the time when the firing command goes to the inflator, you might asked for a lower output system, as opposed to turning off the air bag, even though the person is in movement.

MR. DOWNS: Thank you. Same question to Mr. Tinto, I'll read it again. What testing might be required of a vehicle manufacturer in order to bring occupant sensing technology to market?

MR. TINTO: Well, basically, as a rule of thumb, we have to insure the repeatability and the reliability of the systems. We have to insure that over a wide temperature range, over the vast majority of the driving environments that a vehicle will typically see in the fleet. We have to insure the durability of the system. At the smart air bag workshop, we presented data to suggest, based on some AAMA numbers, that after 13 years, 50% of the fleet was still in service. In fact, I believe after 17 years, there were still 10% of the fleet in service. So these systems have to be very durable, very reliable for long periods of time.

If you could put my graph up—

(Slide 1 shown.)

MR. TINTO: This is an overly simplistic representation of the various positions that we may want to test for.

CHAIRMAN HALL: I can understand this graph.

(General laughter.)

MR. TINTO: I think you heard earlier there's on the range of 200,000 in the matrix. I figured it was too small to see. But, basically, we also have all of these positions, but they range for the three year old, six year old, 5th percentile female, 50th percentile/95th percentile male. We also have different crash severities, different collision types, be them offset, frontal, side, etc., and we need to test for each and every one of these, at this point, because there's been no determination which one of these or which combination of these would be required by a standard.

We need to understand the trade offs in these systems. If we have a system that works well for several of these, where is the trade off in some of the other parts of the matrix. For example, feet up on the dashboard—

CHAIRMAN HALL: Can I ask a question, does Toyota, when you talk about the standard, you say worldwide like the other companies, are there standards in other countries that you have in the market or is it just in the United States?

MR. TINTO: As far as out-of-position testing?

CHAIRMAN HALL: Yes.

MR. TINTO: No. Of course, Toyota does its own internal testing, but as far as specific standards, no, for out-of-position tests. For example, as I was stating earlier, someone's feet up on the dashboard, is that a fire or a no fire decision. Someone has to determine in which of these cases where we get a fire or a no fire and the proper algorithms have to be designed for those decisions. And we need to understand the trade offs within occupant groups and between occupant groups. Are we trading three year old for 95th percentile, or are we trading three year old for six year old, or are we trading inside the three year old group. Those are the kind of trade offs we have to understand.

So when we talk about the kind of testing that has to be done, I think it goes back to the basic problem in that we need—and you've heard it time and time again over the last two days, to define the problem, we need to understand the effect of the current counter measures that we're taking on the future of the problem.

I think Mr. Parker mentioned earlier if no one ever puts a rear-facing child restraint in the front of the vehicle, again, based on the efforts of the coalition or based on the other efforts that we're seeing, do we need to design a system for that. The current picture, we believe, will change significantly in the future, and we need to understand that.

We need to have test parameters defined for us. AAMA petitioned for the ISO positions being included in the standard. We support that. There has to be a finite number of tests that engineers can design for, because there is no way, shape, or form that we can design for every possible scenario. And it's a crippling position to be in without a direction from the government as far as which test procedures and which positions we should use. Again, we have to decide which dummy groups we're going to test.

CHAIRMAN HALL: Well, do you have those today? Has NHTSA provided those today so you can start intelligent air bag technology testing?

MR. TINTO: Well, at this point, we have the petition from AAMA, but there has been no further progress with that.

CHAIRMAN HALL: Was this a chicken/egg situation, somebody's got to give you the parameters, before you can start working on the problem?

MR. TINTO: Well, I don't want to give you the impression we're not working on the problem. What I'm saying is that to finalize the systems for the future, we need these very basic things defined for us, and that should be done at the Government level, we believe.

I want to also add finally, as we talked about before, we need improved test devices. We don't have the dummies capable to run these kinds of tests in the standards. We need the addition of the three year old, the six year old, etc., not just the 50 percentile.

CHAIRMAN HALL: Well, Mr. Hollowell, where are we on getting these dummies approved by NHTSA: the six year old and the three year old?

DR. HOLLOWELL: We are in the process of bringing those into the rule making, such that they are dummies that can be used in compliance testing. We are further along in some dummies as opposed to the others. For example, the—

CHAIRMAN HALL: Do we make too much about all of this? I mean where—if General Motors and all these major manufacturers have these dummies and they're using them for tests, I mean how long does it take the Federal Government to do that which, you know, a worldwide automobile company is doing?

DR. HOLLOWELL: The problem or the dilemma that the Agency faces if, in fact, we come out with rule making in a final rule which sets performance standards based on, for example, a three or six year old child, the last thing we want to have happen is that we put this final rule out, the manufacturers meet the requirements of that rule but we continue to kill children. The biomechanics of child injury is one of the least understood problems that we have right now.

A lot of the injury criteria are based on scaling from adult injury mechanisms. The child data that is supportable has been done with animal testing, but that's been in the past. It's all but impossible to do animal testing today because of certain groups.

With respect to the 5th percentile dummy, we are much further alone. The SAE is looking at that. There are some required changes, but I expect that over the next few months, that the 5th percentile dummy may be at a state where we could start looking very seriously as to incorporating that into our compliance test procedures.

CHAIRMAN HALL: Okay. Well, I didn't mean to get into the middle of Mr. Tinto's presentation.

MR. TINTO: I only have one more thing to add.

CHAIRMAN HALL: Okay.

MR. TINTO: Basically, some of these future technologies we're talking about require things of dummies that current dummies cannot do. For instance, there's some—

CHAIRMAN HALL: Now aren't we this is all going to happen by the year 2000, we aren't going to have this hearing on the subject of the past, but the problem with the credibility, I think, is what people thought they were, you know, their perception of air bags and what the reality is, we've got to all work to be sure that we don't lose the value of it. But how are we going to get this smart air bag technology if we can't first get these children dummies approved, and this is 1997? And I know we're not the Administrator or the Secretary and this isn't a Congressional hearing, I'm not trying to put you on the spot, I'm just trying to ask, this question to try and understand how we're going to make that quantum leap in such a short period of time, because I hear people saying we're going to have this technology available and then we come in here, and we don't have the dummy to begin the testing.

DR. HOLLOWELL: In my opinion, the adaptive technology will actually be implemented in stages. There are certain aspects of the advanced technology which, with very little research, we can incorporate probably within the next six to twelve months. There are other aspects, as Chris has just alluded to, because of the limitations of the dummies being able to be detected by some of the sensor technologies, that it will take a longer time frame.

I would expect, for example, that there may also be some sensors that come on board earlier because of the fact that we're ready and able to develop compliance test procedures that can be used with those sensors. With respect to even the child dummy we may be in the position, for example, of developing out-of-position tests which will force some of the deployment characteristics to be improved. And while the injury criteria may not be perfect, we know that they will be directionally correct and provide some improvement. But that's where we—the Agency has to be very careful in saying that we are not solving the entire problem, but are, again, taking a step in the right direction. Which was our statement with respect to the rule making we just completed last Friday, that even with the depowered systems, we aren't solving the child fatality problem, we are addressing part of it and, hopefully, with our rule making on the advanced technologies, we will address even a greater percentage, if not eliminate the problem.

CHAIRMAN HALL: Okay.

MR. DOWNS: If I may interject here for a moment, Chairman, I understand that Mr. Vos has a list of delivery schedule, is that correct? That may be helpful in terms of your question on the timetable and scheduling.

MR. VOS: Yeah, actually, it's a schedule that was presented at last month's workshop, and it represents the consensus of members of the AORC, pointing out that when we talk about smart restraints, we are talking about a variety of components, a variety of technologies, and an expectation that everything isn't all going to be ready, nor it need be ready, for a single model year introduction; that certain of the product development is very far down the road toward completion, and others are still just emerging from a concept validation form.

We tried to differentiate for you what we meant by availability with the legend to the right, where A means, in, fact, we have concluded the product development, we have completed what we call a DV, or design validation, testing, and are starting the actual serial production of these components. B means that in the course of a lot of technologies, they have to go through a core technology level of feasibility development, and once that gets completed, the product then proceeds into an application engineering phase. And what we are describing in those items marked B, they have just completed their concept validation and have, depending on the technology, a two to three year development or applications level of work.

MR. DOWNS: Thank you. I hope that satisfactorily answers your question, Chairman.

CHAIRMAN HALL: It means that A is going to happen and B might, on this time frame.

MR. VOS: It isn't—it isn't intended to mean that it might, it could.

CHAIRMAN HALL: Could, okay.

MR. DOWNS: Moving on to the next topic, I'd like to introduce a little side topic on the subject of child restraints, seats, and proximity or tag sensors. What are problems encountered in detecting child restraints with this sophisticated technology. I'd like to have Mr. Jarboe address this.

MR. JARBOE: Well, one of the biggest issues with, I believe it's Mercedes with the tag and transponder system, is that when you introduce a multiple or variations in child seats, can you now use different child seats in different vehicles that that system is limited to that particular child seat and that particular vehicle. It introduces a lot of complexity when you potentially sell these child seats. It's—it's a situation where you have uniqueness for that individual vehicle with that individual child seat, and that harmony would have to stay with it for the—for the life of that vehicle and child seat.

MR. DOWNS: Okay, thank you. The next topic I'd like to touch on is that of pretensioners, one of the main elements we were hearing about a little while ago. Again, going back to the problems of introducing this technology to market, what kind of testing is required for a vehicle manufacturer in order to bring this technology to market? And I'd like to have Mr. Wilber address that.

MR. WILBER: Let me start out with a general explanation of bringing any technology to market and then we'll go specific to the pretensioner.

You just saw a slide of availability of particular components that the supply industries are ready to move on and/or are developing. What you have in the overall product development cycle are parallel programs in the earliest stages where you are developing a new vehicle platform. Possibly, you go to your major suppliers and you tell them that you've got a platform coming, let's say it's going to be a three-passenger front seat configuration, I need a restraint system to accommodate that, and you start working in parallel to develop both the concept and the hardware to support that platform.

What happens is at a certain point in time, you come up on the vehicle development cycle that has various references. It's called design freeze, it's called wall of invention, it could be called any number of different things. But, at that point in time, the supplier has to hand over production-ready tooled components to go into that vehicle.

A lot of people have heard claims of lead time being compressed, and most recently in *Automotive News* this past week, Mazda announced world class lead time to consumer of 18 months. That 18 months is from that product freeze point. That is not from the point of initial development. And that is considered world class. Toyota owned the record prior to that at 19 months.

Typically, we're really talking anywhere from a year and a half to two years after designs are frozen, production-ready components are committed to a program, to have that vehicle on the market.

MR. DOWNS: The last topic I'd like to touch on, although we did cover it a little bit in a previous session, is that of crash recorders, In the airline business, we see these extensively used; in the railroad business, we have these used. Why not the automotive trade in that we have the instrumentation available to register the information. We have the mechanism in the way of the crash event computer available. Some systems do record certain information. There seems to be a need for this particular technology.

I'd like to have first, perhaps, Mr. Tinto address this and then follow up by Dr. Hollowell.

MR. TINTO: I discussed this a little bit with the company and they say, yes, of course, the deceleration data is inputted into the ECU, so it's not such a big deal to get the data. The problem, I think, you heard earlier was privacy concerns, legal concerns that are, at this point, difficult to deal with.

So, I think, technically, it's not a big deal, but I think there's some broader issues that have to be addressed first.

MR. DOWNS: But if there was a factual event recorder, much like is required in the railroad business or aviation business, isn't that something that should be made available under certain parameters that, perhaps, do address the legal considerations of privacy?

MR. TINTO: I think that's beyond my ability to answer, not being an attorney. But I would defer that question to someone who is more able to answer that.

MR. DOWNS: Very well, Dr. Hollowell?

DR. HOLLOWELL: I'm in the same position as Dainius Dalmotas, that I am a researcher as well and, obviously, the more information that I can obtain from the real world crashes, the better I can define the problems that are existing and at what thresholds they are occurring.

Again, it goes back to the legal point of view and, unfortunately, I am not well-versed, and that would be more a question for our Chief Counsel's office. But to date I know the Agency has not done anything regarding requiring crash recorders. And I recall the last time I, personally, was involved in that was back in the late '70s where we had a ball and tube type velocity change detector that we perfected. However, from the legal point of view, personal rights and all that, we never did require it.

CHAIRMAN HALL: Well, I am an attorney and I will say that I think that would be difficult to do. But you do have fleets of Government vehicles, and you do have rental car fleets, and you do have maybe other opportunities that we could explore in terms of trying to get that information.

DR. HOLLOWELL: You're exactly right.

CHAIRMAN HALL: Putting it in someone's private vehicle, I think, would be very difficult, right at the moment.

DR. HOLLOWELL: And so, in fact, we do use fleets like this for other activities, we just have not used it recently for crash recorders.

CHAIRMAN HALL: Again, if you dropped a couple of grand off the sticker price for somebody to have it, you might have a large fleet out there.

MR. DOWNS: Mr. Wilber, might you have some thoughts on this?

MR. WILBER: Yes. Earlier, there was some question about how we could steal some ITS money or something like that and do something on improving crashworthiness. Clearly, one of the areas where ITS is offering tremendous potential is getting an immediate signal out of a vehicle that has sustained a serious accident. Part of the on-board diagnostics that are going to create that signal could potentially—well, I think it is in general agreement that it would be an air bag deployment confirmation, that it was a serious enough crash for an air bag deployment. You could potentially have integrated in there were the seat belts being used, so if it was air bag deployed and seat belt use, it's maybe at a different level of injury potential than if not—without seat belt use, for example.

So there may be some on-board capabilities tied into ITS rapid response that could start to fill in the matrix. And if you go beyond that and say, well, maybe we also need to know collision severity to know whether we need to—to dispatch emergency vehicles, or helicopter, or whatever, all of that maybe fits an opportunity to gather some of this data while serving the public good of doing a quick response injury recovery.

DR. HOLLOWELL: Mr. Chairman, if I may, thank you, Vann, because he jogged my memory that, in fact, under our ITS program, we have an effort going on in the Buffalo area of New York regarding automatic collision notification. And as part of that program, we are incorporating some crash parameters that can be used for determining the severity of crashes that may take place of these so-equipped vehicles.

MR. ROBERTS: Might I mention, also, that the Scandinavian countries have recorders in some vehicles, we understand, and they're probably ahead of us in belt use to, I suspect.

MR. DOWNS: Thank you, Chairman, that concludes my questions, unless anybody else has a thought on that.

MR. VOS: I had a thought, just to add to that. With regard to the issues of products liability and as we look further down the road to advanced systems coming in where, by design, the performance of the restraint system is intended to be a variable, it may be that we look at a crash recorder as a means of reconstructing the accident and assuring ourselves that now that we don't have a one size fits all type of system, that the electronics had properly interpreted and directed the restraint system to perform at that particular level of energy management that it was intended to.

DR. HOLLOWELL: Mr. Chairman, if I may add one other aspect, too. Part of the reason that we requested that the crash recorder type information be included in the automatic collision notification is with the hope of improving triage decisions. There is one aspect of improving the crashworthiness of the vehicle. Another important aspect of occupant safety is the treatment that they can get and how quickly they can get that treatment. And so with the concept of automatic collision notification, perhaps the public can, in fact, be sold on the idea of crash recorders, if they understand that the information being collected for that will improve their treatment at the crash site.

MR. DOWNS: Thank you, that concludes my questions.

CHAIRMAN HALL: All right, well, let's move to the tables. Is there any particular order here, Joe, that you want this time? Table Two last, well, we'll go to Tables—begin with Table Three.

MS. CISCHKE: Sue Cischke from Chrysler Corporation. I have a question for Mr. Wilber. What is the incentive for manufacturers to press for advanced technology if NHTSA removes the sunset provision for depowered air bags?

MR. WILBER: Well, depowered air bags is an important first step and I think everybody that's involved in motor vehicle safety to any extent realizes that. But it's certainly not the end all. If anything, the restraint engineer is on the front line daily, trying to find new and creative ways to reduce highway fatalities and injuries. So, clearly, while we think depowering is going to provide substantive safety benefits, we know that's going to have to be coupled with more advanced restraint technologies as the sensory systems come on line and as the logic allows us to further refine the total restraint package.

The initiative is the overall goal that continue to push down the fatality and injury rate out in the real world.

MS. CISCHKE: Okay, thank you. Mr. Tinto, can you discuss dummy development required for advanced occupant sensing? You started to talk about, for instance, if you used infrared sensing, how would you sense a dummy when it's not a warm body, so to speak?

MR. TINTO: Yeah, in fact, that was one of our concerns with some of the technologies we're currently looking at. Some technologies look for a heartbeat. Some technologies look for fluid in the body. Some technologies look for warmth of the body. None of which current dummies can emulate. So we feel strongly that in order to move ahead in some of these areas, we may need some further development to even the next generation of dummies that we see.

MS. CISCHKE: Thank you. And one last question for Mr. Wilber, there has been much confusion today regarding the dual-stage inflators and comments that Mercedes and BMW are cited as having smart air bag systems. How do these systems address the current situation regarding air bag-induced injuries?

MR. WILBER: The Mercedes system, that is the child smart system, that is the unique infant seat that talks to the unique car and as long as they are coupled together, offers an opportunity to automatically suppress an air bag when that seat is present. The so-called dual-level inflation of a Mercedes system and the BMW system is—I think we need to clarify this, a dual-level of triggering signal. If the seat belts are used, then the trigger to the air bag is raised up to about the 18 mile an hour point. If seat belts are not used, then the triggering signal is in the 10, 11, 12 mile an hour, plus or minus whatever their tolerances are. They do not have a dual-level inflator. Once that signal is delivered to the inflator, that air bag comes out the same, regardless of the speeds.

CHAIRMAN HALL: What if you have one person that's got the seat belt on and one that doesn't?

MR. WILBER: I don't know, we'd have to ask Mercedes that.

CHAIRMAN HALL: Any other questions?

MS. CISCHKE: No, thank you, we're done.

CHAIRMAN HALL: Table Four?

MR. PARKER: Yes, Mr. Chairman. George Parker, Association of Automobile Manufacturers. I have four questions. The first is to Mr. Tinto. Does Toyota have the information it needs to know what problem it is trying to solve with advanced air bag technology?

MR. TINTO: I think you've heard several times today and yesterday, and briefly during my presentation, that we, at this point, don't know which scenarios we need to fire or have a no-fire signal for. So we believe further development is, and a understanding is necessary of the trade offs before we can make decisions of fire, no fire for the various cells in the matrix.

MR. PARKER: Thank you. Related question to Dr. Hollowell. How will NHTSA factor in the effects of depowering, continuous restraint system improvement, and education activities into NHTSA's problem definition for which advanced technology is to address?

DR. HOLLOWELL: The field experience of the depowered system and other changes made to the vehicles over the next few years will obviously be examined to determine whether or not the safety problem of child fatality disappears all together or, in the worst case, as we—the Agency will project, that we have only solved a part of the problem. So we, will monitor the field experience to see how the systems are performing.

If, the problem goes away, maybe the need for the advanced systems is less. Whereas, in addition to the advanced research on the technologies being used to minimize, if not eliminate the problems of the low severity air bag-induced injuries, we will also examine how we can, in fact, improve the performance of the air bag system as a whole and, thereby, drive up the benefits that we have currently as just published in our report to Congress.

MR. PARKER: I guess a follow up question on that, NHTSA has announced its intention or desire to do a Notice of Proposed Rule Making either this year sometime or early next year on advanced technology systems. While I agree with your answer is that in conflict with NHTSA's plans for a Notice of Proposed Rule Making?

DR. HOLLOWELL: That's a good question, George. When we went out with the rule on the labeling, at that time, we defined the advanced systems as the Type 1, Type 2, Type 3, and it has become obvious to the research side of the house and to others within the Agency, as well, in our discussions, that unfortunately the Type 1 technologies are not as well-developed as we had hoped. And so, in fact, there has been a great deal of discussion as to whether to proceed with the NPRM immediately or to defer it to the near future or what. But, at this point in time, there has been no policy decision regarding that.

MR. PARKER: Thanks. The next one is to Vann Wilber, and Mr. Wilber, you may have answered this somewhat already, but do you have an opinion on whether advanced technology restraint systems should be designed for current or depowered air bags?

MR. WILBER: Well, I think that depowered air bags, as I mentioned, or are going to offer a substantial safety benefit. And we had recommended to the Agency and to others that we take a very careful look at quantifying from field data as quickly as it's available from the first day a car is built with a depowered bag, to take a look at what's going on out there, to take a look and find out exactly what that benefit it. I believe that we will find, and we have every confidence that we're going to find that this safety improvement associated with depowering would continue to be an integral part of advanced restraint systems, that these depowered systems would be enhanced with new technologies, not replaced by them.

MR. PARKER: Also to Mr. Wilber, do you have an opinion on whether all of the advanced technology being discussed is necessary to solve the problem of out-of-position and improperly restrained occupants?

MR. WILBER: That's what we hope. We've heard a lot today about 200,000 iterations for trying to find out where people are and what they're up to. We've had discussions about where this danger zone is. And I think as we move into the depowered arena, the danger zone is going to be a fire/no fire within four inches of the air bag deployment door for the passenger side, and zero inches on the driver's side. That's what the depowering system brings us to.

How close in time can you make that decision, that will be the challenge. If we're going to iterate every millisecond, that will be pretty good. Can we get to that level, let's hope so but it certainly isn't anything that's been demonstrated yet to us.

So I think that the challenge is there to, say, how much of a three-dimensional aspects of an occupant moving around in a vehicle compartment, be they moving around because of their own initiative or because of crash influence. How soon can we picture and how soon can we make an informed decision to the inflator to do something right or not to inflate at all is the real issue, and we're talking milliseconds here.

MR. PARKER: I guess as a follow up, and maybe this is a statement more than a question, but it seems to me that the best solution is the simplest solution, and that's why I asked whether all of the advanced technology being discussed would be necessary to solve the problem.

CHAIRMAN HALL: Table Five?

MR. HASELTINE: Phil Hasteltine representing the Blue Ribbon Panel. One question for each member of the panel, but it only requires a one-word response, Mr. Chairman. Each of you has discussed a number of potential innovations which could offer the potential to make air bags perform better than current designs. Do any of you envision a system which, within the foreseeable future, would make it unnecessary for vehicle occupants to wear safety belts?

MR. WILBER: I'll start. Not now or in the foreseeable future.

MR. TINTO: I would concur with that.

MR. VOS: Never.

MR. JARBOE: I concur with that.

DR. HOLLOWELL: I actually concur with these people.

(General laughter.)

DR. HOLLOWELL: And from the point of view, for example, that rollover protection, in my opinion, will always require some type of belt system.

MR. JARBOE: And I'd just like to add to that, as far as the belt system, I think Oldsmobile had a commercial this is not your father's Oldsmobile, and that's the same with belt systems today, with pyrotechnic pretensioners and load limiters, and also belt and seat application, we have a product in the Chrysler Sebring with an integrated height adjuster, which a lot of those technologies need to be advertised as well. Maybe we can increase belt use by advertising the technology that's in that device, as well.

CHAIRMAN HALL: Okay, is that it? There are clearly other reasons for wearing seat belts, rollovers, secondary impacts, and others. Right, George?

MR. PARKER: Yes, sir.

CHAIRMAN HALL: Very good. George wanted to be sure I got that plug in for seat belts. Table Six?

MR. DITLOW: I'm Clarence Ditlow, representing the Center for Auto Safety. For Mr. Vos, the time table that you showed from the NHTSA smart air bag workshop indicated the introduction of advanced air bag systems. It listed dual-inflation technology in the near term, and occupant position sensing further out. Can you proceed with dual-stage inflation on the time schedule that AORC stated and then later integrate occupant sensing into such systems?

MR. VOS: Yes. Actually, I have introduced or suggested that type of a phasing schedule of technologies in various SAE and top tech forums, and Government industry meetings and the like. What we refer to as our first phase essentially is a take off of the system described earlier by Mercedes as being a sensing system which looks at multiple crash thresholds and whether or not the person has worn their belt.

The added feature that we've applied to that is rather than simply raising the threshold of the single-level output air bag, based on whether or not the person is wearing their belt, is we carry that to the next step and we say that even though that person is wearing their belt, this is still just slightly above the firing threshold. It is not necessarily a life-threatening scenario and, therefore, we could, given the added flexibility of a multi-output type of inflator, go with the lower level output. Conversely, had it been the population of crashes that is more severe, then we would have the opportunity to kick in the second level of output.

So what we would appreciate through that combination of components is a reduction in exposure rate, in the vast majority of actual crashes, of the occupants of those crashes to a high energy deployment, reserving only then that population of crashes that are truly up in the life-threatening range.

After the industry has gone through essentially the testing and the development of testing, that was my first question this afternoon, and we are all comfortable that we have defined what are the requirements and have developed, robust occupant sensing systems, then that technology can be phased in as a yet added feature to that configuration.

MR. DITLOW: And in the first component of those systems are the crash sensors, are you confident the crash sensors are available today for dual-stage inflation?

MR. VOS: Yes, I am confident they are. They are in production in Europe and TRW has released a sensor that is capable of doing that. As you start getting into adding additional features, I think several panelist today mentioned, Mr. Nusholtz in particular, that the added complexity and the taxing of the microprocessors and so forth that are associated with that, you obviously have to continue to upgrade computing capacity of the systems as a consequence of adding more inputs.

MR. DITLOW: Mr. Hollowell, is NHTSA conducting work to develop any performance standards for crash and occupant sensors?

DR. HOLLOWELL: At this point in time, what we are doing is, first, we have a program with NASA and the jet propulsion laboratory to actually survey the state of the art regarding advanced technologies, including the sensors. JPL, in particular, has expert knowledge with respect to microelectronics and propulsion type systems, and can provide an objective, critical review of the state of the art of these technologies, thereby telling us what technologies are available today, what are available in the near future, and what are available in the far future.

A second effort on which we have actually signed an agreement is with Transport Canada to do coordinated research to develop test procedures by which we can then introduce the advanced technologies.

At this point in time, we have agreed in principle of what that work shall be, that is, developing the test procedures, as well as making the necessary improvements to the dummies and associate injury criteria. But the defined activities have yet to be outlined due to the fact that we are—or at least I, personally, am waiting for some interim type report from JPL to help define that activity.

And so the answer specifically to your question is at this point in time, there is no activity. However, over the next six months for certain, we will start introducing activities that undertake the action that you suggested.

MR. DITLOW: Will NHTSA have any funding from the Intelligent Transportation System monies for air bag sensors?

DR. HOLLOWELL: To date, the funding has been used primarily in the area of the precrash sensing, on the radar technologies. As part of the ITS, they are looking at automatic cruise control, using radar technology from keeping the vehicle running off the road, and so they have allowed us to define some of the activity as to examine how those radar technologies potentially could be used for precrash identification or precrash sensing.

However, mind you I'm not an expert in the radar technology and I rely on my staff to keep me briefed on that, but my staff, if I recall correctly, has informed me that the radar characteristics required for the crash avoidance type capabilities are quite different from that for crash sensing. And so, at least, that's part of the findings that we have to date. However, if we have the computer processing available on board for ITS that can be used for the crash avoidance work, then we can add in our own radar chips, for example, that meet the requirements of doing precrash sensing, and then piggyback the computer that's already there, thereby making precrash sensing only an incremental cost when you have the entire ITS technologies available in the vehicle.

MR. DITLOW: Thank you. Vann Wilber, the Chairman Hall referred to the chicken and egg scenario, and Mr. Tinto referred to the need to have the dummies before you can develop the advanced technology and the other position testing, what are the manufacturers doing in terms of getting the 5th percentile, say, female dummy, which has been pretty well developed since the mid-’80s, into a code of federal regulations to resolve these dilemmas so that we can move forward with it, recognizing that rule making is only a petition away.

MR. WILBER: Well, hopefully it’s not even that far away because the second half of our petition of six or seven months ago specifically said let’s add these other size dummies, the 5th percentile and the child dummies that are also fairly well developed.

There is, as noted earlier, less confidence maybe in some of the injury values assigned to those dummies because they are scaled down and we need to focus on maybe some of those limitations and try to improve our level of knowledge.

But our petition basically took a snap shot of where we thought we are right now in our state of knowledge. We know a lot about the 5th percentile dummy. We have high confidence in the child size dummies that have been developed. We think there’s some reasonable injury criteria to start with, at least, and we recognize that ISO had done a considerable amount of work in trying to define an out-of-position parameter. So that was part of our petition and we hope NHTSA moves forward on it.

MR. DITLOW: Finally, Mr. Tinto, when you look at advanced air bag technology, you see the AROC indicates a dual-stage inflation is near on their schedule, what do you envision as the near term advanced technology?

MR. TINTO: Directly related to dual-stage or anything?

MR. DITLOW: Anything and how soon can we get it?

MR. TINTO: I guess that we would say that the closest thing to being implemented would be maybe a CRS tag system; although, the Government has to standardize the frequency and the power of that tag system because there are different manufacturers of tag systems that talk to each other and, you know, if you have your Toyota product and your Mercedes product, you would have the expectation that you could move the seat from one to another, but that may not be the case if the tag systems are not standardized.

So we would urge that direction also be pursued. That, in our opinion, is the most near term, “smart technology” that we can envision.

CHAIRMAN HALL: Okay, Table Two?

MR. MILLER: John Miller, AORC. Just one question for Mr. Vos and Mr. Jarboe. NHTSA has, in some of the NPRM’s, embraced weight sensing as maybe one of the initial means of introducing a smart system. Could you please speak to some of the technical shortcomings or technical hurdles related specifically to weight sensing?

MR. JARBOE: Yes. Specifically, what we found is there are numerous ways you can fool the weight device. One, I think it was mentioned earlier, is in an ALR mode of the retractor or when the retractor is in a mode where it can be cinched for a child seat. If you over cinch that, you get a false reading on the weight of the seat.

Another condition we see is on a rearward facing child seat, if you take that seat and move it full forward, where the back portion of the child seat is providing a leverage load off the instrument panel onto the seat, you can also get a false reading on the—on the child seat, as well.

MR. VOS: I'd just like to expound on that a little bit, that what we're pointing out here is that it isn't that the technology doesn't have the capability, it's the application. Measuring weight in a seat is an extremely difficult task and some of the cases cited by Mr. Jarboe are but a few of the ways that when you start looking at the definition of the task, whether or not the child is added to the weight of the child restraint. If you have to look at the variation of people applying a preload on the belt and so on and so forth, even a sensor that has a completely perfect capability will not be able to measure a finite threshold, and that's why we're opposed to a ruling which would have us turn off the air bag at a specific range.

On the other hand, we believe very strongly that a true weight scale, something that is able to discriminate a full range of weight, though you have some error bar in that determination, is a very key component in corroborating data from other sensor inputs and will be a significant contribution to the accuracy and reliability of the more sophisticated and encompassing systems.

CHAIRMAN HALL: Table One?

MR. BISCHOFF: Don Bischoff, NHTSA. A question for Mr. Tinto. He indicated that the current situation was crippling, since the Government has not provided for a performance envelope for evaluating advanced systems. He also indicated that Toyota had some internal practices, and were evaluating advanced air bags. Could you elaborate on what some of these internal practices are and, especially in light of what Mr. Wilber just indicated that the new family of hybrid 3 dummies are fairly well advanced and that ISO has established test procedures for looking at out-of-position occupant testing, and finally most of this air bag technology is permitted under the current version of 208, so how exactly is the Government holding you up from introducing advanced air bag technology?

MR. TINTO: Well, first of all, the out-of-position test that we run are based on ISO tests. ISO tests, or International Standard Organization tests, are not sanctioned by the Government. They are through a consensus organization. They are the best we have, to date, and, at this point, those are the kinds of test postures that we use when we evaluate these systems.

I don't recall the rest of your question, unfortunately. Would you please reiterate it for me?

MR. BISCHOFF: The general thrust of the whole question is you thought that you were being crippled from introducing advanced air bag technology because of the Government not specifying it, and yet I've heard much discussion over the last couple of days that, a number in the ISO has agreed on how to test for out-of-position, a family of dummies is available certainly for research purposes, albeit they're not federally certified yet. I'm at a loss to understand why you cannot introduce some of these technologies without the Government stepping in.

MR. TINTO: Well, we believe there are significant problems with all the current technologies that we've tested. It's not my intention to poke holes in anyone's efforts. We're all making great strides towards developing smart systems. But, having said that, the systems we've tested so far, even with the dummies that we've been able to use, have shown fatal flaws, in our opinion, and need further development. Therefore, we would not be comfortable introducing them in our vehicles until they exhibited the durability and the reliability that I discussed earlier for 15 million vehicles per year in the fleet.

MR. BISCHOFF: Mr. Wilber, you mentioned that it's about 18 months from the time a manufacturer reaches the design freeze point with any advanced system to production. Could you comment on some of the types of advanced systems that are closest to this point and what the projected schedule might be for their introduction?

MR. WILBER: I think that I would probably defer back to the timing chart. Here, as you well know, as a trade association, we are somewhat limited in how much product knowledge our members choose to share with us when it's that specific. So all I can say is that the 18-month time frame, again, was the world's best and it does represent the absolute shortest time to bring to the market an existing technology that's been proven to meet all the performance parameters that a manufacturer would hold against it.

How close any given technology is to any of our members to that particular time frame, I wouldn't be privy to that information.

MR. BISCHOFF: Thank you, Mr. Chairman.

CHAIRMAN HALL: Thank you. Mr. Osterman?

MR. OSTERMAN: I just have one, I think, for Dr. Hollowell. Mr. Tinto had previously indicated that the technology level of the current dummies and those of the immediate future would not be able to detect such things as body temperature and so on. Now I understand the difficulties that surround animal testing. Are there other alternatives to these two methods of determining the effectiveness of these devices?

DR. HOLLOWELL: Other than animal testing?

MR. OSTERMAN: Of the advanced technology devices, other than animal testing and a yet to be designed advanced dummy.

DR. HOLLOWELL: For this rule making activity which I am currently part of as far as advanced technologies, we are looking primarily to nominal changes to the existing dummies. And such that, in fact, we have defined a research program on the fast track for introducing changes to the dummies such that, they can reproduce the heat of a person; that, they can be detected by sensors that are based on capacitants, that is locating with the fluid in the head type changes.

Also, as far as understanding injury mechanisms, we are very heavily involved in the mathematical modeling, as that from the engineering approach, we can determine exactly the mechanisms of injury within the body, in particular the neck which is a key area as far as air bag-induced fatalities, and relate the measures that we get from computer modeling to the real world crash experience. So there are other activities underway, yes.

MR. OSTERMAN: That's what I thought. And how far away are we from introducing some dummies that can replicate fluids and temperature?

DR. HOLLOWELL: That's just a guess on my part, but probably a minimum of a year away.

MR. OSTERMAN: That's all.

CHAIRMAN HALL: Mr. Arena?

MR. ARENA: No questions.

CHAIRMAN HALL: Mr. Sweedler?

MR. SWEEDLER: Nothing.

CHAIRMAN HALL: Dr. Ellingstad?

DR. ELLINGSTAD: Mr. Hollowell, with respect to this dummy certification again, not including these embellishments that you were just talking about, where is the certification process with respect to 5th percentile women, with respect to the child models, where is that work being done, how quickly is there going to be a standard there?

DR. HOLLOWELL: Okay, with respect to the 5th percentile female, our safety performance standards office our rule making office, and the SAE regarding the 5th percentile dummy. And, as part of the improvements required of the dummy, our lab in Ohio, the VRTC, is doing part of that research.

Again, I believe I mentioned that we hope that that activity comes to fruition over the next few months. And my understanding, around the May time frame, if I'm wrong, I'll get back to the Board here, is that hopefully, the SAE will say that this dummy is ready for use and for our evaluation, and then it's just a matter of a few months for the Agency to be convinced that it's a tool that can be used for compliance testing.

MR. ELLINGSTAD: Thank you.

CHAIRMAN HALL: Good. I have one last question, Dr. Hollowell, unless Elaine or any of the technical staff have anything? Now, this depowered air bag rule—which was something that our Board had recommended—does NHTSA yet have a program plan for evaluating the performance of depowered air bags and do we have to wait until they are actually out on the highway, or can we begin looking with these tests at the effectiveness of depowered air bags?

DR. HOLLOWELL: As part of our FY-98 budget request, we have put in significant budget dollars for the activities regarding the child fatalities and out-of-position occupant injuries and fatalities, including monies for our National Center for Statistics and Analysis for doing the types of studies that you are talking about.

CHAIRMAN HALL: But that's October 1 of next year, right?

DR. HOLLOWELL: In addition the depowered systems, at the earliest, will be introduced over the next few months, if that early, and probably it'll be the new model year, and then even once they're out in the fleet, it may take some time to actually have crashes with those vehicles. So that may not be so bad, okay. However, having said that, we do already have our special crash investigations program which we also would like to expand, and obviously we would like to, track vehicles that do have the depowered systems. So with funding, which I am hopeful that we will get with our current special crash investigation program, I do hope that we will be able to adequately monitor the field experience of the depowered systems.

CHAIRMAN HALL: Well, what about the manufacturers association foreign, and domestic, are you going to be doing anything in industry to look at depowered air bags and their experience?

MR. WILBER: Yes, sir, Mr. Chairman. We have been going out to discuss the idea of how to focus all the possible accident data sources towards depowered vehicles as quickly as possible. When I say going out to all the possible sources, looking at insurance records, claims histories as quickly as possible, committing to look at every single fatal accident that occurs with a depowered system. Our members have committed to advise NHTSA and the accident data folks on how they can identify these vehicles, whether it's by specific VIN number or some mechanism to accurately track the vehicles as they are introduced into the field.

We want to get a handle on what problems, if any, show up with the systems that we haven't foreseen. The test data so far in the laboratories, and on the simulations, and on the sleds, have looked very promising, and we'd like to see that confirmed as quickly as possible.

CHAIRMAN HALL: All right. Well, I'll offer this panel the same opportunity we've offered all the others. If anyone has any closing comments or things that have not been discussed that you think are important to put on the public record, I would appreciate it and we'll start with Mr. Hollowell.

DR. HOLLOWELL: I will just make my closing remarks with respect to what I actually hope and pray, to be quite frank, that the depowering, as well as the other changes made by the manufacturers voluntarily, will in fact solve the child fatality out-of-position problem. However, having said that, our Agency does not project that to happen and, thereby, require that we work very rapidly to develop procedures by which we can introduce the advanced technologies.

CHAIRMAN HALL: What about the vehicles on the road now?

DR. HOLLOWELL: That's a good question. I can't answer that.

CHAIRMAN HALL: All right. Yes, sir?

MR. JARBOE: I'd just like to state that I think NHTSA should also look at the new car assessment program. There is going to be the desire to, when the automobile manufacturers are marketing their vehicles, to show five star performance, and that may be interpreted by the general public as being in a vehicle that has overall the best safety, when in fact it would strictly be for the 30 mile per hour belted case. I think that's what Mr. Tinto mentioned in that we need to define test procedures and requirements for out-of-position, as well—whether it's the three year old against the panel, the 12 month old baby four inches away—to define some type of lower level, lower limit to be able to say does this vehicle have a good balanced system in terms of the two extremes we are trying to meet, the 35 mile per hour belted, as well as the situation for Mr. Ambrose's child, to protect for that condition as well.

CHAIRMAN HALL: And I guess we're saying that—is that back seat as well as front seat, since obviously we're making all our efforts that the children aren't in the front seat. I understand there's—we need to maybe look at that, but are we looking at the back seat, as well?

MR. JARBOE: Yeah, and I believe the main reason we're here today is the front seat and the point that was brought up the social and economic factor as these vehicle are passed down, it's going to happen.

CHAIRMAN HALL: Right. Okay, Mr. Tinto?

MR. TINTO: I'd just like to say that with all the discussion about smart technology, don't lose sight of the primary message, which is children in the rear, buckle up. And we want to concentrate our efforts towards minimizing the segment that's left of the population that's at risk. So we need to get the message out, we need to reiterate the message at every opportunity we can, and also work towards minimizing other risks.

CHAIRMAN HALL: Okay, well, thank you. Mr. Vos?

MR. VOS: I wanted to add a comment, too, about the discussions that have gone on today regarding raising the crash threshold, and I wanted to be sure that people recognize that where that has been successful in meeting some of the objectives, has been in those instances where there has been extremely high belt use. I am very concerned about anyone coming away from this meeting with the thought that raising the crash threshold is applicable to our particular situation, with our particular belt use rate. I am concerned that if we were directed to do so, that it would delay our time to fire. It makes it extremely difficult for the sensor manufacturer, the algorithm engineer, to discriminate early enough the offset barrier types of crashes, the car-to-pole types of crashes, and so on, so forth, from virtually non-events, and I'm afraid that restraint will be compromised in those circumstances.

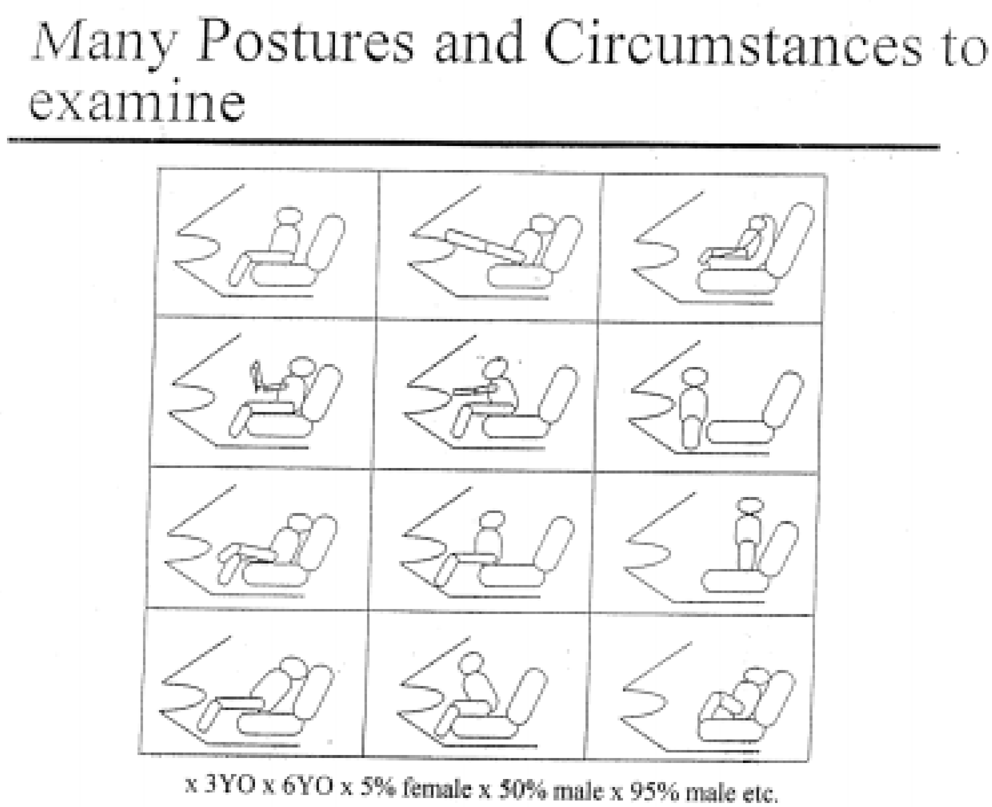
CHAIRMAN HALL: Thank you. Mr. Wilber?

MR. WILBER: Thank you, Mr. Chairman. Again, just to echo the clear message that belt use is an intregal part of any advanced technology that we can envision or, in fact, have any opportunity to truly maximize the safety benefit. And I would like to thank you for your leadership and pulling together this public forum for this exchange of information.

CHAIRMAN HALL: Well, thank you very much, Mr. Wilber. The credit really goes to the folks that do the work at the Board, that have worked very hard at the staff level to do this, but I appreciate that compliment for all of them.

This concludes the session today and believe it or not, if I hurry and don't mumble too much, we'll be on time. Is it okay with the Tables if we start again at 8:30 in the morning, to give us that extra 30 minutes so that if we want to get into something in more detail—well, good. We'll begin again with the panel tomorrow morning on the experiences with air bags in other countries at 8:30 a.m., and this will conclude today's forum.

(Whereupon, at 5:00 p.m., the hearing was recessed. To be reconvened on Wednesday, March 19, 1997, at 8:30 a.m.)



Slide 1. Passenger positions. (From Mr. Tinto's presentation, March 18, 1997.)

Wednesday, March 19, 1997

(Time Noted: 8:42 a.m.)

Panel 1

What is the Experience With Air Bags in Other Countries?

CHAIRMAN JIM HALL: On the record. We will continue with the next session of the public forum of the National Transportation Safety Board. Our friends with the Republic of Germany pointed out to us that the slide which is behind me, which indicated seat belt use around the world was incorrect. We checked it out and we had transposed the numbers in putting the slide together.

As you can see from the slide over my head, the Federal Republic of Germany has excellent seat belt use, and I owe an apology to Mr. Kallina because of transposing the numbers. In fact, they are ranked second in the world, with some 92 to 94 percent use.

So, our apologies to the many Germans who buckle up for presenting a slide that incorrectly reflected that information initially. [The transcript of the forum contains the corrected slide. Refer to slide 1 in Chairman Hall's opening remarks on March 17, 1997.]

MR. KALLINA: A silver medal is okay.

CHAIRMAN HALL: All right. We're not perfect over here, but when we make mistakes, we admit them. So, we'll proceed ahead this morning with a panel I'm particularly interested in. And I really want to thank these panelists, because all of these individuals have come some distance to share with us this morning their experience.

The title of Panel 1 is "What is the Experience With Air Bags in Other Countries?" And I'll ask Elaine to take charge and begin the panel.

MS. WEINSTEIN: Thank you Chairman Hall. Good morning. This morning, we're going to cover three issues; air bags, seat belts, and child restraints in other countries. I would like to start by asking the panel to identify themselves and their organization for the record, starting with Mr. Dalmotas.

MR. DALMOTAS: Dainius Dalmotas, Road Safety and Motor Vehicle Regulations Directorate, Transport, Canada.

MR. KALLINA: I'm Ingo Kallina working at Mercedes. I'm the Vice President and I'm responsible for the structure development for all passenger cars and safety.

MR. MAKEHAM: My name is Peter Makeham. I'm the Director of the Federal Office of Road Safety in Australia.

MR. SPARKE: Good morning. I'm Laurie Sparke from Holden in Australia. I'm an Engineer with some experience in bio-mechanics, and I'm responsible for the vehicle safety in our company.

MS. WEINSTEIN: Thank you. Mr. Makeham, I would like to start with you, and then we'll go to Mr. Kallina. Could you describe for us how the design of air bags differs in your country from those in the United States?

MR. MAKEHAM: I would like to commence by just talking a little bit about our policy setting. Our Australian design rule which is the equivalent of your Federal Motor Vehicle Safety Standard is derived from FMVSS 208 with a fundamental difference. The dummies are tested belted. All the other essential criteria are essentially the same.

So, we have not mandated air bags, but we took the view that while setting those performance criteria in that way, it would give manufacturers the flexibility of coming up with an appropriate restraint system that met those needs.

Now, in conjunction with that design rule, we have an agreement with the motor vehicle industry in Australia, that all models, from the beginning of 1995 would have air bags available and that has taken place.

So the result of that is the air bag, the manufacturer has the flexibility of designing the air bag primarily to suit belted occupants and that is the objective. Our second objective is not to cause harm to people who are unbelted.

Probably the third thing that I just want you to refer to is our child restraint package, because I think it is relevant to what is here today. Our child restraint package is that children should be in the rear seat and that has been the case for many years. So, the issue of children traveling in the front seat is of passing relevance to us. We have very, very high wearing rate in the various seats. And one of the reasons for that is that all child restraints the bassinet, the child seat or the booster seat have a top tether which clicks to the mounting point in reach behind each rear seat. That's a very good clip. It's designed right here in the United States in the early '70s, but we've had it in our design rules for some years.

Now that, plus the use laws, has meant that most children travel in the rear seat.

CHAIRMAN HALL: Could I ask to clarify two things. You've had the air bag requirement since 1995?

MR. MAKEHAM: Fully since 1995. Air bags have been on the Australian market since the early '90s. You know, the upper market, top cars, imported vehicle have had it since that time, but the design rule has been mandatory since the beginning of '95, but it does not require air bags. I'll just make that the point.

CHAIRMAN HALL: What percent of new vehicles have air bags?

MR. MAKEHAM: We're doing a formal survey now, but I would think 70 to 80 percent. It varies from model to model. Some models only supply vehicles with air bags, but that's the—

CHAIRMAN HALL: And as they are sold on the market in Australia, is that an additional cost or is that part of the sticker price?

MR. MAKEHAM: It depends very much on the manufacturer. Some manufacturers, such as Ford, only provide vehicles with air bags. So, it's built in. Others provide it as an option. Others provide it as built in to a particular model. You know, it's an option on others. It varies from manufacturer to manufacturer.

CHAIRMAN HALL: And do you all have pickup trucks in Australia, I guess?

MR. MAKEHAM: Yes, we do. Not probably to the same extent as you do in the United States.

CHAIRMAN HALL: Do you have off/on switches or they just don't have air bags?

MR. MAKEHAM: Some do and some don't. The larger ones tend not to, unless they are sort of upper market vehicles.

CHAIRMAN HALL: And on the child restraints, is that a requirement at the Federal level or your equivalent state level that the children be in the back seat and how it is that enforced?

MR. MAKEHAM: Australia is a Federal country, the same as the United States. The fitting of that tether behind a rear seat is a Federal requirement and Federal law. The supplier of the harnesses is a requirement in Federal law. In other words, you cannot supply child safety appliance that does not have that upper tether and clip.

So, the Federal law covers the supply to the market element. The use laws are a state responsibility with our coordinators nationally. And today, they're enforced through the states.

CHAIRMAN HALL: Thank you.

MS. WEINSTEIN: Mr. Makeham, is there anything else you wanted to add?

MR. MAKEHAM: No, I think I've covered the main, I think, policy settings.

CHAIRMAN HALL: I think Mr. Sweedler has a question.

MR. SWEEDLER: Excuse me, Mr. Makeham. Are the children required by most of the states or all of the states to ride in the rear seat up until a certain age?

MR. MAKEHAM: It's a primary law that every person should be restrained and that every child should wear an approved restraint, if fitted. Two jurisdictions have a requirement that children can only be carried in the rear seat.

MR. SWEEDLER: Up until what age?

MR. MAKEHAM: Up until the age of ten, yes.

MR. SWEEDLER: And the other states?

MR. MAKEHAM: Well, the other states have, as I say, this use law that says children must use the restraint if one is available. Now, most parents use a restraint for their children and because of the upper tether, it's fitted to the rear seat. So, it's an indirect route to achieve the objective.

Just about observational data, if I can—that might be relevant to you. From zero to four years old, 94 percent of children travel in the rear seat. From five to seven, 85 percent. And from eight to 16, 86 percent. So, we're getting very high rear seat usage.

CHAIRMAN HALL: Do you maintain fatality statistics in Australia in regard to belt, unbelted, and what would those reflect?

MR. MAKEHAM: Yes, we have a fatality file, which the Federal Office of Road Safety, my organization, keeps. And that is quite similar to your file system. We also have an injury file which is, again, quite closely modeled on the system. So, we do have very, very extensive data, particularly on fatalities and serious injuries.

MS. WEINSTEIN: Mr. Kallina, would you describe how the design of air bags differs in Germany and Europe from the United States?

MR. KALLINA: Well, again, I would like to start with a comment in written form, because of my limited English language skills. I would do it in a written form, please.

This is the first time in my life as a Mercedes-Benz Engineer that I have been asked to speak on behalf of all of Europe. In fact, Europe is not a single homogenous country, but a mixture of significant, different experiences in terms of air bag usage.

Indeed, Eastern Europe is more concerned about getting their cars to operate properly than they are about air bag protection. On the other hand, the U.K., Scandinavia, Netherlands, France, and Germany, have an increasing number of air bags in their domestic car fleet.

The overall development of air bag technologies in the European outer fleet has come about in dramatically different ways than in the United States. In Europe the demand for air bags has been totally market driven. In addition, the air bag is designed and seen by consumers as a supplement to proper seat belt usage, which is mandatory in most European countries.

The final significant difference between the United States and European countries in terms of occupants and protection relates to the legal impact of mandatory seat belt laws. Also, European countries have mandatory seat belt laws similar to those in various U.S. states. The extra driving force, which causes high seat belt usage in the real world, is not enforcement of the mandatory seat belt by the police. But rather, it is a fact that European motorists realize that they will jeopardize full insurance coverage of themselves and their families if an accident occurs in which it is found that seat belts were not used.

Thus, seat belt laws are mainly in force by the societal determination that full insurance coverage will not be available to individuals who do not act responsibly and are involved in accidents in which they are not belted.

Another difference involves public education. In Europe, public education starts at the very early age, which are dedicated programs dealing with highway safety and seat belt usage. This normally results in children's constantly urging their parents to buckle up and assuring that the individual child buckles up in the rear seat. Hopefully, the individual manufacturer notification programs to customers and the industry government ad campaign going on in the United States is a first step in developing this type of public education program in the United States, with the same resulting improvement in motor vehicle safety experience in Europe.

Finally, I would like to briefly describe to you the reaction in Europe to the ongoing debate here in the United States, regarding the risk to occupants from air bag technology. In Europe, there was considerable media attention for some limited time to the U.S. situation. I was personally involved in meetings where we publicly discussed the problem and the situation in the United States.

The conclusion in Europe to the U.S. situation is as follows: European participants believe that better, more objective consumer information would be helpful in the United States, as it is in Europe in explaining the overall benefits of high seat belt usage.

Such information has resulted in European drivers recognizing that when properly belted and positioned in the vehicle, occupants have little, if any, risk from air bag technology. Second, European citizens were also somewhat confused by the fact that it appears American society does not place the burden on the individuals to exercise reasonable care, such as wearing a seat belt.

Europeans feel a responsibility themselves, as well as the public in general, to take reasonable and simple actions to protect themselves and others, and to reduce overall injuries and medical costs.

Finally, in the area of deactivation, there is also a difference between the United States and Europe. In the ECE, there is no standard requiring air bags, and, therefore, there is no prohibition against deactivation.

In the European community, customers may request deactivation from the dealers, sign a contract indicating that the dealer and manufacturer will have no liability for such action, and have the air bag deactivated. Very few customers have taken such action. Most Europeans are aware, of course, that this type of contractual resolution of the U.S. official may not be workable in the U.S.

In conclusion in terms of technology, there's very little difference between the United States and Europe in terms of the air bag and auto safety. In terms of public recognition, as with many other safety advancements, the product must be used properly in order to receive the benefit. There is a distinct difference between the two societies.

MS. WEINSTEIN: Thank you.

MR. KALLINA: If I may add, yesterday I was asked by Dr. Lund from IIHS, if after we changed from two thresholds to a single threshold, if there has been a different pattern in injuries. So we checked our files tonight while you were sleeping. We have an in-depth investigation at Mercedes-Benz. That means we only focus on severe accidents.

So the accidents where the injury outcome is very, very low and only—I would say, AIS level 1 and 0, we have no access on it, because they are not to report it and we don't investigate them. But we only have four cases where unbelted people between the two thresholds, where the low threshold is firing only the pretensioners and the higher threshold is firing the air bag. They were unbelted drivers, four, and they only had AIS 1 injury, which clearly supports our decision, which we have taken to suppress air bag deployment at the lower threshold and to only go to the higher threshold of roughly 18 miles per hour, which is a good justification. This, I wanted to add. Thank you.

MS. WEINSTEIN: Thank you. Mr. Dalmotas, would you like me to repeat the question?

MR. DALMOTAS: No. I think I actually probably mentioned yesterday that really in terms of air bag fitment, there are very, very few differences in terms of designer fitment between Canada and the United States. We have a very harmonized North American market. There may be a couple of manufacturers that, for example, may offer passenger side air bags as an option rather than standard between Canada and the United States, but most of the differences are fairly minor.

We, of course, have a situation with respect to child restraint systems, which closely parallels that in Australia. In Canada, I guess, we've required tethers, anchor hardware, in passenger cars, since I believe 1989. That's in the form of either a bolt or a bolt assembly that people can fasten their forward-facing child restraint system to the back seat.

I think as of 1999, we will actually require that one full row of the vehicle have complete tether hardware, so that—essentially, you have female end already in the vehicle, so that the consumer can simply clip forward facing child restraint systems into the vehicle easily.

I think as a result of our emphasis on the tether systems, we have a high percentage of at least forward-facing child restraint systems in the rear seat as in Australia.

MS. WEINSTEIN: Thank you. Mr. Sparke, could you describe the design of the Holden air bag system?

MR. SPARKE: We have a unique system in that it's been in the field for four years and we get an exceptional protection from the system. For example, we have seen no incidents of any inflation induced injury. By comparison in the U.S., I understand 40 percent of air bag deployments cause some level of injury. And we have heard in these sessions, that some of those have been fatal injuries.

However, the air bag system in the Holden is current technology. There is nothing special about it. The reason it gives such exceptional performance is two-fold. First of all, we chose not to compromise the protection of vehicle occupants to allow for individuals who make irresponsible choices about not wearing their seat belts.

Seat belt wearing in the front seat is around 98 percent. And so we consider anyone who chooses not to wear a seat belt to be behaving irresponsibly and it's not appropriate to compromise the protection of the general community.

Secondly, we decided we would not compromise the protection to occupants in our vehicles by achieving good NCAP performance. NCAP performance drives aggressive restraint systems, exactly the sort of issue that you're trying to deal with here today.

So having made those two decisions we can then develop a system, which is very benign which provides maximum protection to the whole community, male and female, large and small, young and old, in the wide variety of real life pressures, they get involved in. And we use a technique called minimizing societal harm.

Societal harm is a measure of hospital costs, rehabilitation costs, lost income, and some value on pain and suffering. To ensure that we not only simply look at fatalities or out-of-position injuries, but ensuring we provide maximum benefit for the whole community. And that's the approach we've used, and four years results to date support that we have focused on an appropriate strategy.

MS. WEINSTEIN: When you do see injuries with the air bags, what types of injuries are they? Arm injuries, head injuries?

MR. SPARKE: Well, effectively, we haven't seen any injuries related to air bag deployment at all. Now, our air bag is very benign. The deployment energy is about 50 percent of what a typical U.S. air bag deploys at.

MS. WEINSTEIN: And how many air bag deployments have there been, approximately?

MR. SPARKE: Well, again, we have a fleet now that's been in the field for four years, and it's about a quarter of a million cars. We have a very high threshold. And as a consequence, we have seen only about 200 deployments.

CHAIRMAN HALL: How high is the threshold?

MR. SPARKE: It's about 28 kilometers an hour, about 18 miles per hour. And that I should say, is the result of having developed a very effective seat belt system that to that point provides protection, prevents small females from making contact with the steering wheel.

CHAIRMAN HALL: Why did Holden do this, since there wasn't a government requirement?

MR. SPARKE: Very simple. We said if we're going to spend money and effort developing air bag systems, then our strategy will be to provide maximum benefit to our customers. And in doing what we did, we—

CHAIRMAN HALL: Was there a consumer demand in your country to have the air bags and that led you to start developing it?

MR. SPARKE: Yes.

CHAIRMAN HALL: How did you interact between General Motors in this country and your operation in terms of putting this thing together?

MR. SPARKE: Very frequently. Step one was to come here and talk to all of the GM experts and I got a very clear instructions on what to do and what not to do, based on your experience here. So, it was very straightforward.

CHAIRMAN HALL: And you share your experience back and forth with them?

MR. SPARKE: On a regular basis, yes. I guess, I have international meetings four to six times a year.

CHAIRMAN HALL: Do you know what speed the air bag in Australia comes out at?

MR. SPARKE: No.

CHAIRMAN HALL: You know, here it’s said it comes out at 200 miles an hour.

MR. SPARKE: I’d expect it’s more like half of that.

CHAIRMAN HALL: About half. Who makes the air bags over there?

MR. SPARKE: The U.S. supplier, Morton.

CHAIRMAN HALL: Morton makes the same bag that they make for this country.

MR. SPARKE: Yes. Well, it’s not the same, of course. It’s tuned specifically for our request.

CHAIRMAN HALL: Is it a smaller bag? I mean, I want to get into this—Euro bag versus other bag. Is Euro bag a smaller bag or a bigger bag?

MR. SPARKE: Full size, 65 liters, the same as most American bags. But it incorporates tethers and as I said, a benign inflator characteristics and every technology we can use to minimize injury risk. But it’s current technology. There’s nothing unique about it.

CHAIRMAN HALL: Do you have any idea of the average speed of your crashes over there or anything in comparison to this country? Have you looked at that?

MR. SPARKE: No.

CHAIRMAN HALL: I mean, are we talking apples and oranges here? Do you not have interstates or high speed highways and those types of accidents? Is it a similar driving environment?

MR. SPARKE: For this discussion, yes, it’s the same.

CHAIRMAN HALL: I've been there and I thought it was, so—

MR. SPARKE: There are some subtle differences. For example, we don't have the number of freeways. So, we have a lot of undivided highways.

CHAIRMAN HALL: You've got to watch the kangaroos rather than the deer, but—

(General laughter.)

MR. MAKEHAM: Mr. Chairman, Peter Makeham. Could I just comment on that?

CHAIRMAN HALL: Yes.

MR. MAKEHAM: I don't have it with me, but we have got quite a detailed analysis of Delta V and I could certainly provide it to you after my return.

CHAIRMAN HALL: Well, the interesting thing to me is that there's evidently developed by an American corporation and an American company an air bag that in your experience in Australia has not caused any injuries or deaths to infants.

MR. SPARKE: Two liberties I had—two opportunities I had that the people here in America don't have.

CHAIRMAN HALL: Please explain those.

MR. SPARKE: First of all, we don't have a legal requirement that says that we have to meet an unrestrained occupant performance test.

Secondly, I had the luxury of having in Australia, an organization promoting NCAP that doesn't have the same political powers in Australia, and I could choose to ignore them. And thirdly, the seat belt wearing.

Now, given those three opportunities, it allowed me to develop a system that had quite different characteristics.

CHAIRMAN HALL: Sure. Mr. Sweedler wants to ask a question.

MR. SWEEDLER: Mr. Sparke, based on your knowledge of the regulations and requirements in Australia and in the U.S., what changes do you think would have to take place in U.S. standards to allow the use of the Holden type bag in this country?

MR. SPARKE: I think the absolute priority for this safety community is to address the issue of belt wearing. That has got to be the first priority of any action you take. Any new technology, any improvements in system performance will be compromised if you don't achieve appropriate seat belt wearing.

MR. SWEEDLER: Obviously, that's the first priority. But what changes would have to take place in the rules?

MR. SPARKE: Second is the high performance requirements of unrestrained occupants, and you've already taken a very good first step. The third thing that you have to reconsider is NCAP performance, because you've got a total contradiction there. It's a hypocrisy. You're saying here's an opportunity to depower, but by the way, we're going to really criticize you with their NCAP performance if you do it.

Now with the current technology, they are completely incompatible and you've got to do one or the other.

MR. SWEEDLER: We should get into that a little bit more later. That's a good discussion.

CHAIRMAN HALL: Well, I would like to get one little review before we finish, Elaine. It doesn't have to be done now but, you know, if you gentlemen were in charge of the Safety Board here or NHTSA or DOT, what would you change in terms of our public education or how we approach the American public on fastening seat belts, since we have been a dismal failure compared to the rest of the world in doing that and we get embarrassed over here. We like to stay ahead of everybody, you know. We like to be first, not tenth or twelfth as we are down here.

So any suggestions you have at some point in that regard, we would appreciate it.

MR. SPARKE: Well, I think Mr. Makeham is appropriate to discuss that, but I'll relate a little anecdote. I can remember the attitude of the Australian community 25 years on from the introduction of seat belt legislation in 1970.

In the last year or so, I was stopped at the traffic lights and in front of me I observed a driver get out of his car and admonish a driver beside him. And when I looked, the driver wasn't wearing his seat belt.

(General laughter.)

MR. SPARKE: So, it's no longer a legislation issue in Australia. It's a matter of social attitude about responsible behavior. And you can't really begin at that level, of course, and Mr. Makeham is going to describe the process of getting to that point.

MR. MAKEHAM: If I may?

CHAIRMAN HALL: Yes, please go ahead, and then I better—no, wait till I come back to me, because we've got the tables to go and I'm taking too much time.

MS. WEINSTEIN: Vern Roberts has a few questions.

MR. ROBERTS: The question is for Mr. Sparke. The Holden Commodore, how does that vehicle do in FMVSS 208 belted type tests?

MR. SPARKE: Very well. It passes 208 belted with no problem easily.

MR. ROBERTS: Did you say that you have something like an NCAP test procedure in Australia?

MR. SPARKE: Exactly the same.

MR. ROBERTS: It's the same test procedure?

MR. SPARKE: Would you like to know how it does in that?

MR. ROBERTS: I would, please.

(General laughter.)

MR. SPARKE: I had the frustration of dealing with the latest round of NCAP tests in Australia two to three weeks back. And the Holden Commodore was rated the lowest and was promoted in the media by the NCAP organization as Australia's unsafest car in total conflict with the field data we've got, which demonstrates quite the reverse.

The highest performance car, the car that was held up as the top-ranking car was a Japanese car with a U.S. aggressive air bag system.

MR. ROBERTS: Thank you. Mr. Kallina, to go back about the European and particularly the German cars there, could you characterize the air bag systems for the European cars at large or certainly for Mercedes in terms of differences between those products and those that you would ship and sell here in terms of air bag energy and bag size and design and other hardware aspects?

MR. KALLINA: Well, I would say it's basically the same technologies applied both in Europe and in the U.S. The major difference is the belt usage rate and the philosophy when to deploy the air bag. In German cars, for instance, on the driver's side we have T seams, in order to control allocation, but here we have tethers straps and I think the purpose of it is to control primarily location. Location, which might be adequate for the unbelted passenger and it's adopted to the upright seated passenger more—rather than to the belted occupant.

So that's a major difference, and where the threshold is different, and some companies started with Euro bags. And the Euro bags are little bags in order to prevent primarily head injuries, severe head injuries. But we had a long discussion of Euro bag versus U.S. bag, and the U.S. bag won, which is a good message. Because once in your life, you might have an accident. You need the full protection of a big bag. There's no way to have—it's only, I would say, it's still on the chest. It's still a belt system only.

So, the good support from a U.S. bag, the big bag, the big volume is very welcomed. And I'm not in favor of completely switching to the protection for the belted only. We have to take into account in the in the accidents samples, we still have the unbelted over-represented and that's a fact. And independent that they are breaking law, at the same time, they are a social burden. And the side effect of the air bag can help and protect them.

The primary focus, of course, is the belted occupant, but as a side effect, you can also give protection, but you should not make a bad compromise on behalf of the belted.

MR. SPARKE: I agree with you there and there's no need to do that. But even when the system is optimized for a belted user, you still get very good protection for an unbelted occupant.

MR. ROBERTS: What are your thoughts, Mr. Kallina, on the use of tethers? You said that some of the European bags do not use tethers currently.

MR. KALLINA: Well, the Euro bag does not have tethers. Of course, the smaller bag—whereas, the smaller bag obviously doesn't need it, because it only has to cover the steering wheel and it's a very small size. But, in effect, if you have T seams or tethers, there's not a big difference. Its purpose is to shape the bag while deploying.

MR. SPARKE: I guess, if I could follow on that that leads to some other things that I would like to emphasize. Safety—vehicle safety is system performance. There is no—I heard the term used earlier this week—silver bullet. Safety is not about a buckled pretensioner or a top loaded air bag or tether or anything else. It's about the total system performance tuned to the needs of the total community.

MS. WEINSTEIN: I would like to ask a couple of questions about seat belts and child restraint systems and then we'll send it down to the parties, who I'm sure, have a lot of their own questions. What design features are there in your cars to accommodate children who have outgrown car seats? For example, center lap shoulder belts or adjustable shoulder anchorages, Mr. Makeham, can we start with you?

MR. MAKEHAM: Thank you. Essentially, we've got three levels. The first is the bassinet, the infant restraint, which is for babies. The second is for child car seats, which is a car seat fitted to the vehicle retained by the upper tether, but with a strap harness, and that's for eight to 18 kilograms or six months to four years.

And your question really related to when they leave the child seat. So for the group in 14 to 32 kilograms or approximately four to eight years, we have this harness here, which is the one I brought with me. And that is an A harness, which clips to the clip in the rear seat in the three mounting points. And at the bottom of that, there's loops which fit through the lap part of the belt.

So, the child can be restrained by that, plus a booster seat, which is a small seat with ears on it that engages in the left part of the belt. So for that age group, instead of just relying on the lap sash belt, as we call it—I think you may use shoulder belt, lap shoulder belt—instead of relying on that, we have this device here, which is designed to give them extra support. And that's designed, as I say, for 14 to 32 kilograms.

Up above that we rely on the standard belts in the vehicle. Most—by law, all vehicles are required to have shoulder, lap belts in each upward sitting position, but all Australian made vehicles now have shoulder lap belts in the—lap sash, as we call them—in all rear-sitting positions or all sitting positions for that matter.

MR. SWEEDLER: Do you have adjustable upper anchorage points for the shoulder strap? Maybe you can address the front and the rear seat. What is available in Australia?

MR. MAKEHAM: For front seat certainly, it's available. It's not mandated, but it's available on a very wide range of vehicles. For the rear seat, it would be relatively uncommon.

CHAIRMAN HALL: Who developed this item?

MR. MAKEHAM: The child restraint?

CHAIRMAN HALL: Yes.

MR. MAKEHAM: They are developed through standards of Australia, which is the agency that does develop standards. It is a separate organization from mine, but although we're involved with it, of course, I'm a counselor of the standards of Australia, but it is done through an Australian standard, and that Australian standard—not all Australian standards, but these particular Australian standards are enforced through our Trade Practices Act as a mandatory produce standard. So, the keeper of the keys, if you like, if the standard is the standards of Australia, which is the standard setting body, and it's enforced through our Trade Practices laws.

CHAIRMAN HALL: And the manufacturers of the vehicles that are sold in Australia had to have these tether anchorages that those can be attached to since 1993?

MR. MAKEHAM: No, no. They had to happen since the early '70s, mid '70s, in fact. They had to have the mounting point, which is a five-sixteenth UNC mounting point with a load requirement since the mid '70s.

CHAIRMAN HALL: Do you all have those in Germany and Canada?

MR. KALLINA: No.

MR. DALMOTAS: Similarly, like I said, in Canada, we have had a requirement for the capability to tether in the rear seat since 1989 in passenger cars.

CHAIRMAN HALL: Well, I had an opportunity to visit the automobile manufacturers and I'm very impressed with the technology in our country, but they had shown me that this new device that we have and where we can use it and like it was something brand new, we had just discovered. But you've had it since 19-- what?

MR. MAKEHAM: Oh, about '75, '76, something like that.

MR. SWEEDLER: But this is just in the center seating position?

MR. MAKEHAM: No, it's behind each rear seating position. So most vehicles would have three rear points. But now we only require the actual clip, the mounting points, the attachment to be in one seating position, but each rear seating position has to have the socket.

CHAIRMAN HALL: Well, we're going to get into the subject, one of these panels, on the design of child-friendly back seats, because I think we have an obligation in this country, if we're going to tell mom and dad put your kid in the back seat, we better be sure we're doing everything we can to be sure the back seat is safe. So, I compliment you all on what you've done over there.

MS. WEINSTEIN: I just have one last question and we'll go to the parties. What percent of the tethers are actually attached properly?

MR. MAKEHAM: I do have some statistics here about incorrect attachments, which is 40 percent of our population—I'm sorry, can I come back to that?

MS. WEINSTEIN: Sure. We'll go to Canada and then come back to you.

MR. DALMOTAS: Unfortunately, I really don't have any good up-to-date information. We're about to do a survey of specifically looking at that issue over the next, I think, six months. My best estimate right now on proper tether use is about only 65 percent and that's an area that we really want to improve upon obviously.

CHAIRMAN HALL: Are you gentlemen familiar with what they're doing in Australia and do you think that's a good idea, bad idea, got lots of engineering flaws to it, something that's too expensive, or is that something that would be—

MR. DALMOTAS: It's like I said, we had the requirement for tether anchor locations in the car since 1989. So we think it's a good idea, obviously. So in two years from now or from 1999, we will have the actual female hardware that he was showing you required in one row of all cars, light trucks, passenger vehicles in Canada. So, we would have a row of three places where you can fasten directly.

CHAIRMAN HALL: What about Germany? Or just the Mercedes, I guess.

MR. KALLINA: No, we have a somewhat different situation in Europe. We primarily use the standard three point seat belt for fastening the child restraints. And we have child restraints primarily transferred over the child restraints and now in increasing numbers.

It's offered by some manufacturers, I would mention, or, for instance, for an owner of a Mercedes-Benz to offer integrated child seats. And they can add a booster, so they can be expanded to a wider range they can be used. And ECER 44 says we have a category of four—from zero to three and it covers a booster seat for the two and three. So, it's somewhat different. And what is even more scattered is the requirements in the individual countries. So, this is very different and there's now no clear picture.

MR. KALLINA: Would you like to see, because I have it on the—

MS. WEINSTEIN: Do you have an overhead?

MR. KALLINA: Yes.

CHAIRMAN HALL: Yes, please.

MR. KALLINA: Would you please show the overhead?

(Slide 1 shown.)

MR. KALLINA: So if you can tell me if you see some irregularity I have not detected—

(General laughter.)

MR. KALLINA: It says front. It has children in cars, age limit definition, prohibited, permitted, permitted, permitted. And so unpermitted from four years. And he—the manager for the restraint system, he comes from Italy. And condition, belt obligation with SRS, no requirements sometimes. So, it's very scattered. And so that's also what we observe on the roads.

DR. ELLINGSTAD: Do you require a center seat three point belt in Germany?

MR. KALLINA: No, there's no requirement, but manufacturers do it, and start to equip the rear center seat with a three point seat belt. And the Mercedes-Benz all new car lines are equipped with the center seat three point seat belt standard and the three point seat belt.

MS. WEINSTEIN: Thank you. Mr. Makeham?

MR. MAKEHAM: Just going back in terms of restraint use, 91 percent of zero to one year olds use appropriate restraints, and 83 percent of two to four years. In terms of misuse, which I think was the point of your question, all available data shows about 11 percent of cases where the restraint was used incorrectly. Now that covers a range of things, including fitting and adjusting and includes having tethers, but that 11 percent if the title is right from that particular study of misuse of that adjustment.

MS. WEINSTEIN: Thank you. Chairman Hall, I have no more questions at this time.

CHAIRMAN HALL: All right. We'll move now to the tables and we'll begin with table 2.

MR. VOS: Tom Vos, AORC. We had a question regarding Australia. It was mentioned that two states have mandatory laws requiring children in the rear seats. How does Australia address the case where you have large families and more children in seats? Are there exceptions granted in these cases?

MR. MAKEHAM: Thank you. There are no exceptions granted. Well, let me start from the beginning. The law and the primary laws in all states and territories in Australia is that all occupants should be restrained. And there are some exemptions from those rules for people with medical conditions. But I think nationally, there is something of the order of 150 exemptions for medical conditions. So people with children, that is not grounds for an exemption.

It's obviously a difficult area where people have large families. And the tendency is to use station Sedans with additional seats. And there are jump seats, we call them, which are certified on the after market, but they do meet a dynamic performance requirement, which can be used for that situation in the rear cargo bay of vehicles or, you know, what many people do, of course, is buy a—maybe a forward control passenger van, which would have a larger number of seats, all which have seat belts.

CHAIRMAN HALL: Do they have car pools in Australia?

MR. MAKEHAM: Yes, we do.

CHAIRMAN HALL: And do the kids ride up front or where are they usually?

MR. MAKEHAM: The children would be required to have a properly restraint fitted, which most do, and that is in the rear seat. Just, for instance, taxi companies are now required to have child seats available if ordered ahead of time. So it's a fairly comprehensive system. I'm not saying that works in every case. I don't want to mislead you, but that indicates the mind set we have about restraints.

CHAIRMAN HALL: Okay. Table 2 is still up.

MR. VOS: Yes. We have another question. Could I ask each of the panels to describe their particular areas, their deactivation policy, and maybe an opinion as to why so few of their citizens take advantage of that deactivation?

CHAIRMAN HALL: Whichever order. Go ahead, Mr. Makeham?

MR. MAKEHAM: We don't have a formal deactivation policy, because, it's not necessary, because in a sense, this has been built into our system. That by having the design rule that requires the test parameters to be met with the occupants belted has given the manufacturers much flexibility. And our advice, we've got a formal survey going on at the moment, and I can't give you the results of that, because they're not in yet. In many vehicles in Australia, but by no means all, are supplied with depower bags of one kind or another. But probably in a month, we could give you some substantial information on that.

CHAIRMAN HALL: Thank you. Well, we would love to stay in communication with you on the subject.

MR. KALLINA: Well, I made a statement before for deactivation. Deactivation is not a big issue, because the issue didn't get the wide public attention for a very long time. So there are only a few people who are really concerned, and they are really signing the exemption from liability. But it needs an action to do and people have to go to the dealer, so there might be a natural barrier. In very few numbers, it's done.

MR. DALMOTAS: And, I guess, we straddle right in the middle. As I mentioned before, there are no legal impediments in Canada to deactivation, since air bags are not a Federally mandated safety equipment and jurisdiction over the operation of vehicles falls with the Providence, but they have no requirement precluding deactivation.

However, no one is sanctioning deactivation in Canada. So, from the standpoint of the consumer, there is obviously legal implications associated with insurance and stuff that have to be taken into consideration. We're all wrestling I think right now with trying to come up with some type of a national policy in Canada, as you are in the states.

MR. SPARKE: My experience has been that over the last year with all the publicity of the situation in America, there have been a very few number of people that have contacted me expressing their concerns. And the majority of those I've been able to deal with by explaining to them that their misconceptions are incorrect. There was one case of one small statured woman that was concerned, and I pointed out to her that we have Federal exemptions available and that addressed her concerns.

CHAIRMAN HALL: Well, this is the type of letter, fellows, that we get in the United States. This was delivered to me and put under my door this morning from Nancy Phillips with the Phillips Company in Monterey, California, and she watched the proceedings the first day on C-Span. She said, "I'm a 5'2", 110 pound driver of a 1994 Volvo station wagon with both driver and passenger side air bags. I do not have a viable option that will reduce my risk of serious injury from my air bag. I have never and will never place my children in the front seat. I always place them in the back seat as a simple solution to the problem that I can control. Unfortunately, I do not have the option of moving myself to the back seat. I am not able to position myself and drive comfortably while at least 12 inches away from the steering column. Driving this vehicle on a daily basis is similar to having a loaded gun in my lap. I have 14 months left on a lease, so I must continue to drive it. I am deeply resentful of the fact that the laws prohibit me or anyone else from removing my air bag. Until such time as manufacturers can design and produce intelligent air bags, we must be allowed to protect ourselves by disconnecting our air bags immediately. There simply isn't time to study this issue farther or wait for changes in design."

We get these every day. I can't find a whole lot of fault in what she's saying in terms of our own personal safety.

MR. SPARKE: If I had such a letter, I would explain that she was not at risk. And I expect that the Volvo engineer responsible for their restraint system would explain the same thing.

CHAIRMAN HALL: Well, we've got Volvo here. I'll pass this letter on and have them get in touch with her.

(General laughter.)

MR. SPARKE: And that's symptomatic of a real issue that we have as a community. We really have to ensure that we get better information to the general public about safety systems and air bags and what they are or not.

CHAIRMAN HALL: In fact, I'm told the next panel has a Volvo engineer on it, so we will be in good shape there, William Shapiro.

MS. WEINSTEIN: No, that's tomorrow.

CHAIRMAN HALL: Oh, that's tomorrow. I'm sorry. Any more questions from table 2?

MR. VOR: Just one last question, Mr. Chairman. Mr. Kallina had mentioned that in designing an air bag system, while the focus should be on the belted driver, we must be concerned about societal harm and liability. Could the gentlemen from Holden tell us, have you tested, in fact, your depowered system, if you will, in an unbelted situation and what your experience is?

MR. SPARKE: No, we haven’t. We have run a whole series of in-house tests to know where we stand. I understand that NHTSA commissioned some tests of unbelted occupants and found that the vehicle met U.S. Government regulations.

MR. VOS: Thank you. No further questions.

CHAIRMAN HALL: All right. Table 3?

MR. FELRICE: Yes, Mr. Chairman. I’m Barry Felrice with the American Automobile Manufacturers Association. If I could first follow up on Mr. Vos’s question, Mr. Sparke. In the 200 or so deployments that you’ve had with the Holden vehicle with the air bags, have any of them involved unrestrained occupants? And if so, what was the outcome of those crashes?

MR. SPARKE: No.

MR. FELRICE: So that’s the effective belt usage. You mentioned that the inflator is benign and only has about 50 percent of the energy of the U.S. bag. Are there any other significant differences between the bags in the Holden vehicle and what is offered typically in the U.S. vehicles? Or put conversely, if you had to meet the U.S. requirements, how would the bag be different?

MR. SPARKE: I don’t think I’m equipped to answer that question. I don’t know. Obviously—the inflator has to be much more aggressive, and I think that’s the primary characteristic that determines whether injuries occur in unrestrained out-of-position occupants.

MR. FELRICE: Mr. Makeham, Mr. Dalmotas mentioned the other day the laws in Canada for belt usage which helped Canada reach their high level of usage, not quite as high as Australia, but close, involve primary laws, that they’re enforced, and that they involved fairly high penalties for non-compliance, and that points are assessed on driver’s licenses. Is that similar to what exists in Australia?

MR. MAKEHAM: Yes, since the early ’70s, we’ve had compulsory seat belt wearing as a primary law. In other words, it’s a reason for the police stopping a person and fining that person. The fine would be typically—it varies, of course. But it typically would be $150 to $200 and three demerit points on a scale of 12, under which you lose your license.

So if you were driving and you had other people in the car that were also unrestrained, you would score a fine and demerit points for them, as well.

CHAIRMAN HALL: Now, how does that impact your—do you have to buy automobile insurance in Australia?

MR. MAKEHAM: Yes. You have third party—

CHAIRMAN HALL: Is it as expensive as it is over here?

MR. MAKEHAM: Well, I can't comment, but it's quite expensive, yes. You are required to have third-party personal injury insurance. Property insurance is the matter for the individual, and that is part of your annual registration.

CHAIRMAN HALL: Is that impacted by your points or—

MR. MAKEHAM: No, it's not.

CHAIRMAN HALL: Not, okay. It's not similar to Germany, which I wanted to get into.

MR. MAKEHAM: No, there's no connection there. The only area that does come up, if you are say drunk and have an accident, your property insurance would be void.

MR. FELRICE: Since we're talking about insurance, does Australia have liability insurance restrictions similar to those that exist in Europe with regard to seat belt usage in crashes, in terms if you're not wearing your belts, there may be insurance penalties associated with that?

MR. MAKEHAM: Not in the law as such, but I think it could be an issue that would be taken into account in terms of damages in common law situations. I think I would probably have to take the data—but my feeling is that's principally an issue for common law and litigation rather than the primary.

Many of our states—just to avoid any contacts, many of our states, the compulsory personal injury insurance is what is known as no fault. In other words, you don't have to prove fault to get the benefits. And so it would seem to argue against the point you've just raised.

MR. FELRICE: Did I understand you correctly, the harness that you showed works with a lap belt? Does it only work with the lap belt? And if so, does that mean it could only be used in the center rear seat?

MR. MAKEHAM: It's primarily intended for the center rear seat.

MR. FELRICE: Mr. Kallina, are you aware—I know you're not speaking for the European continent here, but are you aware of any adverse effects of air bag deployments in Europe similar to what we've had here? Mr. Dalmotas mentioned yesterday in terms of child fatalities that Canada has experienced one. Are you familiar with the overall European experience?

MR. KALLINA: I've got a report from the Finnish Motor Insurance Center. And this is interesting, because they investigated—their teams, 57 deployments in occupied seats and 56 accidents during '93 to '95. Is that what you want to know of such a field experience?

MR. FELRICE: Yes.

MR. KALLINA: And I should read it, because it's much easier. The air bag did not cause any essential harm in any cases. In half of the cases, the air bag deployment took place without any bodily harm. And in the other deployments, the injuries were mostly abrasions or bruises around arms, chests, or faces. On the other hand, the air bag can, in fact, provide protection.

According to reconstruction based estimates, seven occupants survived death. In 18 cases, it prevented all injuries. And in a further 18 cases, it mitigated them. In other words, an air bag improved protection for 75 percent of the occupants in the seats. Nearly half of the occupants in experiencing the deployment did not notice that. Clouds of air bag's powder and fear of fire were the most frequent observations.

Sixteen people wore eye glasses, none of which broke up. In spite of that, the report emphasizes that even though air bag provides additional protection, it is not substitute for the seat belt.

They want to have warning labels for children in seats and they are going to urge the industry of Transport to do so and going to the European Commission.

And subjects to be improved is interesting. Further more, based on the report, VLAT, which is the insurance organization, proposes to the industry of communications in its European communications, to promote the efforts to further enhance the standards demanding more sophisticated triggering mechanisms for air bags. The committee strongly recommends that an air bag should not be inflated in unoccupied seats or in low speed crashes.

Safety belts for wide sufficient protection in crashes, which corresponds to speeds up to 30 kilometers per hour into a solid barrier. The addition and protection of an air bag should then be provided at speeds above that. More air bags should be redesigned to avoid wind screen breakage or causing other damage.

The investigated accidents, all the right side deployments broke the wind screen. In essence, the system as designed has been proven its sufficiency, but there are things to do, especially, on the area of communication.

MR. SPARKE: Could I add to that?

MR. FELRICE: Please.

MR. SPARKE: Our experience in Australia to date has been that on average, every time a driver's air bag has deployed, the driver has avoided $22,000 worth of societal harm; hospital costs, rehabilitation costs, plus the additional on value on pain and suffering.

MR. FELRICE: One last question, Mr. Chairman, also for Mr. Kallina. We've heard in the last few days about the need or desire for more data, more data faster to learn about how air bags are actually performing on the road. Is there anything in the European experience that's done differently in terms of collecting, analyzing data, that may have applicability here to the U.S.?

MR. KALLINA: I guess you have a wonderful data set with NASS. And NASS is very good statistics, and I think all the information which is in NASS. The only thing is you have to be aware, the estimate for the Delta V or the ES is not very precise. So you have to do it on a case-by-case study in order to make really sure you understand what the impact speed was in order to make the right decisions, because it varies very much and ES is not assessable by most, because you do have not the energy—and Delta V is very high.

So if you have data which is not very reliable, so how can you make a very precise judgment on it? But I guess NASS is superior to what we have in Europe. We have no European database. The only thing is some manufacturers do accident investigations extensively. There are injury databases like from the Injuries Association in Germany. And they have got 15,000 cases, including air bag cases, which is a very good data, but, again, there is a lack of free construction quality.

MR. SPARKE: If I could just emphasize to that. For the development of the—performance, the critical characteristic is to understand the relationship between injury outcomes and crash severity. And in Australia, we have to do detailed investigations to establish that data. But as Mr. Kallina pointed out, the NASS data is useful for what it is, but without that critical part of information, that critical connection between crash severity and injury, to a limited value.

CHAIRMAN HALL: All right. We'll keep moving on and we'll go to table 4.

MR. PARKER: Thank you, Mr. Chairman. George Parker, Association of International Automobile Manufacturers. My question for Mr. Sparke, could you elaborate on how designing for NCAP has an effect on air bag aggressivity?

MR. SPARKE: With the available technology in restraint systems, the technology that's available to us today, it's not possible to get optimized performance at both ends of the spectrum. The NCAP test represents a very severe crash. The frontal crash represents a crash more severe than 98 percent of the crashes that occur in the field. The offset collision test represents a crash more severe than 99.96 percent of the crashes that occur in the real world.

But the majority of injury and the majority of crashes, occurs at a much lower speed. And so there is not the ability to optimize a system that satisfies both requirements today.

MR. PARKER: I presume when you say lower speed, you would be very concerned about a harm measure as opposed to fatalities by themselves?

MR. SPARKE: Correct. Exactly.

MR. PARKER: Also a question for Mr. Sparke, what are your NCAP scores and is there any consumer back lash from low scores, if they are low?

MR. SPARKE: One of the characteristics of the NCAP program in Australia has been that as they've released results in each six months, they've changed the scoring system. I think this time around, we're red instead of yellow, and the time before—oh, no, this time around, we were 28 instead of four. So that little confusion goes on to muddy the water, unfortunately. And the scoring system doesn't relate to the scoring in America, but presumably they will be aligned eventually.

CHAIRMAN HALL: Could you put your American hat on and tell me why do you think we have an NCAP program in this country?

MR. SPARKE: When the NCAP was introduced some years back, I'm not sure how long it's been in America, it was based on a reasonable assumption. That if all cars that were manufactured and met the Government regulation, then if you wanted to distinguish between which car was safer than other cars, if you ran them at a more severe crash, you would be able to separate that. And that's on the basis of knowledge. Twenty years ago, whenever the NCAP was introduced, that was a reasonable assumption.

We now know a lot more about injury risks. And today, we would say that what you need to do is look at the injury risk associated with a crash severity which is more related to what a majority of people get involved in.

MR. PARKER: Next question for Mr. Makeham. I would like to say that Mr. Makeham and Mr. Sparke have come from a long way. I've made that trip. And I want to thank them both for being here and sharing the information with us. Now, Mr. Makeham, could you describe in a little more detail—

CHAIRMAN HALL: Particularly since it's pretty weather down there this time of year.

MR. SPARKE: There's no snow, I can tell you that.

(General laughter.)

MR. PARKER: Mr. Makeham, could you describe in a little more detail the child harness that clips into the tether at the top? I know for Mr. Felrice, you said the bottom end attaches to the lap belt. Is that correct?

MR. MAKEHAM: Yes, thank you. I really should emphasize that there is a family of child harnesses starting with a baby bassinet, going through to a child seat, which is through to this harness here. And all of them have one feature in common, which is the attachment to the upper tether, and that was done originally for dynamic reasons. That during the sled test, the restraint had a much better dynamic performance. But it also fitted in with our policy of getting children into the rear seat.

So, I just wanted to emphasize that it's a family of restraints. This particular restraint is designed for the upper end of the weight scale. And it was designed principally in its current manifestation for the center rear seat. In other words, the upper portion connects to the tether—the bottom portionconnects to the lap part of the seat through two loops. We can hold it up, but that's essentially how it works. But it's one of a family.

And this particular one is used in conjunction with a booster seat, which is—again, it's an approved device, which raises the child and also has ears that engage in the lower portion of the seat belt.

MR. PARKER: The next question is for Mr. Kallina, and you may not have information on this. But we know the Mercedes vehicle sell very well in Japan. Are you aware of any special requirements for the Japanese market with regard to regulations or experience with air bags in Japan?

MR. KALLINA: No, that's the European system. We make no modification to the Japanese sold cars.

MR. PARKER: Thank you.

MR. MAKEHAM: Could I, Chairman, just add to that, if I may? That the Japanese standard for frontal protection is the same as our standard. We worked with them at the time, and it's 208 tested with Hybrid 203 restraint.

CHAIRMAN HALL: Is that correct, Mr. Tinto?

MR. TINTO: Absolutely.

CHAIRMAN HALL: Table 5?

MS. WALKER: Yes, we have several questions. I'm Lorrie Walker from the Blue Ribbon Panel. And I have questions here for Mr. Sparke originally. The Australian NCAP report noted that there was substantial movement of the steering column that may have contributed to poor head protection in the Holden driver air bag. How would the Holden air bag have performed with better control of the steering column?

MR. SPARKE: It would have performed better.

(General laughter.)

MS. WALKER: Okay. We've got another one, a harder one this time.

(General laughter.)

MS. WALKER: This is for Mr. Sparke or Mr. Kallina. Mr. Sparke says that NCAP today is driving air bag aggressiveness. However, aren't there other ways to improve NCAP performance? For example, additional frontal crush space?

MR. SPARKE: You're right. We could extend the cars by another meter.

(General laughter.)

MR. KALLINA: We feel NCAP was justified for some time, as Mr. Sparke mentioned before. But we should think and reconsider it in order to replace it by tests which have more relation to the real world. And Mercedes-Benz has consistently said for many years, we have to have a kind of offset test, in order to improve the structure. You have no benefit at all from the best and wonderful restraint system when your car collapses.

So what we need is a very stringent test in order to learn structural integrity, to design structural integrity, and it needs considerable modifications. And when a program like NCAP is very long into effect, it's very easy to design for it, and it could result in more length in order to get a lower knee average deceleration. But in turn, it leads to a higher weight. And we must look for weight also. Weight is an equal factor because [unintelligible]. So we would be rather in favor to replace it now by an offset test.

MS. WALKER: Okay. Mr. Sparke, another question for you. Does Holden find their pedal extensions are well received or at least acceptable to their short statured customers? Are they Holden designs? And how many people have taken advantage of the pedal extenders?

MR. SPARKE: They're Holden designs. And we haven't got a very big take up of them at all. And one of my challenges is to promote them more than we've done up till now. So, we really haven't got any field experience today. They've been available for a few months, but despite a national advertising campaign, we've virtually got no response.

MS. WALKER: For Mr. Makeham, not only do we have low seat belt use in the United States due to weak laws in all 50 states, approximately four of ten children are unrestrained. Are the penalties for violating child occupant protection laws in Australia as severe as for adults not buckling up?

MR. MAKEHAM: Yes, I have a schedule. I won't go through it, but I can provide that to you. The penalties are quite high, as I said, in the order for $150 to $200, plus three demerit points. So, the driver would be liable for those. The driver has the responsibility to ensure that the child is restrained. So the driver would get very severe penalties. I would like an opportunity to mention that in terms of our seat belt package, penalties obviously are very important and being a primary offense and very strong police efforts. But, we've got very, very high public support for the program. And there's a number of reasons for that.

It's not just the enforcement in the police. And while that's very, very important, I can't underestimate that. But it seems like the media are very important. In the early '70s when seat belt wearing became common a number of the large production houses took a view of their own accord, that they would have a very responsible attitude to seat belt wearing restraint use in the media and developed a voluntary code for their industry, which has been enforced right to this present day, that people are never shown unrestrained unless some terrible thing happens to them and that's a part of the story.

And I think I could contrast that with—you know, we get a lot of Hollywood material and we did a survey recently and we weren't looking for this in particular. It was just to see how our media were going. But it showed that the material coming particularly from Hollywood was about three times more likely to show unsafe practices than the local material.

So I think the media has a very important role. I think Hector Crawford, who is Australia at the time who took that stand, played a very important role in changing public perceptions. And I think in your current, you know, travail that you have here in the United States, I think the media could certainly do more than it is.

CHAIRMAN HALL: Well, that's an excellent point. And one I hope that we anticipate making some recommendations after this hearing. That might be one we want to consider making.

MR. SPARKE: And if I could just add to that. Potentially, the police forces are a role model for the community. In Australia, you never see a policeman without his seat belt.

MS. WALKER: Just a few more questions. For Mr. Makeham, what percentage of Australians use the restraint fitting stations to get an acceptable fit of their tether and child restraint?

MR. MAKEHAM: I can't quantify that answer, that question. I know it's certainly very, very widely used, but I can't give you—I could perhaps get back—their state activity rather than our activity, so I could give that information, but I don't have it with me.

MS. WALKER: Okay. And approximate cost for having a car inspected at one of these stations?

MR. MAKEHAM: It depends. If you're a member of an automobile club, but I'm not sure whether you have quite the same structure in Australia, but many people in Australia join, you know, one of the automobile clubs, and they would do the inspection at no cost. In a number of cases, it's done by state agencies and it would be a relatively small cost, but I would have to come back to you on the figure. But most of this work would be done by the automobile clubs, and that would be considered part of your membership, one of the benefits of membership.

MS. WALKER: We see an approximate misuse of child restraints of about 90 to 95 percent doing on road inspections. And I'm wondering what degree of certification or training the installation servicing places have? Who does that and who monitors that?

MR. MAKEHAM: The training is done at state level by both the state transport authorities and by the automobile clubs. As I say, our observational data from the East South Wales, which is our largest data, that 40 percent of population indicates about 11 percent have problems with fittings. So, I mean, 11 percent is still very high, but it seems to indicate a fairly good success rate at the same time.

MS. WALKER: Okay. In regards to the top tethers that are used for rear-facing child restraints, do they circumvent the use of the actual vehicle seat belt or is that in addition to the vehicle seat belt?

MR. MAKEHAM: We don't have rear-facing seats, which is why I need to qualify that very carefully. To supply a restraint to the market, it needs to comply with the Australian standard. Which means that they all have to have the upper tether. The upper tether is on the rear parcel shelf or that area. It can be in the roof, as well. So that mitigates against rear-facing seats.

But the bassinet, the most popular used bassinet as a child baby cradle, is On Jingles, in a sense that when it's in a normal position, the position so the child can see the parent who is in the front seat, because that's probably important, but during a crash situation, the whole device swings, so that, you know, the baby is in sort of in a space capsule situation, receiving the G forces from below, if you like. But rear-facing seats are not used in Australia to any great extent.

MS. WALKER: I'm confused about that. A newborn is always in a bassinet? They're always laying flat then?

MR. MAKEHAM: Laying flat or it is tilted. It can be tilted. It's, as I said, the most commonly used one is On Jingles. But I've got a brochure here that can show you. I think it's better that I use that rather than try to describe it.

CHAIRMAN HALL: There's a picture here—

MS. WALKER: Well, I saw that picture and I'm wondering, it looks like it circumvents the seat belt system, which is where we find a lot of misuse in vehicle restraints and child restraints. There's an incompatibility there that makes them very difficult to tighten. That looks like it completely circumvents the seat belt system, which would—

MR. MAKEHAM: No, I don't think that's the case. It's quite the contrary. It's designed to fit in, but perhaps I can explain it to you afterwards.

MS. WALKER: And just one last question. The degree of consumer education that occurs prior to birth or after birth, who does it and where does it all happen?

MR. MAKEHAM: Well, the material that you have a copy of, that's produced by our office, and that's intended for distribution at doctors and at health centers to get people who are going through prenatal—you know, training, or through the early childhood. So, it's a very, very widely available at baby health centers and doctors, surgeries, and things of that kind. That's probably our principal means of getting the material out.

MS. WALKER: Thank you.

CHAIRMAN HALL: Table 6.

MR. DITLOW: Clarence Ditlow from the Center for Auto Safety. For Mr. Sparke, Holden uses an 18 mile per hour deployment threshold. What is the so-called always fire threshold and the never fire threshold? The always fire threshold being the one above which the air bag always fires and the never fire being the one below which the air bag never fires.

MR. SPARKE: Okay. I think I need to explain a little more about thresholds. The threshold with a sophisticated system varies depending on the type of crash. And although we talk about what level it is if you run into an 800 ton concrete block, that's not the real-life performance of the system. And the difference between upper and lower thresholds varies on the type of crash. So, it's a variable.

From recollection, for a collision with an 800 ton concrete block, the limits of 28 and 22, I think, but it really is irrelevant to real life performance. But what is important about thresholds or thresholds in our system is it's the cross-over point where—and perhaps the easiest way is to use a diagram. Could I have that diagram of air bag threshold?

(Slide 2 shown.)

MR. SPARKE: Thank you. This is a simplistic diagram, okay, for—this is not a precise description of what thresholds are, but it is some simplistic diagram to try to illustrate the principles of thresholds. I plotted on the vertical access here, injury risk, and on the horizontal access, crash severity. And if you considered, first of all, the line associated with current seat belt systems built with three—that line indicates that as the crash severity increases, the risk of injury increases. Okay.

If you also plot on a line relating to a current air bag performance, there is inherent in that air bag, an inflation injury risk. Whenever the air bag deploys, there is a risk of some injury related to the air bag. At the end of the section, it refers to two points. There's a point at which you want to deploy the air bag. You don't want to deploy the air bag below that point, because potentially, you could add to the injuries that would be experienced due to the characteristic of the air bag inflation.

So that threshold point is only above crash severities relating to that point. So, it's an idealistic location to have your threshold.

It's interesting, I was going to use this to illustrate that you don't want to legislate for that point, because if you develop an improved seat belt system that has a low injury risk, you would then want to move your threshold out to this section point out here. So the threshold would be raised considerably, because you've developed an improved seat belt system.

Alternatively, if you develop an improved air bag system that has a lower inherent injury risk, such as are being considered now by depowering the air bag, then you may want to bring the threshold down to a much lower speed, because you can afford to deploy it, because it's not going to cause anyone an injury.

So the threshold required for deployment is associated with the technology you're using, plus, the type of crash, and it varies with the type of crash involves.

MR. DITLOW: As a follow up to that, if Holden used a lower threshold deployment speed, say, 12 miles per hour that we see in some systems here in the U.S., would you expect to see air bag induced injuries?

MR. SPARKE: If we move the point back down, we would expect that there would be some risks of injury.

MR. DITLOW: Finally, could you discuss any out-of-position occupant, child testing program that Holden has and whether any injuries would occur if the child were against the dash at the point at which the air bag went off?

MR. SPARKE: Okay. Again, I have to emphasize that we're not talking about no injuries or injuries. In the whole spectrum of crashes, everyone is at risk of injury. And what we're talking about is balancing those risks to get the maximum benefit for the community.

So, in any circumstances of risks, any crash, there is a risk of someone getting injured.

MR. DITLOW: The question is has Holden done the out of position test with the child up against the dash with the depowered bag?

MR. SPARKE: Yes, we have.

MR. DITLOW: And what did the results show?

MR. SPARKE: A child against the dashboard with an inflating air bag is at risk of injury.

MR. DITLOW: Even with the Holden depowered bag?

MR. SPARKE: Yes, it's a question of how severe is the injury risk. And the injury risk with a depowered bag is much lower, of course.

MR. DITLOW: Mr. Makeham, in the U.S., as we've heard, the NCAP represents the basic element of Government crash information provided to consumers. Could you describe the information that's provided to consumers in Australia under the Government program, which I think Mr. Sparke seems to indicate changes from time to time?

MR. SPARKE: Yeah, there is an NCAP program in Australia. It's primarily carried out by the not by my organization, but by the motoring associations, the—automobile associations and a couple of state bodies; although, we get involved from time to time.

It is quite closely modeled on the United States system and I know there is a fairly high degree of correlation between the two on how it is carried out. The principal purposes of the program are consumer information and, I guess, to put pressure on the manufacturers.

MR. DITLOW: Thank you. Mr. Kallina, we heard a lot of discussion in the U.S. about the so-called gray zone with sensors in terms of the range in which they caused the air bag to deploy and not to deploy. Could you discuss Mercedes' observation on the gray zone?

MR. KALLINA: We have a no fire and an all fire situation, as well. So as Laurie Sparke has indicated, you never can predict immediately what the injury outcome would be, depending on the damage to the car.

So, there is a gray zone, of course. It's a very sophisticated system. And it reacts, for instance, on certain components, which are attached to the engine and which might a little bit influence the deceleration curve.

So, it's an integration process. It's a weighing function. We have some very complex algorithms in it. So, it's not easy to say in a specific crash, it should have deployed or not. It's a range.

MR. SPARKE: Excuse me. Could I add to that, please? Do you understand that this gray zone is not a choice, not a designed choice.

MR. DITLOW: Yeah.

MR. SPARKE: It happens to be the characteristics of the technologies that currently exist.

MR. DITLOW: Yes, I understand.

MR. SPARKE: And if we had our choice of the perfect technology, there would be no gray zone.

MR. DITLOW: That's my follow-up question. Is the engineering objective to narrow the gray zone?

MR. SPARKE: Yes.

MR. DITLOW: And are we achieving results in terms of narrowing that gray zone with the newer sensors that are being put on vehicles?

MR. SPARKE: Yes. The switch from traditional ball and cube sensor of 20 years ago to the electronic sensor of today is remarkable. But there's still opportunities for improvement.

MR. DITLOW: Mr. Dalmotas, what is your opinion of the child seat anchorage proposal in the U.S. that would require upper tethers, but permit soft anchorage buckles known as the UCRA?

MR. DALMOTAS: I don't think I'm going to venture into that territory. I'm not on a day-to-day basis involved in the whole child restraint issue nor have I been for almost ten years. So, I just got briefed on what our child restraint use laws were and rates, et cetera, et cetera. Obviously, we are big promoters of tethering and we always have been.

I think anything that helps the consumer ensure that the child restraint system is easier to put in and is always put in properly, is the way you want to go. I'm not sure—I know we're wrestling with what we're going to do in Canada, in terms of further improvements over and above the tether in terms of a universal anchorage system, but I really can't comment on whether we're going to go in a manner identical to the United States, similar to the United States, or similar to Europe.

MR. DITLOW: In a final question for the panel, since seat belt use rates are such an important part of the policy decision, in your country, are seat belt use rates based on a national scientific study or survey or how are they determined?

MR. SPARKE: I have submitted a document to the panel on the analysis of seat belt rates. So, that's available to you, if you care to look at it. And I can't remember the methodology used, but it's there.

MR. DALMOTAS: In our country, it's a very well controlled national survey. It's done across 240 sites, the same 240 sites very carefully selected across Canada. They are repeated annually. And the sites are selected so that they would be nationally represented and conventionally represented, et cetera. So we have a high degree of confidence in the observed daytime rate of wearing seat belts. That will differ, however, than the actual accident involved rate. So you have to still appreciate that.

DR. SWEENEY: Could I just comment in Australia? Our observational data there does come from structured programs, which is centrally coordinated rather than just what we were provided by the states. It's something we fund on a regular basis, and we get people to do actual structured observational programs on a statistical basis. It's quite well researched.

MR. KALLINA: The statistics in Germany is governmental run. And it's randomly selected sites where we have observations.

CHAIRMAN HALL: Okay. Thank you. Table 1?

MR. BISCHOFF: Thank you, Mr. Chairman. Don Bischoff, NHTSA. I would like to follow up a little bit on table 6's questions, I think on the success of the Holden air bag. A question for Mr. Sparke.

You characterized the bag as being comprised of current technology, nothing unique. In looking at the characteristics, I'm inclined to agree with you. The passenger inflator 240 KPA, while on the mild side is well within the range of the inflators that we've tested, represent a production in the U.S., and the other characteristics, as well, the folding pattern, size, and tethering of the bag. You said that you had no deployment-related injuries.

So what part of this success do you attribute to the higher deployment threshold which does seem to be unique compared to the U.S. experience at 18 miles per hour as opposed to the other design attributes of the air bag and also the higher belt use in Australia?

Can you partition out how each of those contribute to the success of the system?

MR. SPARKE: Now, the reality is that it's too soon yet. With a data set of 200 cases, we really can't identify those sort of characteristics as yet. Hopefully, over the next couple of years as the data grows, we'll know more about it.

MR. BISCHOFF: Also for Mr. Sparke, you've set the deployment thresholds, you just mentioned, at 18 miles per hour, and you said that was ideally—you would like to set that as the intersection of the injury risk for belted occupants versus inflation induced injuries from the air bag.

What data or other criteria did you use to choose 18 miles per hour?

MR. SPARKE: Yes, of course, there is a lot of data involved in making that decision and it's very complex. The critical part of the data was small females sitting fully forward to avoid contact, head contact with the steering wheel. To give you some idea of the complexity of the process, for that vehicle system, we crash tested 55 vehicles. We sled tested 250 variations of occupant size seating positions and strength system characteristics. And we computer modeled several hundred.

In the model we're about to release now, we actually use an optimizing process to help us select those characteristics. And that optimizer went through ten to the eighth variations of occupant size seating positions and restraint system characteristics in order to arrive at a combination of characteristics, which results in the best protection to the total community.

MR. BISCHOFF: There was a lot of talk about the poor NCAP performance of the Holden vehicle. What was the NCAP performance of the vehicle like before you added the air bag system?

MR. SPARKE: Even poorer.

(General laughter.)

MR. SPARKE: But remember, we are designing to look after the population at risk, not to meet a test. Two incompatible. You can either have one or the other. You can't have both. So, it's a matter of what your priorities are.

MR. BISCHOFF: Mr. Makeham, of course we've heard much that you enjoy a very high seat belt use in Australia. We see in the U.S. that belt use, while not terribly high at 68 percent, also deteriorates as you get into the more severe crashes and we see about 50 percent belt use in the potentially fatal crashes. Do you have a similar experience in Australia? Do you know what the belt use is in potentially fatal crashes?

MR. MAKEHAM: Yes, we have a similar experience. If you take the fatality data—as our observational data, it's up in the 94, 95. In terms of fatality data, 73 percent of all occupants were belted, and 74 percent from age 15 to 19, and 65 percent of children up to 15, which is probably disappointing. So, although we do have a very high belt rate, it does drop off in the fatality data.

MR. BISCHOFF: One final question for Mr. Makeham. We've heard about the good inflation induced injury experience of the Holden bag. What has been the—do you have an idea what the experience has been with the other air bag equipped vehicles in Australia?

MR. MAKEHAM: We fund the Monish University Accident Research Unit to do in-depth analysis of crashes. And, in recent times, air bag crashes. We have so far examined a 100 such crashes, which are vehicles. The data set is in the thousands, but 100 of these are air bag equipped vehicles.

Of that 100, which is, you know, still a small number, but of that 100, there have been no fatalities of children or small adults. The majority of the injuries observed have been around the AIS 1, but that's sort of little. That may be a factor of the size of the sample with management, but that's certainly what we found so far.

MR. BISCHOFF: Would you just clarify for me, again, are all of those vehicles depowered systems or are some of the air bag systems the same as the U.S. air bag?

MR. MAKEHAM: Of the 100, I couldn't quantify the percentage that would be powered or depowered. As I mentioned earlier in my comments, that we are doing a survey of the industry to find out what percentage of bags supplied to the Australian market are a powered or—and to what they're being tailored for the Australian market. Our advice is that most of the Australian produced vehicles are depowered to some degree. Holden has done the most, but the other major sellers have been depowered or in one case, they used the FMVSS propellant, but they've played around with the vents. So, that's a moderate amount of depowering.

But to get down to answering your question, I can't quantify specifically.

MR. BISCHOFF: Thank you, Mr. Chairman.

CHAIRMAN HALL: Thank you, Don. Mr. Makeham, do you all have dummies in Australia? Do you have an Australian dummy like ours or do you all use American dummies?

MR. MAKEHAM: We use the Hybrid 2 and 3. Principally, the Hybrid-3 these days. All our testing is done with Hybrid-3.

CHAIRMAN HALL: And, Mr. Sparke, that's the same you use for all the tests you said?

MR. SPARKE: Yes, we do a lot of testing with the Hybrid-3 female and with the Hybrid-3 child dummies, of course, to establish our performance criteria.

CHAIRMAN HALL: Do you have a certified dummy in Australia or do you let the auto manufacturers use their own dummies, Mr. Makeham?

MR. MAKEHAM: We don't certify the dummy specifically. We have an Australian design rule, which sets out the requirements. How a test should be carried out. And in conjunction with that, we have a test facility manual, which gives more detailed information in terms of, calibration, and things of that kind.

Now, that is quite closely modeled on the FMVSS material. They're not identical in every respect, but we certainly do not certify them. If they meet the requirements that are set out in the rule in the test facility manual, that would be enough for us.

CHAIRMAN HALL: What about Germany, Mr. Kallina?

MR. KALLINA: Well, we use the standard Hybrid-3. But and the amount of crashes that are conducted, I would not be very proud of, because we want to make as few as possible. We use simulation to a big accident and we have models, certified models, and we make extensive—simulation in order to understand and to make design changes, to quantify design changes very easily and if we accept the data, so we go in hardware crashes.

CHAIRMAN HALL: Okay. Mr. Dalmotas?

MR. DALMOTAS: As I mentioned yesterday, we make extensive use of the Hybrid-3 family, fifth percentile female, 50th percentile male. Certainly in research applications, we don't use the 572 dummy.

CHAIRMAN HALL: Is there a 95th percentile male dummy, as well, so that we got both ends of the spectrum of the whole community?

MR. MAKEHAM: Could I just qualify my answer about certify? I mean certify in the sense that we don't do it, but the rule, the design rule does specify Hybrid-2, Hybrid-3.

CHAIRMAN HALL: Okay. Thank you. Mr. Osterman?

MR. OSTERMAN: Mr. Makeham, I just wanted to clarify this. In Australia are the tether, anchors required or just the anchor locations?

MR. MAKEHAM: No, the anchors themselves. To supply a vehicle to the market, and that's not just passenger cars, but four-wheel drives and the like, we have to have three, five-sixteenths UNF or UNC, excuse me, soffit behind each rear seating position. And one of those seating positions has to have the fitting on the top. That's not uncommon for all fittings to be provided, but we require them to fit one. So, the soffit is required, plus one fitting.

MR. OSTERMAN: Thank you. Mr. Kallina, you had indicated your preference for offset frontal tests. Do you believe that there is a need to continue to conduct purely frontal collision tests for certification—not the NCAP, but for performance criteria?

MR. KALLINA: Well, the question is what is relevant for real crashes, for accidents out on the road. And we believe the best is to have the adjacent test configuration, which is complementing in itself, which means we are happy with a 50 kilometer—which is a 30 mile per hour head-on, full frontal crash in combination with an offset. This ensures the quality of the restraint system in a full frontal, because you have the hardest pulse and you really test the restraints.

And in an offset, it's different. You are qualifying the structure and you need both in order to ensure occupant protection, the best occupant protection. So, we would plea for both. But NCAP is not very often. So when do you really hit full frontal with a 35 miles per hour into a rigid wall? So this—the car can become very soft and long, so it would fail in an offset or it could fail or it results in an excessive length, in order to get wonderful scores, if you want to have five stars or six stars or seven stars like with the Cognac, so—

(General laughter.)

MR. OSTERMAN: I would actually like to hear from Mr. Dalmotas and Mr. Sparke and Mr. Makeham on that same question about the frontal versus the offset.

MR. DALMOTAS: Certainly, we in Canada still support the 48 kilometer per hour frontal barrier crash test. It provides, I think, a good evaluation of restraint system performance. Remember in Canada, we're still assessing essentially complete systems, since we don't have a mandate just for air bags.

I share, I guess, the observations made earlier that if you're going to do supplementary testing over and above that, right now our current thinking is we need something in the offset area. And in the offset area, we would like to see testing done over the full range, just to get a proper balance between performance and hard crashes and soft crashes.

We do not have NCAP—and, again, I share some of the earlier concerns that I think if you only have NCAP over and above the 48, you do tend to force designs in the wrong direction. I don't think it's inherently bad, as long as you have some other balance. And I think once you start introducing things, like offsets, especially a full range of speed offsets, then you can actually look at an NCAP score later.

And if you can do 48 good, a low speed offset very well and an NCAP score very well, then obviously, you've accomplished something. But simply accomplishing a good scoring NCAP, I agree with everybody else, it tells you nothing and actually could be misleading, particularly for some subsets of the population, short-statured females, for example.

MR. MAKEHAM: In terms of the regulated requirement, we in Australia place a fair emphasis on international harmonization, because you're getting down to issues of the fundamental design of the vehicle. And with the size of our market, we do need to move with other major international requirements. So in terms of the frontal barrier test, we have a requirement based on 208, and we would intend to keep these speeds in the central parameters the same. That's not subject to change.

We are also l working with the AEVC on offset barrier requirement and it is our intention. We are currently at advance of rulemaking, I think to use your earlier language, in terms of an offset requirement, which would come in towards the end of the century.

So, our state is still being negotiated, but it would be straight down the line, based on AEVC, which would be the offset test with the barrier that AEVC have developed together with the speed. We're at the site where we're now negotiating implementation dates.

So, that is our essential premise to work with the international community, to develop international standards, and certainly from our prospective, we have progressive standards, we believe the current range are. We will use the same speed as the AEVC specified.

MR. SPARKE: I recognize that it's necessary for consumer groups to have some measure of safety performance. So what that leads me to say is that the NCAP needs to be revised, so it has a better reflection of what real-life performance is. Mr. Dalmotas' proposal is theoretically fine, but the trouble is right now, we don't have the technology to be able to achieve the performance throughout the spectrum that you would like to.

So we have to carefully look at what we can achieve and how best to demonstrate—and I think Mr. Kallina's suggestion of an offset collision at a lower speed is the most appropriate way to go.

MR. OSTERMAN: Thank you.

MR. DALMOTAS: If I could just add a comment. I would agree. I think right now with the technology that we have, we probably would see that rankings—if you did all three tests, not all vehicles—not any one vehicle would do well in all three. Publishing the ranking, though, I think for all three tests gives the consumer more information and at least moves to perhaps design then in the right direction.

CHAIRMAN HALL: Mr. Arena?

MR. ARENA: Mr. Chairman, I have one question and I would like to direct it to Mr. Makeham and the other panelists may respond, if they have anything to contribute. Earlier in the session, there was some comments or some concern about the senior population, those of small stature, in crash situations where there was three point belt only use, not air bag use, that there may be some increased injury from the crash forces being distributed by the seat belts. Have you seen any evidence of that in your crash statistics?

MR. MAKEHAM: Can I just clarify it quick? You're talking about the senior population. In other words, the older passenger.

CHAIRMAN HALL: We don't put an age on that around here, to keep—

(General laughter.)

CHAIRMAN HALL: It's the older people, older than you are.

(General laughter.)

MR. MAKEHAM: I'm glad you put that qualification, Mr. Chairman. Thank you. Yes, we have seen that situation where the data shows that people who are older are more likely to be involved with particularly intersection crashes and more particularly, to suffer worse from them, because of the likelihood of injury is much greater, and the capacity for recovery is less. So, yes, we are observing the same phenomenon.

In relation to the current inquiry in terms of air bags, we have not noted yet with the sample of 100 that we've investigated in depth, any particular correlation there, but the information I just gave you really comes from our fatality and injury files, where certainly older drivers and passengers are much more subject to injury for the same crash severity.

MR. SPARKE: And if I could expand on that, just to make sure you don't feel too comfortable about it all. From age 20 to age 40, bone strength halves, and from 40 to 60, it halves again. And it's your skeleton that takes a load in a crash. So from age 20 on, we're all more increasing risk from aggressive restraint systems.

MR. KALLINA: Well, our data also clearly indicates or proves what is clear from bio-mechanics. You are subject to a much higher risk, if you are elderly people. And we observed, for instance, clavicle fractures and sternum fractures. Increased number with elderly people, and we found we have to do something against this effect. And what we did is the implementation of the belt force limiter, which—distributes excellently and in a wonderfully optimized way, the load in use by the belt and the huge area of the bag. And we have a significant reduction now.

MR. ARENA: Thank you. Thank you, Mr. Chairman.

CHAIRMAN HALL: Mr. Sweedler?

MR. SWEEDLER: Just a couple of quick questions. We heard about the high belt use rate and the rate in fatalities in Australia. How about in Canada and maybe if there's any data in Germany? What's the use wearing rate in fatal accidents in Canada?

MR. KALLINA: Sixty-five and 35, accordingly. So, 65 is—strictly for fatalities?

MR. SWEEDLER: Yes.

MR. KALLINA: Sixty-five belted and 35 unbelted. And that's—it drives our decision, because we cannot ignore 35 percent.

MR. SWEEDLER: Canada?

MR. DALMOTAS: I don't have a very recent figure in front of me, but certainly, I think the figure of about 32 to 35 percent is probably where we are right now in Canada, too, in terms of the percentage of fatally injured drivers who are unbelted.

MR. SWEEDLER: Okay. One other quick question. The seat belt use law in Australia, the penalties are rather significant with points and the financial aspects. How about in Canada?

MR. DALMOTAS: The situation is really variable, because we have 12 jurisdictions. All have seat belt use laws, all have child restraint laws, all impose fines, but the fines vary in dollar value and the demerit points also vary in terms of how they're applied. But certainly, demerit points is common. It's usually about two demerit points, and that has implications as a function of provence and what type of licensing system they have. Worse-case scenario is you're a young driver on a graduated licensing scheme, you have a total of four credits, and two—a seat belt infraction will get you two demerits, so you're walking after two tickets.

For adults, I think you have, nine credits before we haul you up before a judge for a lecture and 15 before you lose your total driving privileges. Things like, you know, how many passengers aren't wearing seat belts and other things also influence the level of the dollar fine, particularly if you decide to contest a seat belt infraction.

I think the most recent case that I heard was someone who was silly enough to go to court to contest his ticket and I think he had two or three children in his car that weren't also belted. The normal fine I think would have been something like $60, and the court decided to charge him $600, so.

MR. KALLINA: We have—it's rather cheap in Germany. So you pay $25, U.S. dollars, if you are fined not wearing a seat belt, in all seating positions. That means both on front and rear seats. And in Italy, the police officer even grants your interest in belt wearing if you have a T-shirt with a seat belt on it.

(General laughter.)

CHAIRMAN HALL: Dr. Ellingstad?

DR. ELLINGSTAD: No questions.

CHAIRMAN HALL: Okay. Let me ask Mr. Kallina just one last question. On the insurance coverage, you mentioned that in Germany, that if you're in an accident without your seat belt, you can either lose your coverage or have a serious impact. Now, how do you find out whether they have the seat belt on or not? How does the insurance company get that information is that done by the police officials on the form?

MR. KALLINA: Well, if it's critical and very substantial damage to pay, so they send an investigation team in order—I don't know how it's called. It's an expert witness who goes out and looks for the car. And you clearly can observe and determine if he has worn the seat belt or not, because of wearing marks. And in our cars, of course, all pre-tensioners have been fitted. So, that's so easy to detect.

CHAIRMAN HALL: All right. Thank you. Well, gentlemen, I appreciate again. This panel has come a long way to be here and to share with us on this very important issue, and I would like to give you an opportunity, if you would, to give us any final comments you have on any of the subjects we've discussed. And specifically, any suggestions you have on what we might do to increase seat belt usage in this country, and we'll just start with Mr. Dalmotas and go down the row.

MR. DALMOTAS: Well, I think we've heard the expression, there's no silver bullet for air bag design. I guess, there's no silver bullet for increasing seat belt use. Certainly, if you're going to model efforts after Canada, I think you need as a starting point, an obviously strong political commitment.

Certainly, you know, the Federal Government can't take credit for the high rate of seat belt use alone in Canada. We had excellent cooperation from all provincial people involved. They are the ones responsible for administering the seat belt use laws. I guess what you need to do is establish goals and strategies, just like everything else and work to them. Certainly, seat belts have been the cornerstone of the Federal policy in Canada on occupant restraint system, and we haven't wavered.

I guess we've, always emphasized belts as the most important safety feature that we have in the vehicle, and that's one of the reasons, we haven't experimented with passenger restraint systems and sort of straying, trying to protect unbelted people through any other means other than getting them belted.

CHAIRMAN HALL: Okay. Thank you. Mr. Kallina?

MR. KALLINA: Well, we would like to encourage all the manufacturers to support the baby smart approach, because we cannot prevent parents to sit their children on the passenger side seat and you have to face an interaction with the air bag. And the baby smart with the transponder system is a 100 percent safe system to transport them and the air bag is definitely shut off. So, it's an issue we should discuss in the next panel. I think it's worth to do.

CHAIRMAN HALL: Thank you. Mr. Makeham?

MR. MAKEHAM: I'm confident that you will get the technical standards sorted out. I'm impressed by the material that NHTSA put out recently in terms of the changes to the standard, and I believe that's headed in the right direction. But the two points I would like to make is, I believe that at the technical level, that's fine. But I think the real effort, the real messages that I could bring to you is that you need perhaps to focus much more in terms of seat belt use and as a nation, be much more aggressive in terms of trying to get a high seat belt wearing rate.

And the second thing is I think get children in the rear seat. I think that's absolutely critical.

CHAIRMAN HALL: Thank you. Mr. Sparke?

MR. SPARKE: And I can just reiterate that as the first recommendation, and I think it's essential. That a first priority is seat belt wearing and kids in the back. There is no technology available that's going to address the behavior problem. And secondly, change the NCAP, because you risk losing the benefits of depowering air bags and the need to achieve acceptable NCAP numbers.

CHAIRMAN HALL: Well, thank you very much for those comments and for being an excellent panel. And we will take a recess and return at 11:00.

(Whereupon, a short recess was taken.)

Laws applicable in Europe

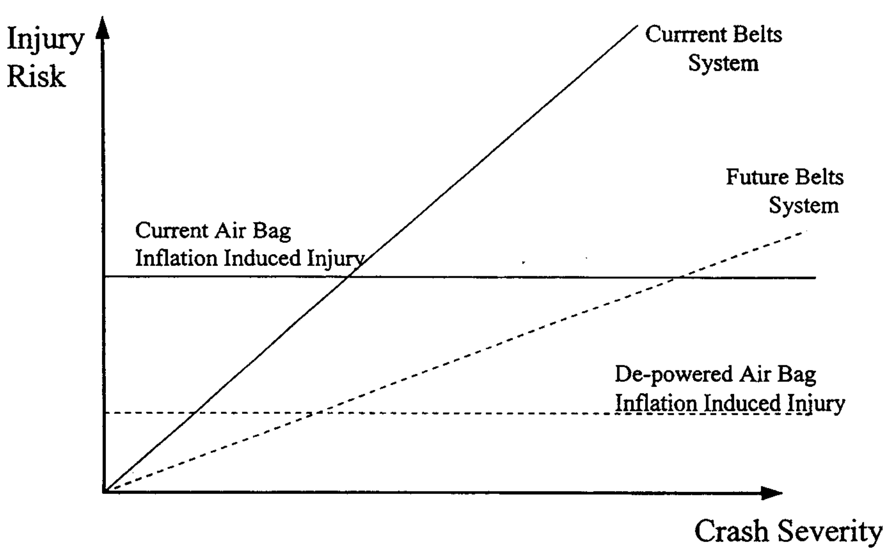
Statutory provisions on the positioning of children in cars and rear seat belts

Country	children in cars				rear seat belts	
	age limit definition	front passenger seat		rear seats		
	years	use	condition	protection/features	fitting	use (adults)
BELGIUM	12	prohibited	-	none	mandatory	mandatory
DENMARK	15	permitted	belt obligation	none	optional	voluntary
ENGLAND	14	permitted	belt obligation from 1 year	infants in CRS	optional	mandatory (where fitted)
FRANCE	10	permitted	-	none	mandatory	mandatory
GERMANY	12	permitted	with CRS	CRS recommended	mandatory	mandatory
GREECE	10	prohibited	-	none	optional	voluntary
IRELAND	17	permitted	belt obligation	none	optional	voluntary
ITALY	10	permitted from 4 years	with CRS	none	optional	voluntary
LUXEMBOURG	10	prohibited	-	none	optional	voluntary
NETHERLANDS	12	permitted	with CRS	none	mandatory	voluntary
PORTUGAL	12	prohibited	-	none	optional	voluntary
SPAIN	12	permitted	belt obligation*	none	optional	voluntary
SWEDEN	7	permitted	with CRS	CRS mandatory	mandatory	mandatory

* = only on rural roads and highways

Slide 1. Statutory provisions in European countries. (From Mr. Kallina's presentation, March 19, 1997.)

AIR BAG DEPLOYMENT THRESHOLD



Slide 2. Principles of thresholds. (From Mr. Sparke's presentation, March 19, 1997.)

Panel 2

The Effectiveness of Air Bags

CHAIRMAN HALL: On the record. I see representation now at least at each one of the tables. I want to welcome our next panel. The subject here is going to be the effectiveness of air bags. And I will turn it over to Elaine for introduction of the panel and let's proceed with this discussion.

MS. WEINSTEIN: Thank you, Chairman Hall. This panel is going to look at the data sources and the methods that we use to evaluate the effectiveness of air bags and also seat belts. I would like to ask the panel, for the record, to please identify yourself and state your affiliation. We'll start with Dr. Evans.

DR. EVANS: Thank you, Elaine. My name is Leonard Evans, and I'm very pleased to be here as a guest of the National Transportation Safety Board. I am here at their expense, and I presume I was invited because of my many contributions to the scientific literature on traffic safety.

The most noted of those contributions is my book, "Traffic Safety and the Driver." In the preface of which it states, "This book was written in my own time to express my own views on the subject of traffic safety." It does not necessarily reflect the views of any organization with which I am affiliated. And I am making my remarks at this meeting in that same spirit.

I am reflecting the knowledge contained in my book. I am here giving what I've learned from a long exposure to this subject. So, I am expressing my personal views and I'm not giving the official position of any organization. Those official positions have been very effectively presented by the spokesman who have the role and the knowledge to do so. I have neither. So, I am reflecting what I have learned, and I am reflecting my personal views on the subject.

MS. WEINSTEIN: Thank you. Dr. Ferguson.

DR. FERGUSON: I'm Susan Ferguson, Vice President for Research at the Insurance Institute for Highway Safety.

MS. WEINSTEIN: Dr. Graham?

DR. GRAHAM: John Graham, Harvard School of Public Health.

MS. WEINSTEIN: Dr. Griffin?

DR. GRIFFIN: Lindsey Griffin. I'm with the Texas Transportation Institute, Texas A&M University System.

MS. WEINSTEIN: Dr. Kahane?

DR. KAHANE: Chuck Kahane from the National Highway Traffic Safety Administration.

MS. WEINSTEIN: Thank you. Dr. Sweeney is going to start the questioning for the Safety Board.

DR. SWEENEY: I'm going to start with the first question for Dr. Kahane. We've seen both the NASS CDS and FARS data sets have been used to estimate the effectiveness of air bags. Could you please describe each of the data sets and include in your description how the data were collected, who collects the data, what is collected, how much data are collected each year, and how many air bag deployments would be in each of these data sets?

DR. KAHANE: FARS, a census of fatal crashes in the United States, which has been in place since 1975. Theoretically, every fatal crash involving a vehicle with an air bag should be on it. Some of them cannot be located.

CHAIRMAN HALL: Mr. Kahane, can I ask you if you would mind pulling the microphone a little closer to your lips. Thank you.

DR. KAHANE: Some of those crashes, perhaps between 5 and 10 percent can't be located, because information is lost on the vehicle, such as the vehicle identification number. Thus, you have on the FARS files as of early '96, approximately 9,000 fatalities that occurred at seating positions that were equipped with an air bag. It doesn't necessarily mean the air bag deployed. And these are continuing to come in at the rate of probably 400 to 500 a month. So by now, you have well over 10,000.

As far as NASS, which I didn't use in this report, I really don't know how many crashes involving air bags are on it. I believe they get about 5,000 crashes a year and would obtain a representative sample of crashes involving vehicles equipped with air bags.

DR. SWEENEY: I understand that special studies are done in conjunction with NASS CDS. Are you aware of any studies being done for air bags?

DR. KAHANE: I'm sorry, I don't know about it.

DR. SWEENEY: Dr. Ferguson, does the insurance industry have any additional data that could be used in determining air bag effectiveness?

DR. FERGUSON: Well, one of the problems with insurance industry data is that it's mainly set up to address the issue of paying claims, not to do research. So, the kinds of data that you have available do not lend themselves readily to that kind of analysis.

Now, a number of special studies have been done and John Warner talked yesterday about a couple of such studies that he's done in collaboration with the Insurance Institute and also with George Washington University. But these kinds of special studies often involve, for example, going into claims, talking to the claims representative, because, you don't often have the direction of impact information on the file, you don't have seating location sometimes. You don't have type or severity of injury. You don't have hospitalization.

So whenever you need to look at that, it needs to be a special kind of study in which you need to identify the crashes in which you're interested and make a special effort to find that extra information. It's very time intensive. And even for, say, several hundred, several thousand cases, it takes a lot of time.

So, it's not the kind of database that you can statistically analyze, such as the ones that we at the Institute have done and NHTSA and everybody else.

DR. SWEENEY: Are you aware of any other databases that are available, other than what's been mentioned already?

DR. FERGUSON: Not that are typically used for this kind of analysis, no.

DR. SWEENEY: Dr. Evans, you introduced a double comparison method in comparing the fatality risk of belted and unbelted occupants. Since this technique has been applied by others, including NHTSA, to estimate air bag effectiveness, could you describe in basic terms the method and do you believe it's an appropriate method for estimating air bag effectiveness?

DR. EVANS: I'll answer your second question first. Yes, the FARS is an extremely useful data set, but it has the characteristic that for inclusion, a fatality must occur.

In the United States, the most common occupancy of a vehicle is one person, and the most common crash leading to death is a single vehicle crash. So if you were to go into FARS and look at all the drivers who were unbelted and killed in single vehicle crashes, you would find that 100 percent of them were killed, because if they weren't killed, they wouldn't be in the data file.

If you then went in and looked at all if you now looked at all the belted drivers who were killed in single vehicle, single occupancy crashes, you would again find that 100 percent of them were killed. This may be interesting from some narrow points of view, but it's not going to tell you very much about the effectiveness of the safety belt in reducing fatality risks.

In the double comparison method, we focused on vehicles containing two occupants; let's say a driver and a passenger. We take one set of crashes in which the driver is belted and the passenger is unbelted, and we looked at the ratio of belted drivers killed to unbelted passengers killed. Then we looked at another obviously completely separate set of crashes in which both driver and passenger were unbelted. We look at the number of unbelted drivers killed compared to the number of unbelted passengers killed.

If you divide one of these ratios by the other ratios subject to assumptions that are spelled out in great detail in a paper, in accident analysis and prevention, the ratio of these two ratios gives you a fairly unbiased estimate of the effectiveness of the belts in reducing fatality risks.

In doing this, I estimated that the standard lap shoulder belt reduces driver fatality risk by 42 percent.

DR. SWEENEY: Dr. Griffin, do you have anything to add about the double pair comparison method?

DR. GRIFFIN: I would like to comment just briefly. I you'll excuse my voice this morning. I'm quite hoarse this morning.

In 1989, I wrote a paper entitled, "Criticism of Evans' Double Paired Comparison Technique." I sent a copy of that to Leonard, who wrote me back and suggested I change the title to "A Critique of Evans' Double Paired Comparison Technique." And what I would say is that I think that in fairness, that's probably a better title.

The mathematics that Leonard presents in the double paired comparison technique are certainly not new. It is a mathematical technique that has been used among epidemiologist going back at least till the mid 1950s. The use of odds ratios or log odd ratios, as Leonard uses in these papers, is very compelling. I think that what Leonard has suggested to us that we could do with the FARS or other similar databases, numerated databases, to try to get out effectiveness of crash safety devices is very insightful.

Having said that, I think that there are a few fine points. I think when Leonard goes through and combines several estimates and in the process may reuse some of the data, I think that we could quibble about what the standard area is if we have two estimates we're putting together that are not independent. But, again, I would emphasize that this is a fine point.

I think that on balance, given the limitations that we have, in trying to come up with estimates of effectiveness of crash phase safety devices, that the double paired comparison technique is an excellent way to proceed. I think I'll stop at this point. We may get into more details in later questioning.

DR. SWEENEY: Dr. Kahane, NHTSA has reported that driver air bags reduce overall fatality risks by an estimated 11 percent. Can you explain what this means?

DR. KAHANE: It means if you had a 100 driver fatalities in passenger cars without air bags and some of those fatalities were belted and some of those fatalities were unbelted in the ratios that are common during the last ten years, and now you took all those cars and put driver air bags in them, there would be only 89 fatalities in those cars, instead of 100.

DR. SWEENEY: Did you use the double paired comparison method to establish this?

DR. KAHANE: Yes, and I used actually two different double paired comparison methods. One where the driver's fatality risk is compared to the right front passenger. This is done for vehicles with air bags and vehicles of the same makes and models without air bags. And then another one where the fatalities in frontal crashes are compared to the fatalities in non-frontal crashes for cars with air bags and for cars without air bags of the same makes and models.

These methods respectively came up with estimates of 10 percent and 12 percent in this latest go around. In earlier versions of the report, they sometimes came out with 11 percent and so on.

I would like to mention something else in the context of double paired comparison, I think worth mentioning. Some of the controversy concerning double paired comparison analysis—actually, there's very little controversy. I think it's a method that just about everybody uses. That doesn't necessarily make it correct, but we all say it's correct. Okay. But some of the controversy has to do with estimates of belt effectiveness in reducing fatalities. And here you have an issue of whether belt use is correctly reported in some of our data files.

However, in the study of air bags, the reporting of belt use is not an issue in the computation. So, I think this is probably a less controversial use of the double paired comparison method.

DR. SWEENEY: When you begin to make some comparisons and particularly when you get down to looking at age or weight and height, the sample sizes are reduced. Is there enough data available to make reliable estimates in effectiveness?

DR. KAHANE: I've tried to show a confident band, which are two sigma or is a 90 percent confidence band. So, there's like 1.64 sigma for the various estimates. You can easily see that as you cut down to smaller amounts of data that these confidence band get wider. For example, that overall estimate of 11 percent, I believe I had a confidence balance of seven to 15.

Now, even there with all those data, you have a possibility of about a two to one ratio between the lower and the upper bound, which is fairly typical in the middle of the range of confidence balance of, levels of error for NHTSA evaluations over the years.

They are all based on somewhat limited data. You're looking at trying to find a relatively small effect in fatal crashes and you never have that many fatal crashes. Now, so let's start with all the people together, confidence band seven to 15. If you get, for example, people over the age of 70, which is roughly a little over a tenth of the whole sample, then those confidence balance are wider, they are, for example, from, a negative 12 to plus 15 percent. That's no, that's in all crashes.

So to sum that up, is that a reliable estimate? You do not really have a precise estimate of how effective air bags are, let's say, for people age 70 or above. In fact, you cannot draw a conclusion whether they're effective or not.

DR. SWEENEY: The data also show that air bag effectiveness is about 13 percent for males and about 9 percent for females.

DR. KAHANE: Correct.

DR. SWEENEY: Is that a meaningful difference?

DR. KAHANE: No, that's not a statistically significant difference. I believe the data do show that there is a significant fatality reduction for females, and there's a significant fatality reduction for males, but you cannot draw a conclusion at this point that it's more effective for males than for females.

DR. SWEENEY: In most of these studies and particularly those using the FARS, data have been used to estimate air bag effectiveness in terms of air bag equipped versus air bag deployed. Is that variable air bag equipped an adequate surrogate for air bag deployed?

DR. KAHANE: I feel it is, yes, because we're interested in how many lives this device is saving. Now, if it doesn't deploy, it's not saving any lives. But in either case, we're estimating the total number of lives saved or the total percentage reduction in the fatality risk, given that this is in your car.

The same way, for example, that you estimate for an energy absorbing steering column, this is the fatality reduction associated with the energy absorbing steering column. We don't necessarily look in detail whether it was compressed or not during the crash. This is our usual way of estimating effectiveness.

DR. SWEENEY: There is a variable in the FARS data set for air bag deployed?

MR. KAHANE: Yes.

DR. SWEENEY: Can you explain why you chose not to use that variable?

DR. KAHANE: I'm under the impression that until later years, that variable could not be relied on. In fact, I think in general, in the earlier years, you could not really rely on FARS to tell you whether the car was equipped with an air bag or not. In all cases, what I did was I used the vehicle identification number to identify whether a vehicle was equipped with an air bag or not. And if this was not evident from the vehicle identification number, I did not include it in the study. In about 99 percent of the cases, the vehicle identification number is adequate to identify that.

DR. SWEENEY: Dr. Griffin, do you feel that air bag equipped is a suitable surrogate for air bag deployed?

DR. GRIFFIN: I think it depends on the question you're asking. And I think that Chuck's answer is a defensible one. If what we're trying to figure out is what is the overall benefit for air bags, the question is how many lives are being saved through this estimation process independent of whether or not the thing is deployed.

DR. SWEENEY: And, Dr. Evans, do you have any opinion on air bag equipped versus air bag deployed?

DR. EVANS: No, I have nothing to add to that.

DR. KAHANE: May I elaborate on that a minute? In most frontal crashes likely to result in a fatality or serious injury, the air bag does deploy.

DR. SWEENEY: Do you know what the percentage is of deployed air bags in the FARS data set?

DR. KAHANE: No, I've never looked at the deployment variable after I've satisfied myself—it was quite incomplete, at least in the earlier years.

DR. SWEENEY: Dr. Graham, could you explain to the public what you mean by cost-effectiveness of air bags?

DR. GRAHAM: Yes. First, if I could just refer to the beginning of the meeting, Mr. Hall, you were correcting the misimpression about the safety belt use rate. I think it was in Germany. And I wanted to add to the corrections.

I've seen some press statements attributed to me about children and most of them being decapitated, the ones who have been killed. I think that I need to get straight that I believe it's primarily brain injury and spinal cord injury. There have been only a relatively few cases of decapitation. That word decapitation has such a power to it, that I think we should get that straight.

But to get back to your question, which I think is a good one, I have distributed a page, front and back, and I would just summarize for you the cost-effectiveness information that we have available for comment today at the meeting. And that is, we looked at driver side air bags and passenger side air bags. I should note that I'm referring to work that my colleagues at the Harvard School of Public Health and I are engaged in. That includes Kim Thompson, Maria Sequi-Gomez, Sue Goldie, and Milt Weinstein.

The way we summarized the cost-effectiveness of a life-saving technology is the ratio of the cost of that technology to the number of years of life that are saved, adjusted for the quality of those lives, to take into account the impacts on non-fatal injuries. In the numerator of that ratio, include not only the gross cost of the technology, the equipment cost, and the replacement cost, but also any savings in health care costs, emergency room visits, hospitalization, rehabilitation. That's all accounted for in the numerator of this ratio.

The basic result that we've come up with is that for the driver side air bag system, we're looking at roughly $70,000 per year of life saved using this measure of what we call quality adjusted years of life saved. And for the passenger side system, the news is not quite so good. We're talking about a number of roughly $400,000 for quality adjusted year of life saved.

Now, these kinds of numbers have a lot of sensitivity to them, because there's a lot of uncertainties in what the precise effectiveness rates are and the cost figures themselves. So to give you a feel for how unstable these kinds of numbers are, if we were to discover that the passenger side bag were 17 percent effective in fatality reduction instead of 11 percent effective, the number for the passenger side system would go down from 400,000 to 127,000 for quality adjusted life years saved.

So, I'm quite hoping that Chuck and Lindsey and my colleagues here are going to be able in the next year or two to pin down more precisely exactly what this effectiveness number is.

A second example of that is if we could get all children into the back seat of cars and you rerun this cost-effectiveness calculation, the passenger side bag goes from $400,000 per quality adjusted life years saved to $104,000 for quality adjusted life years saved.

So, I think that Germany and France may have a hint for us, and I was very interested this morning to hear that at least two provinces in Australia require these young children to be in the back seat.

That gives you some rough feel for the cost-effectiveness information, and I hope we can discuss that more.

MS. WEINSTEIN: Dr. Graham, everybody agrees right now that the numbers that we're seeing of lives saved versus lives lost on the passenger side is not good enough. How do we determine what an acceptable ratio of risk is?

DR. GRAHAM: Well, that's such an easy question. I think we all realize that in the final analysis, if there's going to be a value judgment made, different people are going to make different value judgments.

The couple of comments that I would make on that is if you take at face value the numbers on the passenger side bag right now—I think these are NHTSA's numbers—roughly, five lives saved with maybe one life lost, particularly children. I don't know of very many preventive medicine measures that we would require, compel everyone in the country to take a vaccine or something, that would have that kind of ratio.

So one of my reservations now that I have seen the actual field experience with this technology is that we have mandated something that really has a kind of ratio that's not acceptable. However, I think as I've indicated, if we can take some steps, for example, to require that children be seated in the rear seat, we can move that ratio quite substantially, and I think move the passenger side bag into a more acceptable situation.

MS. WEINSTEIN: As we see more passenger side air bag deployments, Dr. Kahane, do you expect that the effectiveness numbers will change on the passenger side?

DR. KAHANE: Well, the expected is that they should stay the same, but, there is some room for change there. It could go in either direction and not just statically speaking.

MS. WEINSTEIN: In terms of how we evaluate the effectiveness of air bags, they are designed to work in frontal crashes. Dr. Kahane's study has looked at the effectiveness, both in frontal and all crashes. Dr. Evans and Dr. Griffin, I would be interested in your comments on which way we should be reporting the numbers? Should we be looking at effectiveness in all crashes or in frontals where the air bag is designed to reduce injury and fatality risks? Dr. Evans, do you want to start?

DR. EVANS: Well, I have a very clear view on that. It is normal for all occupant protection devices to express it over all crash modes. Say for safety belt, it would be inappropriate to say the effectiveness of a safety belt is 80 percent in reducing fatality risks, with the parenthetical comment, "this is just for rollovers." One doesn't normally express the effectiveness just for the most effective mode.

The number for safety belts that is quoted is the number for all crashes. The appropriate number for the air bag is likewise average for all crashes. The driver cannot choose what sort of crash to have. And if I could perhaps, now that we're talking about the question of effectiveness, show an overhead that I think complements very much what Dr. Kahane was saying—if my first overhead could appear.

(Slide 1 shown.)

DR. EVANS: I think we're getting somewhat greater coherence. What I've listed and it relates exclusively to belted drivers, I want to confine my remarks only to belted drivers, because driving unbelted is illegal in every state of the United States, except New Hampshire. It's also illegal in the District of Columbia and Puerto Rico. So, it is illegal to drive unbelted essentially everywhere in the United States.

In 1991, I made an estimate and it wasn't using the double paired comparison. It was before that data were available. It involved a few intuitive assumptions, and it was published in a paper, "Accident Analysis and Prevention" in 1991, where I estimated the effectiveness of the air bag in reducing driver fatality risk for a belted driver as 9 percent.

Later, Zador and Ciccone from the Insurance Institute for Highway Safety in a much cited paper in the American Journal of Public Health had an estimate of 9 percent for the reduction for belted drivers. And the Gold Standard, Chuck Kahane's latest report—

(General laughter.)

DR. EVANS: —gets 9 percent. Never has there been a case of such agreement between industry—the automobile industry, the insurance industry, and the Government. That 9 percent effectiveness is interpreted if you think of 100 belted drivers killed in cars without air bags, if the cars had air bags, everything else being equal, that nine of these drivers would survive, but 91 would still die.

A couple of comments are in an order. The ones that would survive, I think that perhaps conveys a sense that they would walk away and say that that was an interesting experience. That is not so. The people who survived potentially fatal crashes tend to sustain injuries. In many cases, very severe injuries.

Another very important point that I want to return to later—and I don't want to bring it up at this time, because it's going to take our attention off this particular area. All these estimates, all the estimates that we mentioned, including Professor Graham's benefit cost estimates, dictate a very important assumption. And it's an assumption that I believe is not true, and that is the assumption that there are no behavior changes associated with the air bag.

But I want to proceed on the assumption that there are no behavior changes, because we have that assumption in order to proceed. If I could go to the next view graph, just to get a little bit of context.

(Slide 2 shown.)

DR. EVANS: And by the way, I don't want to attach any qualitative judgment to what 9 percent is, but I would suggest if Sears advertised they had a 9 percent off sales, they wouldn't have too much problem with the crowd control.

Two observations: A driver can reduce fatality risk by 9 percent by driving two miles per hour slower, and there a number of other attributes of driving two miles per hour slower. Virtually, every occupant of the vehicle receives that reduction in fatality risk. And secondly, people external to the vehicle receive a similar reduction fatality risk.

Another way to receive 9 percent reduction fatality risk is to choose a car heavier by 200 pounds. Another area that has cropped up a great deal is the question of smart air bags. I've labeled it, "Smart Air Bags, A Smart Idea." And let me stress that, as I did at the beginning, these are my personal views. I'm speaking only for Leonard Evans, who studied traffic safety for a long time and who's been deeply embedded with technical matters for a long time.

I've labeled it, "Smart Air Bags, A Smart Idea." It would have been logically identical to write "Smart Air Bags, A Dumb Idea," but it somehow seemed more appropriate to write it that way. In a mature technology, an air bag certainly is a mature technology. They've been around for three decades.

In a mature technology, an improvement as large as 10 percent is very rarely achieved, not even if we could get a 10 percent improvement. A big assumption, even if we could get a 10 percent improvement, this would raise the 9 percent effectiveness to only 9.9 percent. So, I believe about 10 percent reduction of fatality risk is about as much as we are likely to achieve with new generation air bags, which, of course, will have all sorts of problems with thresholds of new devices and questions about new devices.

If I could go to my third overhead.

(Slide 3 shown.)

DR. EVANS: What I've quoted is a 9 percent average effectiveness that applies to all cars and all drivers, but there are clear indications in a number of sources that the effectiveness may be lower than average for females, for older drivers, and for small cars. And this raises the most fundamental of questions and that is, when we're talking about belted occupants, does the air bag, in fact, decrease or increase the risk for these categories; females, older drivers, small cars? These categories contain tens of millions of drivers.

And in that regard, I had deep sympathy for Mr. Hall this morning when he had this question from the 5'2" lady, who was asking why her Government compels her to drive a car which is increasing the risk that she is going to be killed or serious injuries. As much as I commensurate with your problem, my family and I have a much greater one, and I have it on a daily basis. I am the father of a 4'11" daughter, who lives in Chicago. She doesn't bother me with too high frequency, but I am the husband of a 4'11" wife, who quite often points to that driver seat in our car and says to me, the safety expert, why am I compelled to drive at increased risk of being killed and injured by a device that was installed in order to reduce the risk to a large male who is driving illegally without a safety belt? Such a person will never sit in that seat. It is my car. Yet, I sit in it twice per day.

CHAIRMAN HALL: Well, I think that's the issue that's brought up here today, sir.

DR. EVANS: If I could just ask, Mr. Hall, if you can get an answer to that question, I would be deeply grateful.

(General laughter.)

DR. EVANS: If you could pass it on maybe the next time you're talking to Dr. Martinez, you could ask him about this first rule of the position, do no harm. What other procedure are patients obliged to have whether they wish it or not?

CHAIRMAN HALL: Well, this is a complicated subject, but we're going to work at it here the rest of the time. Go ahead, Elaine.

MS. WEINSTEIN: I just want to ask one last question of Dr. Griffin, whether or not you agree, should we be looking at frontal crashes or all crashes when reporting the effectiveness of air bags?

DR. GRIFFIN: I think I agree with Leonard, that ultimately we want to talk about effectiveness overall, which is how many lives are we going to save in terms of the great variety of crashes that are going to occur out there.

If we can go back and look at the literature where we were looking at the effectiveness of seat belts in saving lives, we can go all the way back to the first study that I'm aware of in this country with real world data, which was Touring and Garrett in 1960, if I remember correctly. If you look at the sublevels in there, you see that the seat belt certainly was not equally effective in all of the different crash modes.

But overall if I remember, again, correctly, it's about a 35 percent reduction in serious and fatal collisions and based upon data that were collected in the summer of 1958. It's interesting to note, too, that in those data, the people who had belts at that point in time were involved in systematically more severe collisions. The vehicles in 1958 that had seat belts were atypical of the vehicles in the fleet. They were more often sports cars and so forth.

But in any event, it was a particular kind, the more catastrophic rollover crash, where the belts showed most efficacy, but had an overall effect of reducing serious and fatal injury by about 35 percent.

CHAIRMAN HALL: Mr. Griffin, can I ask you, were those statistics based on people that were in seat belts that were attached or buckled?

DR. GRIFFIN: Yes, people who were lap belted versus people who were not lap belted.

CHAIRMAN HALL: How do you have statistics in air bags where they're not deployed?

DR. GRIFFIN: I'm not sure I understand your question, sir.

CHAIRMAN HALL: Well, I don't understand this part of it. Do you mean we have statistics based on the fact that air bags, whether they fire or not and we're looking at the effectiveness of the air bag based on whether it's an air bag equipped car versus whether the bag itself actually deployed? Then you say that's no problem I'm just asking, because I don't understand if I was to say well, I'm going to give you statistics on seat belts where the car is equipped with seat belts, whether I have my seat belt on or not, I don't think you would get effective statistics now.

DR. GRIFFIN: What I would say is that basically right now in terms of looking at the overall benefits to be derived from air bags, I would look at the analysis very much the way that Dr. Kahane has done it. That is to say, I would look at what is happening to drivers who are in air bag equipped vehicles at the driver's side versus those who were not, and in comparable vehicles, to see what kind of benefits are being realized at this point in time. Realizing, of course, that those benefits may not be the same and probably are not for those who are belted and those who are unbelted.

MS. WEINSTEIN: I have one more question, and then Vern Roberts has a question. Mr. Kahane, for the record, could you discuss what your findings are in terms of injury reduction We've been talking about fatality reduction for the most part.

DR. KAHANE: I don't have any findings on non-fatal injury reduction.

MS. WEINSTEIN: Okay. Vern.

MR. ROBERTS: Yes, Dr. Graham. You presented some dollar figures. I believe they were quality adjusted life year figures. I think $70,000 for a driver air bag. Approximately $400,000 for passenger air bag. A question, what do these numbers mean? Have you done similar analyses for other auto safety devices, such as seat belts or energy absorbing steering columns or how would these numbers compare with any standard measures in the medical field?

DR. GRAHAM: Yes, we have at the Harvard Center for Risk Analysis, we maintain a database of about 600 life-saving interventions in medicine, in environmental health and consumer product safety, where we can now begin to compare these cost-effectiveness ratios for different kinds of interventions.

The manual safety belts are a fascinating example, because it turns out that they are so effective when used, that the savings in hospital costs and rehabilitation more than pays for the cost of the safety belts themselves. So, in a sense, their cost-effectiveness ratio is negative. They don't even have a cost per year of life saved.

But in contrast to that, we've also done some comparisons, say, with cervical cancer screening and breast cancer screening. And I think it's interesting, if you look at the health plan that Mrs. Clinton's task force proposed unsuccessfully several years ago, the recommendations for cervical cancer with screening every three years. They chose not to do it every two years. To do every two years, would have been roughly speaking, about a $200,000 per year of life saving investment and they regarded that as not an appropriate investment.

In the case of breast cancer, there's been some publicity very recently about women under the age of 50. And the analyses that have been done on mammography screening, every year under age 50, come up with numbers around $100,000 per year of life saved. And that's been considered a very difficult kind of thing to confidently recommend that it's worth it for women to do.

So, I think we should understand that we're talking about the driver's side air bag, the current ones out there in the field. We've got something that I think's basically a pretty good technology, and it's within the range of what is normally considered acceptable in preventive medicine.

On the passenger side, we've got a lot of work to do. And it's not just a cost issue; it's the fact that we're inflicting harm on young children. That is undercutting the effectiveness and cost-effectiveness of that technology.

MR. ROBERTS: Is that harm inflicted reflected in these numbers?

DR. GRIFFIN: Yes. And you should keep in mind that each child that is killed, we credit them with a loss of 75 life years. Each adult that is killed, we assign them roughly 35 life years. That has a big impact on this calculation. Now, obviously different people could have different value judgments on how they want to weigh those, but we do it on an actuary basis on how many life years those children lost.

MR. ROBERTS: If smart air bags and the harm goes away, do you have a comparative number to offer?

DR. GRIFFIN: Well, one of the things I was hoping to get at this meeting was actually some good quantitative estimates for both depowering and for various smart air bag systems of how much they would reduce the risk to children. I think it's going to be very hard to get precise numbers, but if we can get some numbers like that, we can redo these kinds of calculations and see what extent they're going to come out like.

MS. WEINSTEIN: We have no more questions.

CHAIRMAN HALL: All right. Well, we will go to the tables. The Chairman has got to sit and think about all of this. This is an important panel on the effectiveness of this system that's presently mandated. I'll pick on table 4. We'll start on table 4.

MR. PARKER: Thank you, Mr. Chairman. George Parker, Association of Engineer Automobile Manufacturers.

MR. PARKER: I just have two questions. First to Dr. Ferguson. There's been some controversy regarding the benefit of depowering in NHTSA's preliminary regulatory evaluation for depowering. For example, AAMA, American Automobile Manufacturers Association has projected substantial net benefits for depowering.

Do you have a recommendation for resolving this sort of a long-term evaluation?

DR. FERGUSON: Well, as you may know, the Insurance Institute for Highway Safety has done a study looking at the National Accident Sampling System. Dr. Lund referred to this, I guess it was yesterday, where we've looked at people who were killed in air bag equipped cars to look at how they died. And what that suggests to us is that on the one hand, the NASS analysis has said that depowering is going to result in a loss of life for a lot of unbelted drivers.

They are assuming that these unbelted drivers are going to be in position when the air bag deploys and that the air bag being less powerful won't provide the same amount of protection. The results of our studies have suggested that, in fact, many unbelted drivers may be out of position at the time the air bag deploys. So, that depowered air bags may provide them more protection than the current more aggressive air bags do.

So on the one hand we don't agree with the NASS analysis and we believe that they need to take that into account.

We've always looked at unbelted drivers in NASS, just to see when you look at the kinds of crashes that they're involved in, how often they are likely to be out of position. For example, if there's some heavy pre-impact breaking or perhaps there's multiple impacts, a light impact first, followed by the frontal impact that deploys the bag. You may also get a situation where perhaps the driver first hit some bushes and then continues forward toward the steering wheel. And we find that in about 50 percent of cases, it's possible that the driver will be out of position at the time the air bag deploys.

So, again, we believe that a less aggressive bag is going to help rather than harm.

MR. PARKER: Thank you. The next question and the only other one we have, may be addressed to Dr. Graham first and then Dr. Evans—do you see any way to accelerate an evaluation of the net effectiveness of depowered air bags compared to current air bags?

DR. GRAHAM: I'm sorry. You were directing that at me?

MR. PARKER: Well, yes, you first and then Dr. Evans.

DR. GRAHAM: I think the first thing that would be very helpful is that the people in the experimental and the bio-mechanics community, I would like to see them come forward with as precise a quantitative projection of what they think depowering is going to do with judgmental error bars on it, and this is before the field experience is accumulated. Then I think that we ought to very diligently follow this field experience as these depowered bags come into the fleet, so that we can validate or not validate the kinds of estimates that are coming from the laboratory.

The more explicit these estimates are from the laboratory community, the more helpful it is going to be for us to understand in the future how seriously we should take these estimates from the laboratory in future kinds of design decisions.

I didn't answer your question head on, but I do think we need a lot more explicitness about what we're expecting from depowering.

DR. EVANS: George, let me first make a general comment, that this safety device like almost any other device you can think of, defines three categories of occupants. There are occupants who are going to be helped by it, are going to have reduced risks because of it. There are occupants where it's going to be too close to call. And there are occupants who are going to be harmed by it.

So, there's a group that will have a net benefit, a group that is too close to call, and a group that will suffer net harm. It seems to me very clear from all we've heard and from everything else, that no matter what changes we make, these three categories will still be there. We can change the relative proportions in them.

In other words, we can do things that would reduce the number of people harmed. Such changes will likely also reduce the number of people helped and will define additional areas of uncertainty.

Relative to Dr. Graham's comments, I think the history of predicting the effectiveness of these devices based on bio-mechanics is one that does not need one to have a confident feeling about future predictions. In the past, they have been very wide of the mark, indeed.

The only way to get a really good measure is from data and this seems an arena in which the American public are being used as involuntary guinea pigs in an experience which may lead to their death.

Will the Food and Drug Administration ever send something out there by the million, based on some completely uncertain knowledge about its efficacy and send it out there with confident expectation that it was going to harm people who would not otherwise be harmed if it were not there, and these people are forced to take it, whether they wish to or not. They are not legally allowed to purchase a vehicle that doesn't have this device.

DR. GRAHAM: Can I comment on that, please? Yes, I think that the analogy to drugs and vaccines, I think, are provocative. They're interesting and I think they're important for the public to think through on this issue. But I think we have to remember that in this area, it's not going to be as easy to design, say, a clinical trial or a controlled demonstration program.

If you remember, it must be now, what, 20 years ago when former Secretary Coleman proposed a demonstration program of air bags as an alternative to a full-scale mandate. And there were a lot of arguments, pro and con, about whether that was a good idea. But in retrospect, as I was reading about that plan just in the last couple of weeks, it's not clear it had the size, the number of cars—in fact, most of them are going to be driver's side air bags—to really be able to learn enough from that—even that rather substantial experiment.

So, in contrast, when we do trials with drugs and vaccines, normally, we're looking for effects that are within the range of what you could detect in a realistically sized sample of human volunteers for a clinical trial.

So, I think it's a really interesting and provocative question, but I don't think that we should overstate our ability to tackle this problem in a purely experimental approach.

DR. FERGUSON: I would like to add one thing to that. You know, it took us a while to really understand the benefits of air bags when you look across the fleet. I think what you're asking us to do now is to evaluate the benefits of depowered air bags, which presumably will be in some models and not others.

Presumably the amount of depowering will be different in some and not others. So, I think that it isn't something that necessarily could be done in 12 months, to get a statistical answer to your question. There are some concerns that come with depowering. Some people, including the NASS analysis, have expressed the concern that larger unbelted males will not be served well by depowered air bags.

I think that we need some sort of monitoring system. I'm not sure how this takes place, but what we need to prove to ourselves is that, in fact, this population—if you look at fatal crashes, for example, involving unbelted males, we have not found any cases to date of unbelted males in crashes that have died because we think the air bag was not powerful enough. The question is, in the next generation of air bags, will that be true or not, and we do have to monitor that.

What we also can monitor presumably, and deaths and injuries to the vulnerable populations. For example, we are aware of children who have died and have been injured as a result of air bags. That is quite clear when the crashes are very low severity.

We also have some evidence that drivers, particularly females, particularly shorter females, have suffered at the hands of air bags. So, what we need to do is also look at those populations and see whether, we are still getting instances of that, and try and understand what those instances represent.

I know it's difficult in crash investigations to know what happened before the crash to know how close a person was; although, there are some things that you can tell from crash investigations. But we do need to closely monitor experiences of drivers and passengers in these vehicles. It is more of a qualitative analysis, but I think in the short term, that's all that we really can do.

MR. PARKER: Thank you, Mr. Chairman.

DR. EVANS: Can I just add to that, George? Obviously, in order to get evidence of the sort that Dr. Kahane used in his study, one would have to wait many years of accumulation. And the reason you have to wait so long and the reason you cannot do the sort of studies that work in more ordinary evaluations of drugs is because the effectiveness of this number is of the magnitude number I've described. The smaller the effect, the more data you need.

For this device, you need lots of data to have a hope of seeing an effect. And it would be the judgment of many people that a depowered air bag would be expected to have an overall effectiveness lower than the current one, which is 9 percent for belted drivers.

CHAIRMAN HALL: Do we have an enough statistics and information based on the air bag experience on the road to say that air bags are not safe for all populations?

DR. GRAHAM: Are you in the driver's side or the passenger's side.

CHAIRMAN HALL: Well, let's do it both sides.

DR. GRAHAM: I don't think that we could fairly say that we're confident that the passenger side air bag systems out there are on the whole good for children. I don't think we can say that. I don't think we can even say it for restrained children. I don't think we really know. So I think that's one clear case where we would not want to make the kind of statement that is made in your question.

DR. FERGUSON: I think I would add, to what Chuck Kahane said earlier and was that we have a lot of experience with driver air bags currently. And the data do suggest that they save lives. But when you do look at smaller groups, when you break the data down by males and females and by age groups, you still don't have the amount of data that would allow you definitively to say that different groups are differentially affected, because of the large confidence intervals around that estimate.

I think that when it comes to passenger bags, Dr. Graham is right that there's only been two analyses that I'm aware of to date; one done by the Insurance Institute and one done by NHTSA. We both find that passenger air bags save lives. In general, they looked at passengers over the age of ten and we just used all passengers.

When you look at the child population, what you find is that it looks like it increases deaths for children. But again the bands of that estimate don't rule out the possibility that they also could save lives. Obviously, the individual crash investigations we've seen strongly suggest that more children are losing their lives than are being saved.

CHAIRMAN HALL: Well, if the Government is going to take into consideration that some percentage of the population is going to be unbelted, shouldn't it also take into consideration that some percent of the children will be in the front seat? They're going to have a different standard for kids and adults in the country?

DR. GRAHAM: Yes, I would just like to comment on that a little bit. I think that one of things that we've been trying to understand in our telephone survey work of random samples of Americans, is why is it that a lot of American are tolerating the circumstance that we have now that children are being killed by air bag systems and other people are being saved.

One of my hypotheses about this is that people perceive that air bags are saving more children than they are killing. If people were to hold that perception, then they might say, yes, it's very unfortunate that some children are killed by air bag systems, but there are many other children who are saved. And certainly with women, we could say that even though women are being harmed by air bag systems in certain circumstances, a lot of women's lives that are being saved by air bag systems. But with children, I don't think we can make that claim.

Until the American people understand that passenger side air bags look like they are killing more children than they are saving, then I don't think that we have a full discussion in a democracy about what we're doing.

CHAIRMAN HALL: Now, that gets me back to my concern. I want to always keep us focused on the cars that are on the highway and being produced at a million a month today. We need to solve the problem for the future. And, again, I think all of this, as I said initially when the Board—when we got into this, all of this was, I think, as a result of everyone's good intentions. Now we have some bad results. The question is, how do we responsibly address those results?

And the American people—you all are five very important people, because the statistics for the American public, most people, you know, are told the air bag is safe. It's saved 1700 lives. It's presented we've saved so many lives, and most people would save their life even if it's just a 9 percent opportunity to save your life, particularly, your family's life.

DR. EVANS: I think this device, unlike anything else, seems to have a strange assumption associated with it. And that is, it's assumed to do good unless there's clear evidence that it does harm. There are categories containing millions of people; for example, there is no evidence that the air bag reduces the risk of death to a belted female. There is much indication, including the paper from folks in Canada, "Air Bag Deployment Crashes in Canada," that suggests very strongly that average females are at greater risk if they have an air bag in their car. And I think it's very compelling that women of short stature are a greater risk if they have an air bag in their car.

Naturally, many people come up and ask me because of my profession. Many people who are elderly, people who are short, people who are female. And if a female under about 5'2" or an elderly persons asks me what vehicle they should get to protect themselves from the possibility of being killed by an air bag, I am in a very embarrassing position of telling them that their Government does not allow them to buy any vehicle that does not have the possibility that they will be injured by a vehicle.

I think the time is long passed to look at this whole problem in a more detached objective way and not say what can we do to fix this policy, but—and again, let me stress, this is me as a citizen, as a researcher, as a father, as a husband—to address it fundamentally and ask why do citizens have to have these devices in the car?

John Graham, yesterday, said we should have a law compelling people to not allow their 12 year old children to sit in the front seat, because there's an air bag there. Would it not be a much simpler solution to not have the air bag there, because there are other costs than monetary in saying you cannot have your children sit in the front seat with you.

CHAIRMAN HALL: Okay. Well get back to table 4.

MR. PARKER: That's the end of our questions. Thank you, Mr. Chairman.

CHAIRMAN HALL: I was summoned by the House Aviation Subcommittee to meet with them in a closed door session on the subject of TWA Flight 800. And they are my boss, along with all of you who pay taxes. I am going to have to excuse myself here in a minute, and I will turn this over to Mr. Sweedler to complete this panel. That's why I wanted to get some of my thoughts out here a little early, because I am going to have to excuse myself, but I appreciate—and let me say, some of you all may be on future panels, but I very much appreciate your participation and assistance. And I'm sure the rest of this is going to be very informative, and I look forward to reading this part of the transcript as soon the Court Reporter can get it together.

So, I will turn the microphone over to Mr. Sweedler.

MR. SWEEDLER: Thank you. George.

MR. PARKER: We're done.

MR. SWEEDLER: Table 5. Table 5, please.

MR. HURLEY: Chuck Hurley, National Safety Council. A question for Dr. Evans. Mr. Kallina indicated the German citizens recognize a moral imperative to wear seat belts that is greater than the United States. Yet, he says that Mercedes does not believe you should design cars ignoring the unbelted. Your statistics, however, ignore the potential benefits of air bags to the unbelted. Why is that?

DR. EVANS: I presented the data exclusively for the belted in order to get a little bit of focus on this. Dr. Kahane mentioned that the fatality reducing effectiveness of the air bag for the unbelted was 13 percent. So, it is unquestionably higher for people who drive illegally. But in that regard, I would like to show my overhead number 3, because, again, it illustrates asymmetry that seems to occur.

Next one, please, I'm sorry, number 4. My apologies.

(Slide 4 shown.)

DR. EVANS: We have had a great deal of focus on the claim of 1700 lives saved since 1986 by the air bag. Now, this is based on the assumption, which I hope there will be time to get to the assumption that there are no behavioral changes associated with air bags, which I believe is an incorrect assumption.

Every time there is an air bag induced fatality, there is great stress put on the possibility that the victim was not belted. Yet, this claim of 1700 lives saved does not appear broken down by the way, these are estimates based on the effectiveness. We don't actually have 1700 people walking around that we can identify. They are just estimates.

The number of those who were belted and the number who were female, the number who were older, the number who were alcohol free. Most of those saved, as your question so clearly points out, Chuck, were indeed driving illegally unbelted.

If we were to modify that 1700 to reflect the number of drivers who were wearing belts and who were alcohol free, that number would drop precipitously. So I think we need to have an understanding of the people who are being saved, how they distribute into different categories, even as we're continually told about the non-belt wearing of those hurt by the air bag.

And just another comment, in the period that that 1700 was accumulated over, over 400,000 traffic fatalities occurred. In other words, the claim—and it's a claim I dispute—but the claim is that the air bag reduced total U.S. traffic fatalities by less than 1 percent. The air bag reduced total U.S. traffic fatalities by less than 1/2 of 1 percent.

Another comment is that the few common standards that have led to people being obliged to choose lighter cars than they would otherwise choose, these standards from the NHTSA have taken far more lives than air bags are claimed to save, and the author of the definitive study on that is Dr. Graham.

So, I think this 1/2 of 1 percent has come at a tremendous cost. The cost of a total national focus on this device, rather than on effective counter measures that really influence traffic safety.

MR. HURLEY: A question for Dr. Kahane, Leonard Evans indicated that there's a presumption of risk to short statured female drivers. And he cited, I guess, a Canadian study. That's the first study I've heard to that. Do you know of any definitive data that short statured female drivers are at increased risk from air bags?

DR. KAHANE: The data that I analyzed in the FARS system does not indicate the height of the occupants.

MR. HURLEY: Thank you. A question for Dr. Graham. Do you think it's really possible to measure in dollars and cents the tragedies of deaths caused by air bags or, conversely, the important lives saved by air bags. If the cost of passenger bags were only $10,000, would child deaths be acceptable?

DR. GRAHAM: The first part of the question, no, I don't think it's possible to measure it completely. The second part of the question was if the bag still killed children, but they cost less—was that the question?

MR. HURLEY: Well, if the cost of passenger bags were only $10,000, would child deaths be acceptable?

DR. GRAHAM: Yes, that is an excellent question. And my turnaround on the passenger side bag was not influenced primarily by the cost-effectiveness ratio, but by the statistics that are out there now that we're roughly talking about a five to one—saved five lives in the passenger side, primarily adults, one child killed. And I've been trying to think deeply about all of us had known in advance that that's what passenger side air bags was about, would we have all signed on to that program? And I really have reservations about that. That's sort of what I'm saying.

So, I guess, I have to say to you, I would still have problems, even at $10,000 per quality adjusted life here. But I think that we can handle that problem. I think we can handle that problem for the cars out on the road by getting our children in the back seat. And in the future, by getting some improved air bag systems. But we have to have enough public awareness of the truth about this situation, so we generate a level of concern that will cause our elected officials to take responsible action.

MR. HURLEY: A related question. What does your study indicate about how we retain the safety benefits while reducing and eliminating the unnecessary injuries and deaths? What does your study tell us about how to do that?

DR. GRAHAM: We do site the experience in France and Germany where there are legal requirements. In the case of Germany, I believe it's for children under the age of 12. And in the case of France, I believe it's children under the age of ten. In these countries, fewer than 10 percent of children under those ages are observed riding in the front seat.

In the United States today, those numbers vary by state, but they're often in the range of 30 to 50 percent. We have to remember that when these 30 million cars with passenger side air bags are resold from their current owner to their next owner, gradually over time, it's less educated and disadvantaged populations that will then be the owners of those vehicles. We know in the safety community that we have a much tougher time with those communities in getting kids properly belted and certainly getting them into the back seat.

So we have a lot of work to do, but we have to recognize the severity of the situation we're in in order to take the steps we need to take.

MR. HURLEY: A final question for Dr. Graham. How sensitive is your passenger side analysis to the low occupancy rate of passenger seats in the deployment to unoccupied seats?

DR. GRAHAM: The low occupancy rate. That's an excellent question. I was actually thinking last night about, if we had a mandatory car pooling program in the United States, you had to have a lot more people in the passenger seat. It would certainly improve the cost-effectiveness of the passenger side air bag system. It's a powerful factor in this analysis.

I think our assumption is like a two and a half times more people killed as a driver than as a passenger. Susan, I thought, made a very good point to me, and I want to rerun our numbers on this. If we would simply have the—it was the weight sensor you pointed out to me, not necessarily to detect children, but just to suppress the bag deployment if there's no one seated in the front right seat. I think that would be a significant step in moving these calculations.

So, I would urge people to focus in the first instance on the overall safety analysis here. And then in the second instance on the cost-effective analysis. Even on the straight safety analysis, I think we've got some issues to talk about and to try to see if we can come to some consensus.

MR. HURLEY: Thank you.

MR. SWEEDLER: Thank you, Mr. Hurley. Table 6.

MR. STONE: Thank you. I'm Judie Stone with Advocates for Highway and Auto Safety. I wanted to ask a couple of questions of Dr. Graham and also of Mr. Kahane. I think I'll go with the question for Mr. Kahane first. How would the effectiveness of air bags change if you eliminated from your analysis all crashes whose Delta V is lower than 15 miles per hour? And would you recommend a minimum threshold trigger speed?

DR. KAHANE: The data that I have don't indicate the Delta V in the crashes. So, I don't think I can answer that.

MS. STONE: Okay. And I would ask that same question of Dr. Graham.

DR. GRAHAM: I'm sorry. Repeat it again?

MS. STONE: Okay. How would the effectiveness of air bags change if you eliminated from your analysis all crashes whose Delta V is lower than 15 miles per hour and as a follow on, would you recommend a minimum threshold trigger speed?

DR. GRAHAM: I have a doctoral student, Marie Sequi-Gomez, who is determined as a dissertation paper to actually try to do a quantitative analysis of the answer to the question that you have just posed. And she is thinking about it in two ways. One is a pure safety analysis of when—at what deployment—at what speed of deployment is the net safety benefit of the air bag positive? Ignoring costs entirely. And then in a second analysis, you bring in the cost of treating different types of injuries.

This is actually an interesting analytical problems, because the head injury is going to have a different treatment cost than the upper extremity injury, which is often induced by the bag. The types of injuries induced by the bags are different than the types that are prevented by the bags. I think that, frankly, it needs a lot more work and I would like to see both NTSB and NHTSA take a pretty hard analytical look at the answer to the question you have, as we accumulate some data that can start to answer that question.

MS. STONE: Thank you. The next question is for Dr. Ferguson. What is the effectiveness of the air bags in reducing serious head injury?

DR. FERGUSON: Well, I actually didn't do the study. The National Highway Traffic Safety Administration did the study. I do happen to have the results with me, though. They estimated the effectiveness of air bags in reducing the likelihood of moderate and serious injury to the head, chest, upper extremity, and lower extremity using the National Accident Sampling System.

For moderate injury, this is for drivers, by the way. If you look at drivers who are unbelted and then you compare that with drivers who are either just wearing a manual belt, who are wearing a belt, and have an air bag or just have an air bag alone, the benefit of just wearing a belt, the reduction in moderate injury to the head of just wearing a belt is about 59 percent.

If you look at the belt plus air bag, it's 83 percent. For air bag alone, it's 46 percent. So the air bag does provide substantial injury reducing benefits to the head for both belted and unbelted occupants.

To look at the risk of serious injury or the reduction in the serious injury, then you get a reduction of about 38 percent for people just wearing belts. When you look at those who you add an air bag to that, that goes up to 75 percent reduction in serious head injury. The air bag alone does not appear to add as much to that.

So certainly, the NHTSA analysis would suggest there were substantial benefits from air bags both to belted and unbelted drivers in reducing head injury. Of course, what that is offset by is, as Dr. Graham was saying, is an increase in upper extremity injuries. And we hope that less aggressive bags will certainly help to reduce that.

MS. STONE: Thank you. For Leonard Evans, your studies are generally based on real world experience, yet, you would ignore the real world fact that the belt use rate in the United States is only 68 percent or less. If public health officials ignore the risk to those people who break the law, do you also suggest not treating pedestrians who are struck while jaywalking or other societal problems involving the violations of the law?

DR. EVANS: Judie, I've never suggested ignoring any categories of people. It's a tragedy when anybody is hurt. But I think it's appropriate to address the question, why are our belt use rates so much lower than another countries?

About a year ago, I had published under my own name, reflecting my own views again, in the American Journal of Public Health, a piece in which I said the cost of this obsessive focus on this one device which has deflected all our national energies away from effective traffic safety countermeasures, tens of thousands of Americans have needlessly died. I've had a year to reflect on that, and when I do, I think I would say it differently. I think the number is probably much, much larger than I had in mind.

Let me just give an illustration. I think if we ask most Americans to name two countries that were most similar in background and traditions to the United States, people would probably come up with Canada and Britain. Since 1980, the total number of traffic deaths in Britain has declined by over 40 percent. In Canada, the total number of traffic deaths has declined by over 40 percent. In the United States in that same period, the total number of traffic deaths has declined by 20 percent.

If the United States' number of traffic deaths had declined by the same percent as occurred in Britain and Canada, currently we would have 10,000 fewer deaths per year. In other words, not 1700 as is associated with the air bag over a 10 year period, but 10,000 per year. We want to save everybody.

MR. SWEEDLER: I think everyone certainly agrees here that a lot of energy needs to be put into increasing seat belt use.

MS. STONE: Safety belt use.

MR. SWEEDLER: And we will be discussing this in a later panel.

DR. EVANS: Many safety measures are vastly more effective than this device and other nations focus on them. We have had an obsession with this device.

MR. SWEEDLER: But just to follow up on that question that Judie Stone asked, Dr. Graham, could you give us any insights into how we might be able to change societal attitudes about belt use and we might go about increasing belt use?

DR. GRAHAM: The first thing I would like to do is—as, I think about Judie Stone's question, there's a very profound analogy that has to be made in the history of public health. If you go back to one of the biggest success stories we had, which was chlorination of drinking water, there were a lot of people at the time who said, well these people, they don't cook their food properly, they don't boil the water. These people deserve the fates that they have. And basically, the public health community and really the sanitary engineering community said, we're not going to let that stop us. We're going to chlorinate the drinking water. And I think now in retrospect, we realize that that was a massive success story.

I don't think we want to have too much emphasis, as I think Leonard is trying to do, in making culpability judgments on these people broke this law, unbelted law, and these people were drunk.

I thought this was best stated in the first panel actually—no, in this first day by Helen Petrauskas. She said, if we cannot move forward on all of these points at the same time and we have to set some priorities, then why not, since we're designing cars for 15 or 20 years from now and hopefully belt use rates will be higher, why not optimize to the belted occupant. And I think that's a reasonable kind of approach.

DR. EVANS: If I could, just a comment on that. We got into air bags because it was a safety—it was a passive device like chlorinating the water. Never in the history of safety devices has there ever been a less passive device. The act of safety belt is a more passive device than the air bag. The user has to do only one thing and know only one thing, fasten the belt.

The air bag now has a book of rules that you would almost need a college degree to follow. And every day, there is a new one. Even the experts at this panel could probably not tell you all the things that the public have been told they're supposed to do, and a mother.

MR. SWEEDLER: Let's move on. This is a panel that is talking about the effectiveness of air bags. Let's move on. Judie, do you have any additional questions?

MS. STONE: Yes, I have one last question for Dr. Graham. The study which you are talking about today is still in draft form and has not been published, has not been peer reviewed, may not be cited, and is not available for review by other researchers. Is the public release of your study on national television an accepted practice in your profession?

DR. GRAHAM: Good tough question. Actually, my intention was to come to this meeting as a technical meeting, thinking that this would be a panel of experts, and that I would have had the opportunity to lay out some of the methods and results. That is, I do have copies for technically-oriented people who would like to give us comments.

In the prepared statement, you'll notice that I did, in fact, ask for comments by May 1st from people who are interested, so we can make revisions, et cetera. So, that's the way I thought we were approaching the issue. But I certainly would agree with you, it could have been handled elegantly.

MR. SWEEDLER: Okay. Could we move to table 3?

MR. TERRY: Tom Terry with General Motors. Getting back to the effectiveness estimates, which I think is the subject of this panel, the industry and NHTSA are going into depowering with a little bit of a different view on what the effectiveness of depowered bags may ultimately result in. And I would like to ask each panelist if they have a hypothesis on what the effect of depowering will have, based on whatever methodologies you use, and a corollary to that is, what type of data collection analysis system will you use to support that hypothesis? So one by each.

DR. GRAHAM: Let me respond, Tom. I think that if you're going to look and try to see what effectiveness you're going to have from a depowered bag, I certainly do not think that we're going to have an answer to that any time soon with mass accident data of the sort that we have in FARS.

It seems to me that if you're going to get some timely feedback on that, it will be more of a clinical sort of an assessment that you'll have by way of data that are collected individually.

I don't think we're going to be talking about running statistics of the sort that are used in double paired comparison method, at least in the short run, to try to see that kind of difference.

MR. SWEEDLER: Dr. Ferguson?

DR. FERGUSON: Yes, I would agree with that. I made the comment earlier, I guess, in response to George Parker, that certainly in the short-term quantitative analyses are not going to be possible, but more of a qualitative analysis, such as Dr. Graham has talked about. But certainly the kinds of analyses that we've done, while it's not very easy to tell what the effect would be of depowered bags before that happens, because you don't know how much depowering is going to go on and there's no real way to look at the databases we have now and say, okay, well, I can see this level of injury, and if I have a less powerful bag, it should translate to this level of injury.

I think that the studies that we have done do suggest that there will be some considerable benefits for the unbelted people for whom apparently aggressive bags currently are designed.

MR. TERRY: Dr. Kahane?

DR. KAHANE: One thing that might help speed this process to a partial answer is there has been some variation among the air bags that are currently on the roads in terms of their aggressive power, however you want to measure it. You already could do a study if you had parameters, you could try to relate effectiveness to some of these parameters for instance, as we did in our evaluation of correlation between NCAP scores and fatality risk in actual crashes.

MR. SWEEDLER: Tom, any other questions?

MR. TERRY: Yes. This is for Dr. Ferguson. The insurance industry has really been a significant participant in the past and currently influencing motor vehicle safety. But we heard earlier that while you had large amounts of data, that data really aren't useful, particularly, for the types of analysis that we would like to have done. With your continued interest in safety, do you believe that the insurance companies will ever shift and perhaps change the types of information that they collect in order to provide the general public with that type of data that we're all seeking?

DR. FERGUSON: Well, I do have to say first and foremost, that I don't speak on behalf of the insurance companies, and I have no way of knowing what their internal policies will dictate in the future. I do know that they do, obviously, try to sponsor studies that will help us to examine some of these issues.

And I want to point out that there was an announcement made of a study with State Farm and the Children's Hospital of Philadelphia, where they're going to sponsor a large study. They're going to provide information on children who are in motor vehicle crashes, so that follow ups can be done with them. But certainly that tends to be the kind of study that is best done with these data, sort of a notification type of system. I don't know in the future what insurance companies plan to do.

MR. TERRY: Thank you. A question for John Graham. What did you use as a cost for your driver and passenger air bags, and where did you get the dollars?

DR. GRAHAM: Yes, this may take me a moment or two to actually get to the right table, but these are estimates from a tear-down study that NHTSA did several years ago. For the driver only bag, we're using a 278 number per vehicle. And then the incremental cost of the passenger side, we're using a 132 number.

And what that means is that all the costs of the sensors is assigned to the driver bag. So, we're being pretty fair to the passenger bag, because an accountant might want to allocate part of those sensors to the passenger bag. But from an incremental cost point of view, I think it's clear that the lower numbers should be on the passenger bag.

I would appreciate comments from various people who have information on the actual marginal cost of the current passenger and driver side air bag systems, so that we can refine these numbers.

DR. KAHANE: These cost numbers come from a study in my division and are available to the public.

MR. TERRY: Thank you. Finally, to Dr. Evans, in your opinion, are the high speed crashes the type which are producing the serious injuries? Are they typified by the barrier collision that, in fact, the manufacturers are using in their compliance techniques? Or do you think there are other crashes that would be more representative, say, as typified by the generic sled pulse which is now allowed in the standard?

DR. EVANS: Well, Tom, as you're aware, crashes come in an almost endless variety of forms and severities. I don't think any one crash test can realistically represent the future experience of a vehicle in the field. There has been very little correlation shown between the numbers in barrier crash tests and the experience of vehicles in the field.

The one physical factor that absolutely overwhelms experience in the field is the mass of the vehicle. The smallest change in mass makes a vastly greater difference than any difference in HIC numbers in a barrier crash test. And, of course, the smallest difference in mass makes a much larger difference in occupant protection than any effectiveness of an air bag.

MR. TERRY: Thank you. That's all the questions we have.

MR. SWEEDLER: Table 2.

MR. VOS: Tom Vos, AORC. It seems like a lot of people at our table and others, as well, have been considering these effectiveness calculations and trying to contemplate what might be the effects of behavioral or future changes in the systems. And recognizing that a lot of these are somewhat new concepts, it's unlikely that we've gone through the process already, but would anyone on the panel care to address—would they anticipate them to be large or small shifts in effectiveness for such things as the inclusion of the manual turn-off switches where you would be subtracting from the fatality side of the equation.

Of these various types of changes in feature or behavior, would you feel that each of these would represent a small or a major change in the effectiveness of air bags?

DR. GRAHAM: Just a quick comment. I think it's clear that if we could for new vehicles at a relatively low cost do something to the passenger side bag that would virtually eliminate the risk for children, you have a potentially very promising innovation from a standpoint of cost-effectiveness. Because as you can tell from the numbers I have given you, that those children and those 75 years of life that we're subtracting away from the lives that are saved, they're having a big impact on that calculation.

So, I think that—and I'm not close enough to a technological development to know exactly what's feasible. But that kind of innovation clearly needs to be looked at very intensively. But then there's the existing cars, there's the 30 million out there. They're probably two model years more in the pipeline. And this is where I disagree a little bit with Leonard, which is that we're not going into this de novo. Would we have required kids to sit in the rear seat if we had done this in the beginning? Well, maybe or maybe not. But now we've got these cars out there and we're going to have more going out there.

I think under those circumstances, we have to perhaps alter our standards of what would be moral purity here and say that we're going to have to tell some parents they've got to have these kids in the back seat.

So, I think we have to work on both fronts. And I think it can have a big impact on the cost effectiveness.

MR. VOS: Leonard?

DR. EVANS: Yeah, I'm glad that the question of behavioral change cropped up. And maybe if the Chairman would allow me a slightly extended comment, because I have a couple of overheads if we could—

DR. EVANS: I think this is very fundamental. it's amazing, how the assumption that this device does the things claimed for it. I had earlier said that I did not accept the 1700 figure. And somehow nobody was interested. It would seem to me that's a fairly strong statement.

Could I have the fifth overhead?

(Slide 5 shown.)

DR. EVANS: Here I want to quote something I've written, because when you write something, you devote more careful attention to it, especially when it's the last two sentences of a major chapter. I write "in principle, it is almost certain that users respond in some degree to just about everything of which they are aware. Empirical studies can never show no user response, but only that user response is less than some amount."

And let me just illustrate that with a hypothetical construct. If you could imagine two vehicles identical in all handling and other characteristics, except for a very important difference. And that is, one of the vehicles was such that an occupant could not possibly be hurt in it, so perfect was this occupant protection, whereas the other vehicle was wired with dynamite to explode at the first minor crash. Almost everybody agrees these vehicles would be driven differently.

Now, the air bag represents a little piece of this spectrum. There is a claim that the risk of being hurt is less and the public perception is that it's much less. When I wrote that, there was no empirical evidence. But if I could have the next overhead—and by the way, I have copies of these overheads available for anybody who would like them.

(Slide 6 shown.)

DR. EVANS: There was a recent study from the Netherlands. I just quote what I wrote about it, because here I was addressing claims that occur recursively that even safety belt laws don't produce any benefit, because the users change their behavior in a way to negate the benefit. And I was sort of contouring that with this comment. I never had air bags in mind at the time.

He reports that in a test crash experiment, drivers were estimated to increase their speed by about 1 percent. This would lead to a fatality risk increase of about 4 percent. Now, when you've got a safety belt that is 42 percent effective and you chop off 4 percent, the costs of a driver behavior change, because of perceived greater protection, that really doesn't compromise the overall effectiveness of the device.

But for an air bag, when you just start with 9 percent and you chop off about half of it—and it's a very uncertain estimate, because that could be more than half—suddenly your effectiveness estimates are highly in question. In other words, they could be much lower than you imagine. In fact, they could even be negative.

There's a lot of uncertainty here. But what is not uncertain is the question of drivers responding in some way to the safety equipment that is in their vehicles. That's almost the definition of human intelligence, that we react to what we think are our circumstances.

MR. SWEEDLER: Okay.

DR. FERGUSON: If I might add something. I don't think that the data are quite as definitive as Leonard makes out in terms of equipment like safety belts leading to increased risky behavior. In fact, I'm not aware of any evidence that air bags lead to increased risky behavior.

And if that were the case, by the way, Leonard, now that everybody is aware of the risks, then one must assume that their behavior is going to go in the direction that we would all want.

DR. GRAHAM: If we just scare them enough.

DR. FERGUSON: If we scare them enough.

(General laughter.)

DR. FERGUSON: That from now on people will do the right thing.

DR. EVANS: Anecdotal, many people have told me they are driving more carefully, because they're frightened their air bag is going to kill them.

MR. SWEEDLER: So, your message is getting out. Do you have any additional questions?

MR. VOS: Just two short ones. We talk about 42 percent or that range for seat belt effectiveness. What, in your opinion, would be the impact of expanding the definition of an air bag system to include side impact, where now we're looking at some degree of side impact and rollover protection of an air bag system?

MR. SWEEDLER: Who are you referring that to?

MR. VOS: I guess, Dr. Graham.

DR. GRAHAM: I don't feel qualified to comment on side impact air bags.

MR. VOS: Is there anyone in the panel that could? Dr. Kahane, do you have any thoughts on that?

DR. KAHANE: No.

MR. VOS: Okay.

DR. EVANS: I'm not qualified, but there's a lot of history in this—

(General laughter.)

DR. EVANS: And the opportunities in frontal are far, far greater than in side, and now we're looking at 9 percent.

MR. SWEEDLER: We're talking about the same. Do you have any additional questions?

MR. VOS: Just one last question. And that is, in Dr. Graham's analysis, we're talking about air bag effectiveness or cost effectiveness, and we looked at the fatalities as the data base. If you look at the injury shift, injury shift such as quoted by Libertini and others, and expanded that data to include the societal costs from injury, would that have a fairly substantial change to your analysis?

MR. GRAHAM: Yes, that's a good question. What we've done in the analysis is include assumptions about the effectiveness of driver side and passenger air bags in reducing non-fatal injuries in the AIS 3 to 5 range. And we also include estimates of how much hospital costs and long-term rehabilitation there would be for people who would suffer those kinds of injuries.

However, I think that the particular numbers that we're using for effectiveness and for costs need to be scrutinized, and I'm hoping that we'll get some comments from people on those specific numbers.

MR. VOS: Thank you. No further questions.

MR. SWEEDLER: Okay. Don.

MR. BISCHOFF: Thank you. Don Bischoff, NHTSA. A question for Dr. Graham. Several people have asked about what the cost effectiveness of passenger side air bag might look like if we could get the children in the back seat or if we could develop advanced air bags which would do no harm to children. If I'm looking at your paper correctly here, at the bottom of the second page, I think you've calculated the children in the rear seat to be a $104,000 per QAL [quality adjusted life]. That's not all that different than the $70,000 calculated for the drivers. I would just point that out.

And we're all—everyone in this room is working very hard, of course, towards trying to get the children in the back and improve the performance of air bags. Is that kind of a number more in line with the other public health interventions that you had talked about before?

DR. GRAHAM: I think it would make a lot of people—and certainly make me a lot more comfortable. And I think that that's really the kind of direction that I would like to see some energy put in. But I have to add that in my own judgment, based upon the experience with behavior change approaches in this field, we're going to need more than education, more than a public relations effort.

I do think you're going to need a legal requirement that all children under a specified age sit in the rear seat or alternatively, perhaps a law that refers to the height of the child as opposed to their age. I think that's also worthy of some consideration. But I think we have to do that or I think we really have to question what we're doing in the passenger side protection.

MR. BISCHOFF: I have no further questions.

MR. SWEEDLER: Okay. Joe.

MR. OSTERMAN: I have just two. I know that Dr. Ellingstad has some questions about the figures that NHTSA came up with. Dr. Kahane, you had based your lives saved estimate on the FARS data. Is that correct?

DR. KAHANE: That's correct, yes.

MR. OSTERMAN: Okay. How accurate is the information from FARS?

DR. KAHANE: The confidence—now this is the confidence bounds on the effectiveness, the 90 percent confidence bounds are 7 to 15 percent fatality reduction. And the confidence bounds on the number of lives saved through 1995 where the point estimate was 1136, those confidence bounds were 692 to 1622. You could use a similar proportion, the width of the confidence bounds relative to the width of the point estimate to that 1700 that's there now, because it's based on the same effectiveness numbers.

MR. OSTERMAN: Okay. You have calculated the effectiveness of air bags in saving lives. I presume that your office has done the same for seat belts and other safety devices. Is that correct?

DR. KAHANE: Not recently, no.

MR. OSTERMAN: No. Would it be feasible to also calculate—we heard several times today, a total system, total occupant restraint system kind of calculation for all these devices together. Would that be useful, do you think, for the people, the American public, to make that total system kind of a calculation and could you do it?

DR. KAHANE: What system are you talking about?

MR. OSTERMAN: Well, seat belts, collapsible steering columns, air bags, all the safety devices that have been designed into the automobiles recently. We've heard for the last several days, the belief that a philosophical change needs to be made and that people need to look not only at air bags or only at other devices, but at the whole system as an occupant protection system. Could you do that, do you think?

DR. KAHANE: Do what?

MR. OSTERMAN: Do a calculation about how effective the occupant restraint systems—

DR. KAHANE: Do a calculation of, let's say, the lives saved by various safety devices?

MR. OSTERMAN: In combination, yes.

DR. KAHANE: Yes, we have evaluated most of the safety devices in the car.

MR. OSTERMAN: Have you done it—you've done it independently, though, each device alone, or have you done it collectively?

DR. KAHANE: It's the same thing. I mean, because one after the other.

MR. OSTERMAN: Okay.

DR. GRAHAM: Could I see if I could ask that question in a slightly different way, to try to get at the same sort of thing? Is the question, what is the benefit of both a lap belt and a three point belt, plus the air bag compared to no belt, no air bag at all? But perhaps that's what you're trying to get at.

DR. KAHANE: The two together are 50 percent fatality reduction. However, if you add in these various other passive standards, such as energy absorbing steering columns and so forth, side door beams, if you used all of those relative to the type of safety you have in the early 1960s, it would be above 50 percent reduction for the person who wears the safety belt. Of course, the safety belt accounts for a very large part of the fatality reduction.

MR. OSTERMAN: Okay. Thank you. The crux of my question was this philosophical change that needs to be made that Dr. Graham had talked about and some others, trying to get them away from the population about just thinking about air bags or just seat belts or just some other device. Thanks.

MR. SWEEDLER: Mr. Arena?

MR. ARENA: Dr. Graham, we keep hearing what we need to do in this country with seat belt use, but do we really understand the problem? Is there any good survey material that tells us why nearly one-third of our population chooses not to buckle up?

DR. GRAHAM: Well, let me first say that I think it's an excellent question, and I think that actually the number really should be considered higher than that. I'm very concerned that the numbers we're using about belt use in the United States are not a fair reflection of what is happening in serious crash situations where people might get serious injuries or fatalities. I think that number is down closer to a half, but reasonable people could disagree on what that number is like.

There's a big literature out there. I don't know that it would serve much function for me trying to summarize it right now. But I think what we do know is that the belt usage rate responds to police enforcement in conjunction with primary enforcement legislation and very visible educational efforts. We have a huge body of evidence in the scientific literature that says that.

But a hard part for me is that how do we motivate our elected officials who have constituents not only like me, but like Leonard—okay, who doesn't want the prescription, the legal requirement coming from the Government. How do we motivate elected officials to take the kinds of steps that are required? And I don't have a good answer for that.

DR. EVANS: John, I'm sure you know, I've written many times in support of safety belt laws. I'm in favor of Government interventions when there are effective countermeasures. Our belt use is just where Canada's belt use was at the same after introducing mandatory laws.

MR. ARENA: Hearing no further answer to my question, I'll defer to Chairman Sweedler.

MR. SWEEDLER: Dr. Ellingstad?

DR. ELLINGSTAD: I would like to ask a few questions basically about the sufficiency of the data that you're basing these estimates of effectiveness on. It's my understanding that virtually every index of effect that we've been talking about here is based on FARS data. Is that correct, Dr. Kahane, Dr. Ferguson?

DR. FERGUSON: That's correct.

DR. EVANS: Mine was a calculation. My estimate was a calculation based on some intuitive assumptions about the air bag work that was made before data were available.

DR. ELLINGSTAD: Okay. That's fine. But in terms of empirical data that have been collected, primarily we're dealing with FARS as the data sets, not NASS—

MR. GRAHAM: Are you talking just fatalities?

DR. ELLINGSTAD: Well, I'm talking about the estimates of effect that we've been hearing. And I think Dr. Kahane was asked whether there were estimates of effect couched in terms of injury rather than fatality.

DR. GRAHAM: Right. There are two things that we should be aware of—and I think someone mentioned on the panel, there's some very interesting work in Canada that is being circulated, that I think that you should have it if you don't have. I believe it's on non-fatal injury, not just on fatality.

DR. EVANS: That's correct.

DR. GRAHAM: And I did see as a third report to Congress, there is some analysis of the NASS data on non-fatal injury. But when I read that, it was pretty puzzling. I mean, it had lots of unexpected things in it. So, I think we're going to have to wait a while to get something definitive.

DR. ELLINGSTAD: Part of the points of the question that I'll get to here are, are we doing a sufficient amount of work in addressing those kinds of things? But with respect to the contrasts that have been made between air bag equipped and cars without air bag equipment, what kind of vulnerabilities in these assessment do we have? What sort of threats to validity or confounding results? Are you comparing, for example, new cars and old cars? And are there characteristics of the air bag equipped cars, other than the air bags that may be accounting for some of that variation?

DR. FERGUSON: I can answer that in part. There are always threats when you compare two groups of vehicles one to the another. And certainly some of the earlier analyses that were done tended to compare vehicles with manual belts with, let's say, all vehicles with air bags, because there just wasn't enough data. And that's true, probably, for the initial analyses that are being done with passenger air bags right now. But as more data come in, you can have more control on the data.

For example, some of our later analyses looked at, for example, matching vehicles. So you would take a make model that had a manual belt and then you would only look at the same model that the only thing that was different, there were no platform—no major design changes. All that had changed really was that it now has an air bag.

So you try and control for some of those vehicle features in choosing the make and models that you compare. That's one way you can do it. Another way that you can do it, obviously, you make the point that the vehicles that you're comparing the manual belt vehicles, for example, are always going to be older than the air bag vehicles. So, again, you have to take account of vehicle age.

Sometimes you can do it by modeling, what we have done typically when we looked at our data by rate of vehicle registrations. What we have done, for example, is take the last year of the manual belt version with the first year of the air bag version and to control even further for that, just say compare only models where there was no more than two years between those design changes.

Another factor that you might want to control for is belt use, because we know belt use has been increasing and that could be a factor. So, one of the ways that we did that was to look at experience only in calendar years after the air bag was in the vehicle. So, again, that's some kind of a control for that.

Dr. Kahane may want to comment on ways that he's also done that. But I think that even doing all of those things, we still see benefits for driver air bags.

DR. KAHANE: I used exactly the same methods for all practical purposes.

DR. ELLINGSTAD: Dr. Kahane, are most of these comparisons you have been using characteristics of the vehicle you've determined whether the car was equipped with a bag from the VIN number, et cetera, does this data source and do these methods give you adequate tools to answer effectiveness questions when we start introducing selective modifications, such as deactivating air bags at the owner's request or using cut-off switches?

DR. KAHANE: I don't think FARS is going to tell us. And by the way, we're going to have an evaluation plan for all of these measures to improve air bags. And we're real interested in all these issues, if there should be a deactivation possibility, how many people would do it. If there are cut-off switches, how many people use them and so on. We're interested in that.

As far as seeing that in the FARS data, I don't think it's going to be there. So, we're going to have to look at say deactivation. I believe we're going to have to look at the survey data and if, let's say, they show 1 percent of the public deactivates their air bags, that's going to be like possibly a 1 percent loss in effectiveness, obviously. If it's a specific 1 percent of the public, why that could be different.

DR. ELLINGSTAD: Are we going to be able to track these changes? Let me ask Dr. Griffin, both with respect to these kinds of things that we're talking about right now and perhaps as importantly when we start talking about advanced air bags, where there's conditional activation?

DR. GRIFFIN: When you start talking about some of the things about actions that could be taken now, I doubt that it's going to be easy to get the data in the FARS. But I think the point Chuck is making is that the statistical power is not going to be there, to look at something that is going to be a relatively small number.

So I think that even if the data were available through FARS, which are basically police level data—let's not lose sight of that fact. These are data that are provided by the states to NHTSA basically from the data form with supplemental information collected by people in the state capitals. So how reliable that information is, how accurate that is, varies from state to state and from variable to variable within the data set. But I think that it's probably not in the cards that we're going to see a lot of evaluations done on some of these enhancements to existing air bags with the FARS data.

DR. FERGUSON: Might I just add something? Currently, as Dr. Kahane mentioned, we determine whether a vehicle has an air bag or not based on the vehicle identification number. We will still have vehicle identification numbers. So, presumably, if the manufacturers will tell us what make models have what changes, we know make models and model years from the vehicle identification number. That is one way in which we could identify and make those comparisons, I believe.

DR. KAHANE: Right. That's for the depowering, analysis of depowering. As I said, our best allies in that, I believe, is if we can get information also for some years back, if some air bags are more powerful, and this can be defined through the vehicle identification number, we should be able to do comparative analysis of air bag effectiveness in these different makes and models. If the differences are substantial, we'll see them. If they are in the order of a few percent, there's no hope for it.

DR. ELLINGSTAD: One of the things I'm trying to drive at is do we have sufficient tools with respect to data methods, et cetera. Should we do be doing more in terms of collecting either the same kinds of data or different kinds of data to position ourselves to be able to empirically determine whether these policy changes that we're making work or not?

DR. KAHANE: I think we have or can get the data needed to evaluate most of these changes that are being talked about now. I mean cut-off switches, depowered bags. And then a very important statistic that we've got to be tracking is the percentage of children that are in the back seat.

Now, I wanted to just say something about that. You know, we always talk about children in the back seat. The truth of the matter is at all ages, you're safer in the back seat without an air bag than in the front seat with an air bag. It's just that most people don't want to ride like in the taxi cab, so we don't really recommend it at higher ages. And it's also pretty hard to drive from the back seat.

(General laughter.)

DR. KAHANE: But we will try to have observation surveys on belt use and on ridership in the front and back seats and in the vehicles equipped with cut-off devices, the extent to which these cut-off switches are used and not used, depending on who is sitting there.

I think with those things together, we should be able to evaluate most of these changes. However, not that quickly in the case of some them.

DR. GRAHAM: Just a quick addition. There are in the tradition of epidemiology, a variety of a diet—diary studies that are done of people's eating habits and of the exposures that workers have to various types of contaminants in the work place.

I think if we're serious as a country about putting manual cut-off switches on vehicles, a condition of that kind of activity should be participation by the owner—or at least in a random sample of those people, some kind of study that documents systematically how they are using the on-off switch. I think that there's a methodology with a certain degree of validity where you could actually get accurate information from people in those circumstances, if they're willing to participate.

So, I don't think we should talk about evaluation just in terms of fatalities and injuries, but we need data to understand how people actually use those kinds of on-off switches.

DR. ELLINGSTAD: Thank you.

MR. SWEEDLER: I would like to, as Chairman Hall has done, give each of the panel members a chance to have some final thoughts or comments. Dr. Kahane?

DR. KAHANE: Yes. I'm reminded of a story of a place where they were going to have a big flood. And this man sat in this house and said, you know, I'm not going to do anything about this flood, because a miracle will be done for me that will save me from the flood. Then after a few hours, the water is coming up and some people come by in a motor boat and they say, would you like to come with us? He says, no, I'm staying here, because, you know, a miracle will be done for me to save me from this flood. And then a few hours after that, these people come by in their helicopter and they say would you like to ride with us? He says, no, a miracle will be done.

Well, anyway, he drowns and he comes up and he says, hey, I've been cheated. I said I wanted a miracle done for me and where was the miracle? And so the answer was, hey, I sent you the power boat and the helicopter, didn't I?

(General laughter.)

DR. KAHANE: I heard a lot said today about, oh, if we only had the data back then. We had a lot of the data, you know. The first child fatality with an air bag was in 1974. Also the first out-of-position adult fatality at relatively slow speeds. Also the first elderly person with those caused injuries was in that year.

Part of the problem is not in having the data, but interpreting it. This is something that we all need to work on, to try to understand from the data that we already have, what is going on.

MR. SWEEDLER: Thank you. Dr. Griffin?

DR. GRIFFIN: I would tell a story, not quite the same as Chucks. I'm reminded of a comment that John Nunnally, a late psychometrician, once said. Not only was he a man who worked a whole lot in quasi experimental designs, methodologies, he realized that, as B.J. Campbell reminds me, if the world's problems are going to be solved with white rats, they would have been solved long ago.

There's a lot of things we have to get out in the real world and bring in methodologies to try to come up with some of these answers. We're trying to come up with indices, numbers, levels that would suggest to reasonable people what the effectiveness of these particular devices might be. As we have seen this morning, the data, the differences in methodology, the differences in approach can have a bearing on that. We're not as far along as we would like to be.

MR. SWEEDLER: Okay. Dr. Graham?

DR. GRAHAM: Just a quick comment. On the child seating law concept, I do think that there's a special justification for it, as it applies to children. I wouldn't be advocating it for all passengers. That is because when there's an air bag in the passenger side and if a child's feet can't get down to the floor, during pre-crash braking, it's not as easy for a child to prevent themselves from sliding forward into the deployment range, particularly if they're unbelted. Whereas, for an adult who's tall enough and their feet can help them brace, they can reduce the amount of forward movement into the deployment zone.

So, I think given that we have these kinds of vehicles out there and we're going to have a lot more of them out there, we may want to take that extra step to make sure children, at least, are in the back seat.

MR. SWEEDLER: Thank you. Dr. Ferguson?

DR. FERGUSON: I believe this panel is about effectiveness and I do believe that certainly as far as driver air bags go, driver air bags do save lives. I would like to remind people of that. And I would like to remind them that as long as they do the right thing, such as put children in the back and in the case of short women, sit well away from the steering wheel, I believe that air bags can continue to provide the benefits that we expect of them.

MR. SWEEDLER: Dr. Evans?

DR. EVANS: Well, first let me reiterate the comment I made earlier that all of the things I've said here are my own personal views, based, hopefully, with some additional illumination from 30 years experience in this subject and my professional activities. I know many, many colleagues, in many countries, in many institutions, and I believe the group assembled here would be shocked to know how many of those colleagues do not want an air bag in their personal car, because of the risk it poses to short members of their family.

If I could just react very quickly to Susan's comment. The advice we keep hearing that short women should not sit where they wish to sit, which for some their vision out of the windshield will be reduced and from which they have a less chance of reaching the brakes, seems to me rather extraordinary safety advice. It seems to me from a personal perspective, what I would like our nation to do is to receive better benefit from the marketplace. There are clearly large categories of people that evidence indicates are at increased risk by having this device in their car. They should not be compelled to purchase an object that increases the risk that they will be killed.

The interaction between what customers want and what the market provides, I think is a much better way to go. Clearly the optimum benefits from this device will result if the people whom it helps purchase it and the people whom it hurts do not purchase it. That would be the optimum solution. That will increase the effectiveness. This seems something that ought to be on the table instead of the presumption, that we're basically on the right track—

MR. SWEEDLER: Thank you.

DR. EVANS: —and we've just got to keep fine tuning.

MR. SWEEDLER: Thank you. I don't think anyone is saying that short statured women should sit in the position that they're not comfortable in in their driving habits?

DR. EVANS: They're already sitting in the position that they're comfortable and they're being told to sit in a different one.

MR. SWEEDLER: But that's another thing. Again, I would like to thank the panelists. I think this was maybe the most provocative of the panels we had. I think we had a good debate and gained some insights. But let's take a break for lunch and let's come back at 2:45. Thank you.

(Whereupon, a luncheon recess was taken.)

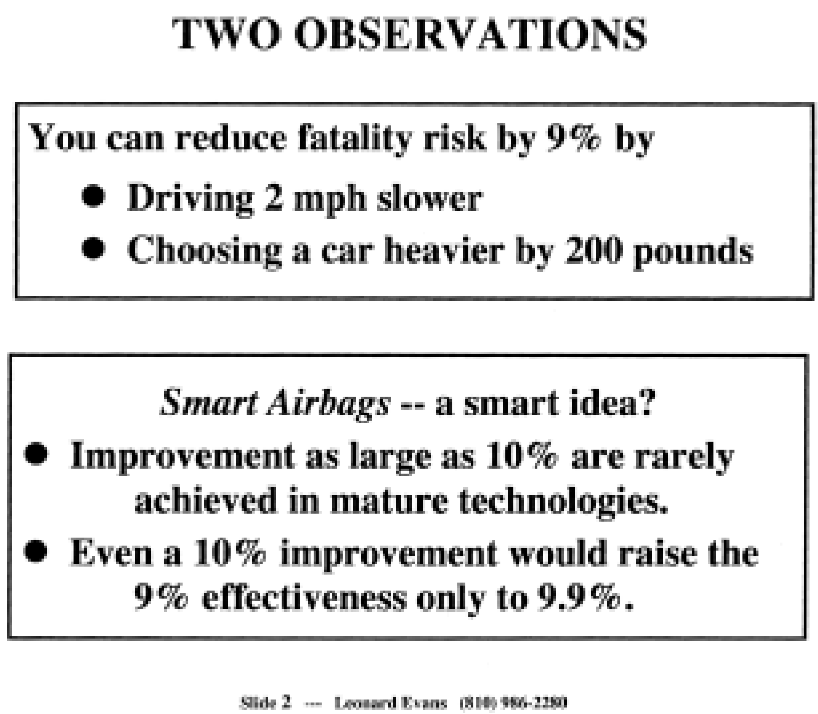
Effectiveness of air bags in reducing fatality risk to BELTED* drivers
(*driving unbelted is illegal in all states except Maine and New Hampshire)

Author(s)	*Year*	*Effectiveness*
Leonard Evans	1990	9 %
Zador & Ciccone	1993	9 %
Charles Kahane	1996	9 %

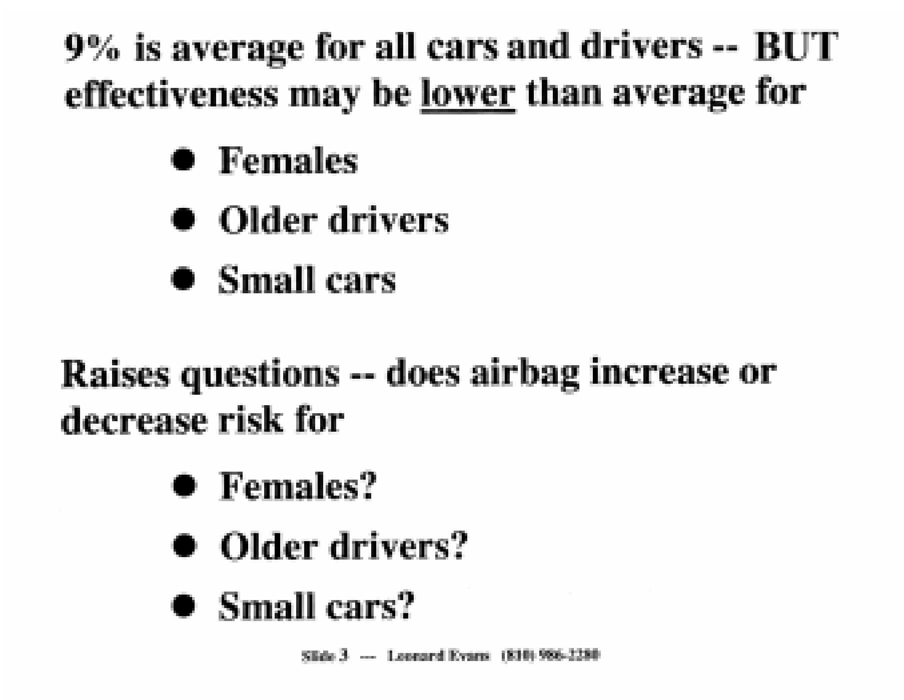
To interpret 9% effectiveness, think of 100 drivers killed in cars without airbags. If the cars had airbags (everything else the same), then 9 of the drivers would survive, but 91 would still die.

Slide 1 — Leonard Evans (810) 986-2280

Slide 1. (From Dr. Evans's presentation, March 19, 1997.)



Slide 2. (From Dr. Evans's presentation, March 19, 1997.)



Slide 3. (From Dr. Evans's presentation, March 19, 1997.)

Claim of 1700 lives saved since 1986

But, estimates not published of net lives saved (taken) of occupants who were:-

- **Belted**
- **Female**
- **Older**
- **Alcohol-free**

A count of total occupants killed in crashes in which airbags deployed since 1986 should be published for same categories.

*

- **Over 400,000 traffic fatalities in this time period.**
- **Fuel economy standards that led to lighter cars have taken far more lives than airbags have saved.**

Slide 4 --- Leonard Evans (810) 986-2280

Slide 4. (From Dr. Evans's presentation, March 19, 1997.)

Does airbag change driver behavior?

"In principle, it is almost certain that users respond in some degree to just about everything of which they are aware. Empirical studies can never show no user response, but only that user response is less than some amount."

Last two sentences of Chapter 11 "User Responses To Changes In Traffic Systems", ***Traffic Safety and the Driver, p. 306***

Slide 5 -- Leonard Evans (810) 986-2280

Slide 5. (From Dr. Evans's presentation, March 19, 1997.)

Observed behavior response to driver protection

"Janssen (1994) reports that drivers putting on belts increased their speed by about 1% in a test track experiment. Such a change observed under experimental conditions applied to actual driving is estimated (Evans 1991, p 153-4) to increase crash risk by about 1%, occupant injury risk by about 2%, and occupant **fatality risk by about 4%**. While such changes would reduce the safety benefits from mandatory laws, the effect is small compared to the fatality and injury reducing effectiveness of the belts."

Quoted from:

Leonard Evans ***Traffic safety measures, driver behavior responses, and surprising outcomes.*** **Journal of Traffic Medicine** 24:5-15;1996. (Text of 5th Westminster Lecture, Parliamentary Advisory Council for Transport Safety, London, Dec. 1994)

Slide 6 -- Leonard Evans (810) 986-2280

Slide 6. (From Dr. Evans's presentation, March 19, 1997.)

Afternoon Session

(Time Noted: 2:45 p.m.)

Panel 3

Enforcement of Restraint Laws and Need for Primary Laws

MR. SWEEDLER: On the record. Can we all take our seats and we will reconvene this forum on air bags and child passenger safety. This afternoon, our panel will be discussing enforcement of restraint Laws and need for primary laws.

Frank Ghiorsi will be handling the questioning from the staff. Frank, I would like to turn it over to you to introduce our panelists.

MR. GHIORSI: Yes. Good afternoon. I would like to have the panel introduce themselves and give their affiliation. Starting with Senator Cullerton.

MR. CULLERTON: Yes. My name is John Cullerton. I'm a State Senator from Illinois. My district is the north side of the Chicago. And I have been in the Illinois General Assembly—I'm starting my 19th year. I was a sponsor of our seat belt law, and our child passenger protection act.

MS. DEWEY: My name is Janet Dewey. I'm the Executive Director of the Air Bag Safety Campaign. I have been involved in safety activities, education, legislation, and enforcement activities at the state level and now the local level—excuse me, at the national level for several years, and worked in a state where we were successful in upgrading safety belt law.

MR. HOYT: My name is Tim Hoyt. I'm the Vice President of Safety for the Nationwide Insurance Enterprise and the Chairman of the Enforcement Committee of the Air Bag Safety Campaign.

MR. HURLEY: Chuck Hurley, Executive Director of Public Affairs, National Safety Council.

MAJOR PRICE: I'm Ralph Price with the North Carolina Highway Patrol, at the State for Zone Operation Enforcement.

MR. GHIORSI: We can't hear you.

MAJOR PRICE: I bring you greetings from our great state, North Carolina University and NC State University and Wake Forest and—

(General laughter.)

MAJOR PRICE: —I've watched 15 live games in the last 14 days. I'm worn out. Nice to be here.

(General laughter.)

MR. GHIORSI: Thank you very much. Major, in fact, I'm going to start the questioning with you. And we would like know a little more about the North Carolina Enforcement Program, the Click It or Ticket, since it's been credited with raising the usage rate—seat belt usage rate in North Carolina. Could you give us some background and describe the program?

MAJOR PRICE: If you have about four hours, I'll give you all of it.

(General laughter.)

MAJOR PRICE: Click It or Ticket really got off the ground in 1993 with the North Carolina Governor James Baxter Hunt and the cooperation of the Insurance Institute, NHTSA, some other private funding, the Governor's Highway Safety Program, the University of North Carolina Research Center. And the idea was to bring seat belt and child restraint usage up from about—I think it was about 60 percent at the time, to a respectable level.

We had had a primary seat belt law since about 1985, which was, I might add, not being enforced, not vigorously, anyway. And so the Governor's Highway Safety Program came up with Operation Buckle Up early on in 1991. Then it became Click It or Ticket, which is a really catchy type phrase.

And it started out with, of course, a lot of education within the communities, the school systems, and so forth, and the media blitzes. But the key to it was following up on it with enforcement. You can pay all the ads you want to pay and all the education you want to give, but if you don't get enforcement, you just don't get it.

And so the State Highway Patrol in conjunction with local sheriff's departments, local police departments, and local public safety departments started a series of checking stations. And when I say checking stations, checking driver's license, adult restraint usage, along with child restraint usage.

In the first year I think we had helped 3800 or close to 3900 checking stations in 1993 statewide. If you consider 365 days in a year, that's quite a few checking stations.

I might add, we did not do this alone. The Highway Patrol did not do it alone. We had an awful lot of help from local departments, as I described before. We put some of our people with some of their people, and built a relationship there. And we just wrote an awful lot of seat belt tickets. And we would back off for a short while, two or three months, come back with another media campaign, immediately reinforce that again with enforcement.

And by doing that over a period of three years, we found that when we backed off the enforcement end, the usage would drop, but not as drastically. Every time we came back with enforcement, it would drop a little again before we hit our next blitz, but not quite as bad.

So we've gone from about 60 to 65 percent usage now. The last survey was 83 percent and is running higher, of course, in some areas and lower in other areas. But statewide, we are about 83 percent right now. That data was collected by the University of North Carolina Research Center, which is an independent group, and we stand pretty firm on that data. We feel very comfortable with it.

MR. GHIORSI: [Inaudible.]

MR. OSTERMAN: If you could all speak up and right in front of the microphone, that will help.

MR. GHIORSI: I apologize. Major, when the program started, was it a funded program?

MAJOR PRICE: It was funded, but not for the Highway Patrol. We didn't receive any funding. Local departments and sheriff's departments and municipalities were, in fact, funded to provide off-duty officers, et cetera, et cetera, as an incentive to help with these checking stations, which is, as I've discussed earlier today with some folks in this room, caused quite a bit of grief amongst some of our people. This police department is getting paid to be out here, why aren't we? And there's a very simple answer to that. If you want to work for that police department on your day off, you sign for the Highway Patrol and go to work for them. But as long as you work for us, you're going to do what we say to do.

(General laughter.)

MAJOR PRICE: And so with that in mind, we got all that out of the way, they like it all of a sudden now. We haven't had that problem any more. As far as the amount of funding, I wouldn't even attempt to get involved in that. I don't know.

MR. GHIORSI: Okay. Major, what are the penalties?

MAJOR PRICE: As it stands today, for adult restraints, the violation is $25 civil fine. For a child restraint violation, it's the cost of court costs, which is $65 plus $25, $90. I think the important thing along that line is you run across—and we have numerous times run across a family with three or four children and either had one child restraint system or no child restraint systems, we don't give three or four tickets. We go ahead and give one ticket, state the name of that individual, and how many child restraint seats they need, and make those arrangements. We have a means—we have all kinds of resources to get child restraint systems.

MR. GHIORSI: Does the driver—is there any record made of the violation on the driver's license?

MAJOR PRICE: There is not at this time. We currently have a rule pending before our legislature that will raise that fine from $25 to $50. And in addition, assess two driver license points, which we hope will—we know will add some teeth into it, because when you talk driver's license points, you talk insurance points. When you talk insurance points, you talk money. And that's a three-year deal on insurance.

MR. GHIORSI: Was there any problem motivating the law enforcement officers to take this kind of police action where it's family related?

MAJOR PRICE: I think initially—when it first really got started, they really enjoyed it. But as time wore on, it got old, I'll be honest with you. We started in the summertime. It's awfully hot in North Carolina, in some parts of our state in August, in July and August. But as it went on and on, it kept getting better.

And I'll go ahead and say this, I'm going to say it before I leave today anyway. One thing we have learned out of this whole experience is we have—I think every agency and every state has a tendency to have their own domain and you don't touch my domain. If you're a city policeman, you don't want a ticket in my county. If you're a state trooper, you don't want a ticket in my city. And that's just turf battles. We overcame that. We worked through it.

And by working with these people for the last four years now, you get to know all these local people. And during Hurricane Fran this year, which absolutely devastated parts of our state, our Berry Island is all but gone, the far end of Raleigh is just—we'll be cleaning it up two years down the road. But when that disaster struck, we had no problem with coordination, who to contact. Everyone knows everyone else in other departments and it just made things go so much better, it's unbelievable.

So that has been a benefit we didn't—we never thought about, but it has helped us tremendously during the Hurricane Fran.

MR. GHIORSI: Has there been a reduction in the amount of traffic fatalities with the increased belt usage?

MAJOR PRICE: Yes, sir, we dropped—don't hold me to the exact number. I'd say about 100 last year or close to it.

MR. GHIORSI: What was that number, Major?

MAJOR PRICE: I'm sorry?

MR. GHIORSI: What was the number?

MAJOR PRICE: I think it was close to a 100—

MR. GHIORSI: Close to a 100.

MAJOR PRICE: —the previous year. I don't have the exact totals, but I think that's close. When I say statewide, it's hard to say, because we've maintained the data for the Highway Patrol only.

MR. OSTERMAN: How many traffic fatalities do you have in North Carolina every year?

MAJOR PRICE: The Highway Patrol last year had somewhere about close to 1500. And that goes back up into almost 30 years, that we were killing 2200 a year.

MR. HOYT: If I may, if you would just let me put up a chart here.

(Slide 1 shown.)

MR. HOYT: I think it will help what the Major is describing and will give you an idea of what's happened with fatal and serious injuries in North Carolina. This chart along the bottom gives the year from 1985 through 1996. It starts over there, pre-law with seat belt usage shown in the dotted figure. And the percentage of covered occupants—that's people that are covered by the North Carolina law, who receive fatal or serious injuries is the dark line.

The indications are that it would start out pre-law with seat belt usage down in the 25 to 30 percent range. When they first passed the law, they were writing warnings. You'll see it jumped up at that point at about a 42, 43 percent range. Then they began to write citations. It had an immediate bump that took them way up into the 80 percent or 70 some percent range.

Over time with the enforcement, it continued along, but dropped into the range of about 60 to 62 or 3 percent. When we started the Click It or Ticket campaign in mid 1993, seat belt usage was at 65 percent. The seat belt usage now, as the Major has indicated, is at 83 percent. The percentage of fatally injured and seriously injured persons in the State of North Carolina has dropped by 15.8 percent during the Click It or Ticket campaign. That is a tremendous drop.

If you look just at the raw figures, which they tell me I can't use, because they're not scientifically valid, you'll see that it dropped from something like 2.4 percent of covered occupants who received fatal or serious injuries, dropped down to about 1.3 or 1.4 percent. I can't use those figures. But if you make the estimation, you'll see that's a pretty significant drop. A significant change simply by doing high levels of enforcement.

MR. GHIORSI: Thank you very much. Major or anyone on the panel, do you see any obstacles in the way of any other state enforcement or county enforcement agency adopting this type of campaign?

MAJOR PRICE: As I stated earlier on, I think if you're going to find an obstacle, it will be the turf battle, not willing to give up or incorporate or get along with each other. And that, I think, is pretty much nationwide. I don't care, you've got to have the blessing from the top, from the Governor through the General Assembly right on down.

From the time we got into Click It or Ticket, Colonel Barefoot, who is now retired, was our colonel, and he was very supportive of it. I mean, that's the way our patrol has always been structured. If the colonel says do it, you're going to do it. And if you don't like it, you better not tell it. But we know we have made a difference in North Carolina.

And if the states are going to get into the seat belt laws, I would strongly suggest they go primary, as opposed to secondary. And I won't even open that can of worms, but I think if you don't have a primary law, you really don't have a very good law.

MR. GHIORSI: Mr. Hurley, do you have a follow up on that?

MR. HURLEY: I do. Frank, I think you may have asked one of the most important questions of the entire hearing. One of the goals I think everyone in this room, all the previous panelists have also shared, is to get this country to high levels of belt and child restraint use to the equivalent of what other countries have done, and certainly states like North Carolina, California, and other states here in the United States.

When North Carolina results started coming in in 1993 and '94, there was an unfortunate reaction, I think in other states, saying, of course North Carolina could do it. It was the money. They bought it. The Insurance Institute for Highway Safety, where I was at the time, has invested nearly $4.5 million for the five-year life of the program. That went in major areas to paid ads in the initial year and a half. And also for overtime for other than the Highway Patrol for the integrated enforcement that took place.

I think there was a perception, a false perception in other states, that the magic of the program was the money. And I would like to certainly state and ask the Major to comment that that was not the magic. The magic was leadership.

When the three pilot programs were done in Elizabeth City in the east and High Point in Piedmont and Haywood County in the west, they got their belt use rates to 80 percent, and that information was presented to the Governor. Tim [Hoyt] and I were there. The Governor leaned across his desk to Colonel Barefoot at the time and he said—I'm not going to get the accent right—he said, "Bob, I want you to go back and tell your people I am behind this program. And you tell them if they've got any comeback, I can take it." That is exactly what's missing in most states in the United States. The political permission for law enforcement to do their job in the most effective way.

Prior to Click It or Ticket, North Carolina had an excellent highway safety program, and for many years had an excellent highway safety program, and was giving 11,000 tickets a month from the Highway Patrol alone. The Click It or Ticket program really drew attention to that enforcement.

When the Click It or Ticket program was announced and it was announced by the Governor, the initial check point to launch the first round was held in front of Legislative Hall in the State Capitol. There was an announcement probably two weeks ahead of time saying, beginning on a certain date, there will be aggressive enforcement of the seat belt laws. Save yourself 25 bucks, buckle up.

The Governor wrote all elected officials in the state, all members of the State Assembly, the sheriffs—the elected sheriffs of North Carolina, the mayors, city councils telling them in advance of the program. To my knowledge, in four years, there has not been a single public statement by an elected official in North Carolina other than in support of this program.

The public support is in the 85 to 90 percent range, frequently measured by Insurance Institute public opinion surveys. But the magic was not the money. The magic was the leadership by the Governor. The Insurance Commissioner has certainly played a role that has not gotten enough attention.

Tim and I have figured, I think some time back, the Insurance Commissioner has put in about 2500 hours attending planning meetings, going to check points, and doing car safety seat clinics. Obviously, it is pretty good politics for the Insurance Commissioner to keep rates down.

We've never had a President of the United States about to announce a belt use plan. We've never had the Senate Commerce Committee about to write letters to all 50 states. We've never had the funding that the Air Bag Safety Campaign now has. We've never had the involvement of the NTSB in the way that we now have.

We need to somehow harness that leadership in order to seize this opportunity to get other states to understand they can do this. And the magic is not the money; it's the leadership.

MR. GHIORSI: Thank you very much. Talking about it's not money, I would like to address the next question to Janet Dewey. The Air Bag Safety Campaign has funding to support enforcement programs and other activities towards strengthening the state laws. How have the states responded to your offer of financial assistance?

MS. DEWEY: We put out an RFP to all 50 states indicating that we would fund a two year high-visibility enforcement program on the step model, North Carolina model. It would be $500,000 over a two year period. We had 39 states respond to give us a proposal for six slots. So, they are very interested in doing it.

What we found out was that not everyone understands the level of commitment that it takes to have a successful high visibility program. And many people still want to give out lollipops and key chains and do that type of enforcement rather than say, you're going to get a citation. And what the Air Bag Safety Campaign is funding is campaigns that we know work on the step model. You give citations. Not warning tickets, but you give citations.

And so that was some of the reasons why we had to weed out some of those 39 proposals. And from my perspective, we've got many, many, many states who are willing and who are interested. But we need to have more time and more money to hold their hand and help them understand the benefits of good positive enforcement.

MR. GHIORSI: Has there been a difference between the municipal or county police or state police in terms of their response? I mean, because I understand some police departments don't have traffic law enforcement as one of their top priorities.

MS. DEWEY: Right.

MR. GHIORSI: Does that seem to affect your offer?

MS. DEWEY: The offer was for a state-wide program. And I think that that's what we have found is that for these programs to be effective—as the Major said, it was a state-wide effort. It wasn't just the state police and it wasn't just cities. It was everyone. And that is so important, because we need everyone to understand that if you're stopped in this state—not in the major metropolitan, but in any area in the state, you will be ticketed.

I will tell you that one of the things that the campaign is doing to help every agency across the country, the public and the media understand that enforcement is a key and that unbuckled children are unacceptable. In May of this year, we will be sponsoring a 50 state mobilization of law enforcement across the country to get out the message, unbuckled children are unacceptable in your state, in your city, and in the United States.

If you ride with a child unbuckled, you will be ticketed. And in planning for this—that mobilization will be May 19 through the 26th. In planning for this, we sent letters to every Governor. We have had 20 Governors write us back personally and say, I commit my state police resources to this activity.

We have had Governors' Highway Safety reps from every state tell us they're interested. We have had over 40 state police, colonels, superintendents give us their point person within their state to say I'm interested.

So, I think the whole conversation about air bags and the unbuckled children and the need to have high visibility enforcement has made law enforcement in this country understand that they are beginning to get the political permission from the Governors, from the mayors, from the President, from the NTSB, from lots of people that really set that political permission standard, from the public—the public abhors the sight of an unbuckled child. And the public wants law enforcement to enforce.

And then also from their voters, from their constituents. So through the mobilization, we hope to get the message out to more agencies that this is something law enforcement can do and must do.

MR. GHIORSI: It seems to me that states having a primary restraint law would be more apt to participate, because I think that having a secondary law certainly would impede that type of a program.

MR. HURLEY: We already have 50 primary restraint laws in this country, the child passenger safety laws, that only in a handful of states are being effectively enforced.

One of the things I think we need to do is to focus first on kids and getting them, as Janet said, restrained. The leading risks kids face is not dangerous air bags. It's being unrestrained in the crash. We have 50 primary laws on that subject, and only a handful are being properly enforced. I think that is exactly the goal of the mobilization, to enforce those.

I think once states do that in a high visibility way—and, again, the proven model is what we've been doing in most states is doing a little bit of enforcement stretched over a long period of time with a primary reliance on education. That has gotten us to the optimistic level of 68 percent. The probability is more like 60 percent.

We've already got everybody now, adults who vote, who write letters to the editor, who pay taxes, and we're probably not going to raise that level much more through education. The awareness of the Air Bag Safety Campaign reaches 85, 90 percent.

The most effective form of education we can now do is enforcement. And that we've got 50 primary child restraint laws that need immediate attention. There are some 22—hopefully, soon to be Illinois—23 states which have expanded their child passenger safety laws up through, I think, age 19 is the highest in Maine. But I think there are 22 states, eight and under.

Illinois may be about to enact a law of 15 and under primary enforcement. And we need to focus, rather than waiting for the—you know, the hopeful moment when all 50 states will have primary adult laws, we need to take immediate action to protect the kids who are at risk right now, not just from air bags, but from being unrestrained in the crash.

MS. DEWEY: I might just add also that there are several states out there with secondary laws that have high belt use, Washington State is the example because they are committed to it. Governor and the head of the state police understand and said, we will do this. And they are at, I think, 82, 83 percent.

Virginia is another state. They are at approximately 70 percent, but they are one of our grant states. Because what we want to do is say, you can do good enforcement with a secondary adult belt law, not as successful as those with a standard law, but we wanted to develop a model, because the reality is it will be more years before we have all standard laws, and we want a model for high visibility, good enforcement in a secondary stay.

MR. GHIORSI: Thank you. Mr. Hoyt, let me ask you, is there a premium penalty for drivers that get a summons for violating restraint laws?

MR. HOYT: No, there's not. The reason that there is not, it would be something I think that insurers would use as an underwriting standard, much as we use speeding violations as an indication of a person's willingness to take risks and would be used. But in every state that has them, since there are no points associated with it, there's no traffic record kept of the violation. So, it cannot be used in any way to motivate higher seat belt usage.

MR. HURLEY: One slight correction. There are—four child restraint laws that do have points, and that's something I think that we should also expand on. Virginia, District of Columbia, I think two or three other states.

MR. GHIORSI: Are there any benefits that the insurance industry derive from increased belt use? I know the answer is obvious, but I would like to hear what they are.

MR. HOYT: I think there clearly are significant advantages from anything that can be done to reduce both the frequency of motor vehicle crashes and the severity of those crashes. And that's why my company and a lot of others have participated in supporting the Air Bag Safety Campaign and have participated in supporting the North Carolina Governor's Highway Safety initiative.

If you reduce the frequency of crashes through efforts like drunk driving or just by knowledge that the law enforcement officers are on the road enforcing the law or if you reduce the severity of those losses that occur as the result of the crashes, it has an impact on insurance. That is not the only factor and I won't go into a lengthy discussion about a lot of other things that drive the cost of insurance. But does it have an impact? You bet it does.

MR. GHIORSI: Thank you. We have been waiting for the Chairman before I spoke to the Senator. But the Chairman is tied up at the meeting. So, Senator, it seems that the primary seat belt laws are an important element in a successful enforcement program and are an important element in increasing belt usage. Yet, only 11 states have adopted such a law. What the impediments are to adopting this type of law?

MR. CULLERTON: Yes. Well, a little bit of it is historical. When I first sponsored the seat belt law in Illinois, it actually was primary and it passed one chamber and went to the other chamber and it was a very close vote. And in an effort to get the bill passed in the second chamber, the sponsor had to pledge to make it a secondary law. As soon as this bill passed, they would have a trailer bill to make it a secondary law, which we did in Illinois.

So, you're starting off with some of these laws, ten, 12 years old, but they started out as secondary.

Now, I think that now that there's an effort in many states to have a primary law or standard enforcement law passed, the analysis—it's helpful, I think, to look at what goes through a legislators mind in determining how to vote. And really this can be said—this is the way legislators quickly run through a check list of how they vote on a lot of bills. And different legislators have different—would use a different order of priority, but I think there's a number of things you look at.

Number one, are your constituents asking for it? Is this something that you've been getting a lot of letters from or you're getting a lot of input from our constituents? And I think at this point in time, the answer to that with regard to a primary bill is, no, there's not anybody calling me on the phone saying, can you please vote for this bill. That can be generated through a media campaign, but unless that's been done, you're not going to have that.

The next thing that a legislator—some legislators ask when they're confronted with any bill is, if I vote for this bill, will it hurt me? In other words, is this going to be a bad idea for my constituents? Not so much, you know, am I going to lose my next election if I vote for it, but there have been less—you know, less subtle—more subtle things that are communicated to legislators. Like if you vote for this bill, maybe you'll have a primary election next time or maybe you'll have a new opponent. Not that you're not going to win, but—and that's something that runs through the back of somebody's mind.

It's a big, big issue, and there might be some people in parts of my state that say, boy, if I vote for that seat belt law, it's not popular in my district, I might have somebody that might want to run against me if I vote for it. And that runs through their mind.

At some point in time, I think all legislators say, what are the merits of this bill? Is this a good idea or not? Is this thing practical? Is it going to save any lives? Is it going to just make people be harassed? You know, is it a good idea? For some legislatures, that's the first thing they ask. And for others, that's the last thing they ask.

Another factor, quite frankly, in terms of being in the legislature, having a number of bills to vote on, is the question as to who's working in the legislature at the time of the vote? Is there an organized group working against the bill?

Whenever a lobbyist goes up to you and says, would you please vote for or against the bill, you ask, in addition to finding out what their position is, you say, well, who's against it or who's on the other side?

In this particular case, in the case of a primary law, I don't think there's any organized opposition, unlike say a motor cycle helmet law. There's a group out there of people trying to stop those laws from being passed. But in this particular case, there's no organized opposition. And as I said, that's usually, in most tough bills, there's lobbyists on either side.

And then the obvious—the next question will be, well, who's working for it? Is there a particular lobbying effort that's being put forward on behalf of passing this bill? And if there isn't lobbying effort, that makes it easier to pass the law.

So, those are the factors that run through a legislator's mind. I think right now, the reason why we haven't been successful in passing these is that not all of these elements are together favorably in order to create a climate where you can pass. There's just the general feeling that a majority of the legislators feel my constituents don't want it.

MR. GHIORSI: I'd like to welcome the Chairman back. This has been, you know, an excellent panel. And I would like to know collectively, have you got any thoughts about how we could turn this around?

MR. CULLERTON: Well, I do think that just following up on the points that I made in the analysis of how a legislator decides how to vote, obviously, if there's a media campaign out there pushing for an effort to pass a piece of legislation, that's helpful.

If people feel that they could vote for a bill and they're not going to get hurt in their district, that's helpful, as well. If there's an organized effort of physicians and nurses and associations, a group of people that are in favor of passing the bill, down there with lobbyists urging you to vote for it, that's the type of thing that can help.

I also agree with comments earlier that it talked about the difference in perception between a law that affects adults and a law that affects children. I just passed a bill out of the Senate last week in Illinois that extends the primary enforcement of the seat belt law from children up through age five, up to age 15, and there wasn't any questions. There were no questions about whether it was a primary enforcement or not, even though it is. It just seemed to go through.

Maybe that is because most legislators maybe have pulled up to an intersection and seen little kids crawling over the lap of a front seat passenger and they said, well, that's not right. But if they think that it's one of their voters who might not like this law that he or she voted for, then they're a little more reluctant.

So, there is a distinction there, and maybe the effort should be to first get those children laws tightened up and then maybe that would be helpful in passing the laws that affect adults.

MR. GHIORSI: Thank you very much, Senator.

MS. DEWEY: I would also like to respond in terms of what the Air Bag Safety Campaign is doing in the area of legislation. For those that may not know, our three activities are education, legislation, and enforcement. That's where our funds are going. And right now, we know of 27 states that have active efforts, legislative efforts right now to either upgrade their safety belt law from secondary to standard—and actually, you're mentioning primary—the reason I say standard, is we have found that legislators sometimes say, well, I want law enforcement to do more than just enforce seat belt laws.

I mean, there are other things going on out there. And what we're saying is this is a standard law. It's standard with every other traffic safety law on the book. So, we're referring to it as standard now instead of primary, if you're wondering why we said that.

Twenty-two states are looking at a standard safety belt law. The Air Bag Safety Campaign is actively funding efforts in 16 of those states. Thirteen states right now have efforts to have child passenger safety laws closing the gaps. And when I say that, exactly what Senator Cullerton just did. He took the law from five to 15. That was a gap in coverage for those children.

We are funding seven of those efforts. And then right now, there are also seven bills in legislatures across the country to have—to require children to ride in the back seat. So, there is a lot of activity going on.

In the states where we have active funding campaigns, we are funding three separate areas—program areas. Number one, legislative support, lobbyists to help sell the bills, explain the bills. So, legislative support. Grassroots support to get the letters to legislators to say, I want you to vote for this. I give you my permission to vote for this. And then, third, a media advocacy campaign to explain it and educate the public in saying this is why it's good, fiscal, taxes, the human toll, young people. So, we are trying to work smart, do what we know works through past campaigns and cover those three areas.

I would also like to tell you—just also let you know that it looks like we have a bill in Maryland that is about to, hopefully, be signed. It has to go back to concurrence through the other Houses, but it has passed both Houses, passed in the House Chambers by one or two votes. It was a very close vote. But Governor Glendening has indicated that he will sign that bill. And I think he was mainly convinced a lot, because he experienced a severe crash and understands the real impact.

But the other thing I wanted to mention is that what we have found in working so closely with these 30 something states is—to paraphrase a little bit about what Senator Cullerton has said, what we're hearing legislators say is, the personal freedoms, the personal right's conversation. I wear my seat belt, but I'm not going to tell other people to wear their safety belts, even though it's the law now. And many times in the secondary law, it's unenforceable. So, they don't even consider that they have a law.

The other conversation is that my constituents don't want me to vote for this. And that's why, again, we have to have the grassroots. Potential for harassment. We have to bring that up. That is a concern by many people. Minority harassment, and also harassment of youth.

And in that area, I would just like to say what we have tried to help legislators understand in that area is working with the Urban League. We went to the Urban League and we said, listen, this is what we're talking about. None of us want harassment. And if there is harassment, we have to address it. But we have no evidence that standard safety belt laws really cause any harassment situations.

And I want to just read quickly what the Vice President for policy wrote back from the Urban League. He said, "While police harassment is a possible unintended consequence of the law, the data we have examined from several states reveals no reported complaints. People harassment should be a concern to all us and should be stopped. There are undoubtedly far more powerful and effective methods to address police harassment than opposition to primary enforcement of safety belt laws."

We were very pleased to get that. But harassment is a concern and something we have to deal with.

Two other points; one of them is "nannyism." I'm not going to tell another parent how to raise their child. We have that actually going on right now in one of our neighbor states where there—where the bill upgrading enforcement for a child passenger safety has been increased, but there was a question whether the Governor was going to sign it because of nannyism. Well, if everyone had their kids in seat belts, we wouldn't have a lot of the fatalities that we have now, air bag or no air bag.

And then the final one that we actually have in one of these states was, you told me when you passed that standard law years ago, you weren't going to come back and ask me for anything else, and you are. And we actually have that conversation right now.

So, we have a lot of work. We all collectively have a lot of work just helping legislators understand that we're really talking about lives. We're talking about lives.

MR. GHIORSI: Thank you.

MR. HOYT: As an aside to that, one thing that I think has troubled me immensely—was a discussion here earlier and I was delighted at this, that we need to go through a major cultural shift in this country regarding occupant protection and seat belt use and child passenger safety laws.

It is interesting to note that while our friend from Germany illustrated the point that in Germany if one is driving without a seat belt, there's another motivation for their wearing a seat belt, and that is that they are held accountable for that decision when it comes to settling their loss experiences.

The interesting thing is that in almost every state that has either a secondary or a primary law, in the United States, we do exactly the opposite. We pass weak laws, because we don't want to infringe on somebody's personal freedom, but we also do not hold them accountable for their losses that occur as a result of that.

In fact, most of the laws that are currently on the books specifically exclude the opportunity to make adjustments in the loss cost of payments to those individuals for having failed to wear a seat belt.

MR. GHIORSI: Thank you. If there's no other comments, we can turn it over to the parties.

MR. SWEEDLER: Just quickly, Senator, you mentioned there are things that go through a legislator's mind when they're deciding whether they should vote or not vote for a certain piece of legislation. How about the costs that the state would really have to pay and actually have to—come right out of the state budget to pay for situations where people do not buckle up?

MR. CULLERTON: Well, you would think that by actually saving lives, that that would provide enough motivation for a legislator to vote for it. So, I only go into that if I think that a legislator and, perhaps a more conservative legislator, might need some ammunition to explain his or her vote in their district and some times that is helpful, because there's no question that Medicaid is one of the biggest items of any state budget and it takes a little bit to draw the connection. But, obviously, people are injured in car crashes.

A certain percentage of them end up on Medicaid. It costs the state money. And you would think it would be politically popular to try to address that. A lot of times, the connection is not there. But it's—those statistics are true. They really can't refute them. I think it can help.

MR. SWEEDLER: Is it really worth making that connection?

MR. CULLERTON: I think it's helpful to have the figures there. I think people use excuses. They use excuses to vote no or they use excuses to vote yes. They might say that they don't want to vote for it, because they're—you know, they're civil libertarians, let people decide themselves what they want to do. I think that's just a lot of time an excuse that they use. They're just afraid that they're going to have some political ramifications.

If people want to vote for something, they want to use the idea that they're going to save money and that's why they want to vote for it, that's fine. So, I think it's good to have the figures, accurate figures, that are not exaggerated, that are real to arm us in our debate.

CHAIRMAN HALL: All right. We'll go to the tables then. We'll go first to table 1.

MR. BISCHOFF: Thank you, Mr. Chairman. Don Bischoff, NHTSA. Major Price, I just wanted to congratulate you on the wonderful success you've had with Click It or Ticket, and acknowledge that seat belt rose from 65 percent to the lower 80s almost immediately when you began to enforce your primary law. We've heard in the last couple of days that some other countries have gotten into the middle 90 percent. What do you think it's going to take to get North Carolina into the middle '90s, now that you have both the primary law and you've got a good enforcement program? What's next?

MAJOR PRICE: Do you want my personal opinion?

MR. BISCHOFF: Yes, sir.

MAJOR PRICE: I think it's going to take several things. First of all, education again. Second of all, insurance points, which is before our assembly now, meaning to add some body into them that go against the insurance. If you want to get a drunk driver's attention in our state, catch him drinking—you know, driving while impaired and convict them, there's a 300 percent increase in insurance rates for three years. They understand dollars and cents. And I think that's what it's going to take in the end, is the dollar value.

You have a certain segment that are not going to wear their restraints. I don't care what you do. They're not going to do it. And we do have some exceptions—medical exceptions, but some people are just not going to do it. And I've had one tell me one time, I will never run out of money. I said, "And I'll never run out of tickets."

(General laughter.)

MAJOR PRICE: They print both of them every day. I think he's had about 43 or 44. He pays his 25 bucks and smiles all the way home. The bottom line is to put some—attach some insurance points to it.

MR. HOYT: May I just support that with regard to our friends to the north, who had seat belt usage very similar to our usage figures for a long period of time? They looked at the profiles of those individuals who are not wearing seat belts when they got in to the 80, 82, 83 percent usage and found that they were over involved in crashes, under insured, and had lots of DWI citations. These were risk taking drivers.

They did some conversations and polls and all with these individuals. Asked them what it would take to get them to wear their seat belts. It boiled down to insurance points, because they knew that if they got insurance points, the penalty wasn't only a one-time hammer. It lasted for two or three years.

In the provinces of Canada, many of the provinces have state-owned insurance. It was easy for them to then say, well, then if that's what it takes, you've got it. And a point of fact, that is what happened. What I'm saying is the research over the Canadian experience supports what the Major has indicated. That if you are going to take seat belt usage from 65 up to 83, you've got to enforce a primary law.

If you're going to move it from 80s up to the 90 percent, you've got to motivate those who are less likely to wear it by putting a penalty on them they understand. That is, by exposing them to payments for the risk that they actually are on the highway. They ought to be paying their fair share of the insurance costs they create.

MR. BISCHOFF: Mr. Chairman, I don't have any further questions. I would just like to thank all of the panelists for making some wonderful presentations. And needless to say, that I think each of the panel members have made great contributions and it's really been refreshing to hear some stuff that's really gone right after spending a couple of days seeing a lot of talk about things that have gone wrong. So, I would like to thank them for a great contribution to highway safety.

MR. CULLERTON: I would like to add a comment to Don's question. One of the things that isn't as well known is that actually NHTSA had as much money in this program as did the Insurance Institute in North Carolina—in the State of North Carolina, the funding from the Insurance Institute was more than matched by the 402 funds, the 403 funds, reprogramming of 410 on drunk driving. With Tim's chart, can we bring that chart back up?

(Slide 1 shown again.)

MR. CULLERTON: Where progress began to be demonstrated was with the Operation Buckle Down program. Look at ’92—actually following 1991, then Administrator Jerry Curry came back from Phil Haseltine conference, American Coalition for Traffic Safety Conference, having seen the Canadian, he did one of the most important things, began he said—stop what you’re doing. Don’t do anything not proven to work. Do it this way. And they adopted the Operation Buckle Down approach.

There are two full-time enforcement coordinators in the east and the west, Tim Phillips and Wade Anderson. And you can see that the progress really began before Click It or Ticket with the Operation Buckle Down program. And then, obviously, beginning in ’93, it started to drop further. But the model has proven to work. It very specifically was modeled after not only Canada, but the Quebec model. Claude Deseo (sp) was down several times to do it. But the progress didn’t just happen. Governor Hunt made it happen. Colonel Barefoot made it happen. Jim Long made it happen. Joe Parker made it happen. Major Price and the others made it happen.

The model has proven to work, and I think one of the most important things we need to do, since most of the activity in the United States being done in occupant protection is not proven to work, is to marshal whatever sources we have and focus on models proven to work.

In addition, I think what’s needed probably is consideration of substantial additional funding in ISTEA. There are initial discussions of up to perhaps $100 million to make available to states, money for enforcement, because there are costs involved in doing this. Those are the things, I think, that we need to focus on and the recommendations from the NTSB, which I think will be very important.

CHAIRMAN HALL: Thank you. Table 2.

MR. VOS: Tom Vos, AORC. We have several questions. The first one to Mr. Hoyt. You’ve mentioned that in most states, there are laws that restrict the use of evidence of lack of belt use in determining ability to make claims or with regard to mitigation of damages. Are you aware, of any efforts underway to change this, and what would it take?

MR. HOYT: There are continual efforts underway to make changes to that, but so far, we lack the political will, if you will, to hold people accountable for poor choices. And, frankly, until we begin to come around to the idea that we are responsible for choices that we make, it’s going to be difficult to make those changes in the long.

MR. VOS: Thank you. Another one, probably to Mr. Hoyt, as well. In your reference to the Canadian study in terms of the people that continue not to wear their belt and their profile, you cited infringement on freedoms and these kind of things. Are there still lingering issues, such as the hassle for putting them on or their discomfort? And the bottom line of this question is, are there still some things that we, in the seat belt industry, can be working on to improve in removing some of these determinative factors?

MR. HOYT: I think in response to the second question that what I have heard here today that I found probably the most exciting and what I hope comes out of all of this is a recognition of a need to integrate the restraint ideas to recognize that air bags and seat belts are an integrated restraint system and they ought to be optimized for occupant protection for those belted occupants. Because when we do that, we get benefits for the unbelted occupants.

But by so doing, we can then deal with problems like load distribution on the older driver and on the short statured female issue where we can optimize the air bag to deal with those kinds of problems.

Can seat belts be improved? I suspect that there are efforts all the time to improve seat belts. And that we are seeing even the integration of seat belts into the seats themselves, so that the adjustments needed to make them fit comfortably can be improved.

I think occupant restraint systems are evolutionary and will hopefully continue to be evolutionary. But the bottom line behind why people are not wearing seat belts, I don't think addresses specifically the lack of comfort. I would not see that as the case. I think it is most people just honestly do not yet believe that when they're driving within five miles of home, that there's a likelihood they're going to be involved in a crash and that they'll need a restraint system.

And they're getting precious little other information to indicate to them that that's a bad choice, and they need to change that behavior. And until we make provide that kind of information and make that kind of motivation by doing the levels of enforcement that have been done—for instance, in North Carolina and else where, I doubt we are going to move off of where we are with regard to seat belt usage and we will continue to see tragic history. Because there's another thing I've heard here in this meeting over and over again is that no amount of smart air bag technology or improvements in restraints is going to substitute for getting people to wear seat belts.

MR. VOS: Okay. We have one last question and for Ms. Dewey. On Monday in some of the closing comments of Administrator Martinez, he mentioned his confidence that perhaps by the turn of the century, we will achieve an 85 percent seat belt use rate. You mentioned that there are such activities going for adult usage in 27 states. At this time, would you share that optimism?

MS. DEWEY: How many years did he say?

(General laughter.)

MR. VOS: By the year 2000.

MS. DEWEY: I think by the year 2000, we will be close to it. I have to tell that we thought that this year there was such a window of opportunity, because the public was very concerned about all the crash fatalities that they had heard. And we really thought that there was a great opportunity this year, and many of us were very surprised to see that these old conversations were still going on.

The success of us reaching standard safety belt laws means that we all have to help legislators understand what we're talking about, and there has to be a shift in understanding again of the reality of crashes and that accidents are predictable, injuries are preventable. We know what to do.

MR. VOS: Thank you. No further questions.

CHAIRMAN HALL: I guess one of the questions I would have is—maybe the Senator could tell us—how we could get before the National Legislative Organization and the National Governors Association to present some of this information. We've been having difficulty in being able to get the attention of those organizations, as well as in law enforcement, the sheriff's association, the police chiefs, all groups that I wish had a table here at this forum.

MR. CULLERTON: Well, I—

CHAIRMAN HALL: And I appreciate your participation.

MR. CULLERTON: I was reminded of just talking strictly politics. Now, I've been to North Carolina, and I think that there's many legislators in North Carolina that are very similar to the legislators in Illinois, and I've seen the phenomenal success that they've had there.

And I see a Governor taking political credit for an effort to bring the usage rate up, fatality rate down, surrounded by police officers and lights flashing and great visuals. And I'm just surprised that there's not other Governors who would see this as a great political opportunity, not something to be avoided. Because if—as the Major said, if this comes down from on top, now you've added another dimension here.

I talked about what a legislator thinks about when they vote. I didn't mention, well, the Governor wants it. It's part of the Administration bill, because, Lord knows, the Governor can do all sorts of favors for legislators on unrelated matters that can encourage them to vote on a bill.

So if you have leadership from the top down, you can pass these bills in one year in every state if the Governor wants to make it an issue. Now, there are legitimate questions that those Governors have, like, well, what if somebody says I'm using all my police out there giving out speeding tickets and the murders are running around? Well, North Carolina has an answer to that.

If that message can get out—and I'm surprised it hasn't gotten out before. But if that message can get out, convince these Governors that this is a good political thing for them to do, it would be a lot easier to pass these bills.

MS. DEWEY: And, Chairman Hall, if I could just respond. The Air Bag Safety Campaign did go to the National Governors Association and asked them to pass a resolution in support of the MA mobilization. And they also added in there that they did support standard safety belt laws. So, the NGA has a resolution on the book, a unanimous vote.

Now, turning that into action is where we all have to have the individual conversations. But that's a good start. And the Conference of Mayors also voted to support the enforcement.

CHAIRMAN HALL: What about the legislative group?

MR. DEWEY: They're next.

CHAIRMAN HALL: My experience working in the Governor's office is that usually legislators don't like to vote for something for the Governor to get credit for.

MS. DEWEY: That's our challenge is to help everybody understand what—you know—

CHAIRMAN HALL: I'll get into the money here in a minute. I don't want to—I cut off table 2, I'm sorry.

MR. VOS: We've completed. Thank you.

CHAIRMAN HALL: Table 3?

MR. O'TOOLE: Thank you, Chairman Hall. Steve O'Toole from General Motors. Some of this has already been referred to. And I would like to start with Senator Cullerton and just ask the question of what more can the Federal Government do to help states pass standard enforcement laws and enforcement of those laws after they've been passed?

MR. CULLERTON: Well, I would have thought that—to use an analogy, I tried to pass a motor cycle helmet law in Illinois. We're one of three states that has no law at all. And there was some Federal incentives that were provided.

And I thought that was going to help. And I don't think it hurt, but it wasn't enough to overcome organized opposition against it. And we heard speeches on the Senate floor about Federal blackmail, was the term that was used, because they had to explain why they were voting against the bill. That if it didn't pass, we were going to lose Federal highway dollars. But it wasn't enough to overcome.

However, in other areas, drinking age legislation and that sort of thing, Federal incentives do work. This should be an easier concept to pass in the legislature than the example of the motor cycle helmets, because it's just so organized. The opposition is so well organized. Whereas this, it's not.

So, I think the Federal Government, if they were of a mind to do so, could provide some incentives that would be helpful.

MR. O'TOOLE: The rest of the panel?

MR. HURLEY: I think one issue really is money. I think if we are serious as a nation in getting to where Canada is, that we have to put serious resources behind it. And that $9 million in the ISTEA or NEXTEA proposal, quite frankly, is not going to do that. That's a kind of a token—it's a nice provision. But that is unlikely to get us where I think the Secretary of Transportation has said 85 to 90 percent.

There's only one way to get there, by adopting models proven to work. And it will take some funding and it will take a collective political will, both for the people in this room the Safety Board, and the U.S. Department of Transportation. But we're never going to have this opportunity again. When was the last time the President of the United

States devoted two radio addresses to an issue like this, where there is a highway bill moving this year, where there is funding for the Air Bag Safety Campaign, where states are actively considering it.

We need to come up with a very serious program to get to those levels.

MS. DEWEY: There was one other thing that I was going to add. I know you talked about what the Government can do. But the other thing is I see this opportunity that we have as almost what happened to drunk driving ten to 15 years ago. There was not a public awareness that it's not acceptable to drive while intoxicated. There is now. Clearly, the public has called for it. Legislators have responded.

We are at that same place with child passenger safety and with traffic safety. And I think we will begin to see calls that unbuckled children are unacceptable and that families do benefit from increased belt use.

MR. O'TOOLE: Major Price, Ms. Dewey mentioned that harassment is brought up in a lot of the state legislatures as a concern. Has there been any experience related to that in North Carolina? And how have you dealt with it, if there has been?

MAJOR PRICE: I'm sorry, I missed the first part of that.

MR. O'TOOLE: Ms. Dewey mentioned that harassment has been mentioned as a concern by legislators and other state legislatures. How have you dealt with that and—if it's been brought up, how have you dealt with it?

MAJOR PRICE: Well, we have been accused of harassment in our state from drug intervention profiles as has happened in Maryland, in Massachusetts, in New Jersey, and other places, in Florida. That's another thing I like about a primary seat belt law, I don't care what color you are, what your religious beliefs are, you are either wearing it or you're not. As my attorney says, he says I don't like my belt and this is good enough [flipped necktie over the shoulder]. You can't tell the difference. Well, I can tell the difference, believe me. But he tries it every time I see him, but anyway, it doesn't work.

(General laughter.)

MAJOR PRICE: But I just think—and I'll give you a good example in our state. We've held about 17,500 check points over a three year period now. In addition to seat belts and the child restraint violations, we have made over 460,000 arrests for other violations of the law.

Last year, we had 1900 checking stations and we arrested over 3800 for driving while impaired. I think we had it with daytime. I mean these—I won't call them idiots. They're not idiots. They drive up—you know to a sign, a checking station ahead. Be prepared to stop.

(General laughter.)

MAJOR PRICE: Weapons, narcotics, fugitives: you name it, we got it. And they ran that way state wide, not just in one particular area. It was that way state wide. That's a violation we would not have got had we not had a primary law.

MR. O'TOOLE: Okay. Are any of the panelists aware of the graphic seat belt ads that are used in Australia? And if so, would any of you recommend using them here?

MR. HOYT: I'm not intimately aware of them, but I am aware that there have been a number of very creative and sometimes horrible motivations, if you will, by advertisements for wearing seat belts. I think what works, what the research has proven works is public knowledge that the law is being enforced.

If the public knows the law is being enforced and that is done in large measure by earned media, the conversation that was held here just a moment ago, Senator Cullerton referenced the launch of one of the campaigns with the Governor on the lawn of the State House with several hundred troopers standing behind him and every other state agency of police, including the fish and game association were standing there with him in support of this enforcement campaign that he was going to launch. He had police cars lined up down the halls with their lights on.

This is an earned media campaign that says to the public, we are going to enforce the law, and that's what it takes. That's what moves usage, a current public knowledge that they are going to enforce and they're serious about it.

MS. DEWEY: I think one other thing I would like to respond to is just what we know about people understanding and personalizing risks, and they don't change behavior for many people, simply don't change behavior until they can personalize that risk. And I can't think of a better explanation of that than the three children who were killed earlier this year according to NHTSA investigations, who were riding on the laps of adults.

We still have families who don't put their kids in car seats. And goodness knows, we've educated and scared and done just about everything we can on that, and we still have babies on laps. That's enforcement. And we could spend a lot of money on advertising and not reach the people that we really have to reach.

MR. O'TOOLE: Thank you. Thank you, Mr. Chairman.

CHAIRMAN HALL: Thank you. Table 4?

MR. PARKER: Thank you, Chairman Hall. I just have a couple of questions. The first one is for Major Price. NHTSA held a meeting on January 6th of this year with—

CHAIRMAN HALL: Could you identify yourself, please?

MR. PARKER: Yes. George Parker, Association of International Automobile Manufacturers. NHTSA held a meeting January 6th of this year of stakeholder and occupant restraints. Now, there were a couple of police representatives there, a Sheriff's Association, and International Association of Chiefs of Police.

One of them made the statement—I don't know which one—that the police do not like to enforce belt use laws. It's not so much a matter of harassment as it is a matter of they just don't have the perception of doing public good.

Is this an accurate representation? And if it is, what can be done to change that police willingness to enforce these laws? I know it's not the same in North Carolina, but it might be some place else?

MAJOR PRICE: I'm really quite surprised to hear that. I belong to IACP State Provincial Division, and that certainly has not been discussed at our most recent meeting or the one prior to that down in Phoenix. I would say it's definitely not the case in North Carolina. We have the total support, the Governor's Highway Safety Representative, the Governor—the Sheriff's Association, which is very strong in our state.

MR. PARKER: I think the person that asked the question or made the statement said if there was a way to present to the enforcement officers that they are making a positive contribution to the safety of the driving public, that they would be more willing to enforce these laws. Is that something that can be done or is being done?

MAJOR PRICE: Well, again, I think that starts at the head, in any police organization, for those officers on the street, to the very lowest ranking ones, to the various high ranks it depends on what the top man says. He's the boss. And if he wants things to go that way his subordinates are the people that should his programs, that's the way it should be.

So, I say if that's the case, I think it's a management problem from the top down.

MR. HOYT: Two points to support it. One, George, that was already referred to by the Major, and that is with regard to public safety issue. The public safety is helped by traffic enforcement. What we need to do is get the message out to the public that it is helped. As they have in North Carolina, 72 arrests for stolen vehicles and literally hundreds of felons that have been removed from the roadways, thousands of felony and misdemeanor arrests for drugs, firearm violations, DWIs and other things. Those arrests were made because they're out there enforcing the seat belt use law, you are having a very positive impact on the public safety, if you will, by making those kinds of arrests.

On the other side, there is a tremendous need amongst the law enforcement community and we are making an effort in the Air Bag Safety Campaign and others are making significant contributions to training officers on enforcement and child passenger safety.

As you well know, there is a great reluctance, because it is sometimes very complicated to know what is correct usage of a child passenger safety seat. And so law enforcement is sometimes reluctant to do the enforcement job, simply because they are concerned about whether it is correct use or not.

We should begin by simply saying if you notice that somebody is totally unrestrained, it doesn't take a great deal of effort to understand whether the law is being obeyed or not. And then we can go on from there into the finer points of enforcement.

The thing that is disconcerting to me is I have looked at the state statistics with regard to child passenger fatalities, and 70 percent of those children that are fatally injured in this country are totally, totally unrestrained. It isn't that they were improperly restrained in a child restraint. They had no seat belt or child restraint of any kind on them at all. And that's a major cultural shift that has to take place. We have to do something about that problem. That's intolerable. And it doesn't take a great deal of effort to do that.

So the campaign effort that is being launched will start off with just dealing with gross misuse, which is no use, and then work from there to the finer points of usage.

On the other side, there is a great deal to be done on improving occupant protection and the petition that has been put in and the legislative initiative that has been taken by the Government to work on improving child passenger safety mounts will make some significant progress in that direction. And so clearly, there are some opportunities to work on that side of it, recognizing that about 80 or 90 percent of those who are using child passenger safety seats now—indications are they are using them incorrectly.

But we could start with just a recognition that were we to make a very positive effort towards just enforcing those violations that deal with non-use, we could have a very significant impact on what is driving us all to be here today with regard to improving occupant protection.

And I come back to a point I raised earlier. Nothing we will do on smart air bag technology or depowering or anything else, a point that you and your members have made over and over, is going to change the need to get people properly restrained and kids in child restraints.

MR. PARKER: Just responding to that a little bit, Tim, I think NHTSA is of the same opinion that it's non-use rather than misuse that's the biggest problem for child restraints. And even with misuse, you still have some protection, maybe even substantial protection from a child restraint. But if you don't have it in there at all or not even attached, you get no protection at all.

A couple of other questions. Tim, this is for you. In Germany—and I think you've discussed this a little bit before, but in Germany, there is no full insurance coverage if there's injuries without use of the safety belt. Do you think that's feasible in the U.S. to get to that point?

MR. HOYT: Not immediately. No fault insurance is a difficult concept for lots of reasons. But even if we were just to get to the point of recognizing that there is a role in—if we could just start with seat belt usage and child passenger safety seat usage and hold individuals accountable for a choice they are making there, I think there would be significant motivation to properly wear restraints.

MR. CULLERTON: Maybe I can also comment on that. Again, in going through the analysis of how legislators vote, as you know, there's an organized effort, a group of well-funded lobbying effort in all state capitols that would fight something like that. When we passed the seat belt law in Illinois, we had to put in the law evidence of failure to wear a seat belt shall not be admissible, because we had to eliminate one of the potential components to the legislation in order to pass it.

So, we're having trouble just trying to pass a primary law with no organized opposition. To try to pass a law that would repeal that section, for example, is really, at this point in time, very difficult to do. These efforts are all geared up, because of—you know, other fronts, tort reform and medical malpractice. They're all in place. They're ready to do battle and they're sitting there all in the state capitols. And so this is, in my opinion, very difficult to do right now.

It would be nice if we got to that point where we're at 89 percent usage rate and we want to go to 95. Here would be one of the ways we could do it. And maybe ten years from now, that's where we'll be, but not right now.

MR. HOYT: I would just go on to that point and say that I do think there is a potential for a significant amount of political difficulty in moving immediately to something like insurance points or other things like is being done in Germany. I think the way to do it is what Senator Cullerton indicated. Let's move the things that it takes to get seat belt usage up to 83, to 85 percent, which is pass the primary law.

At that point, we can come back and begin to do the assessment of who is not wearing them. We can build the political consensus, the recognition that those who are not obeying the law are risk takers. They are creating undue strains and they aren't paying their fair share. I think it is a step wise process to get there, and we're a long ways from that.

I'll settle right now for just getting primary laws on the books.

MR. PARKER: One final question to you, Tim, and that's in the chart that you presented, there was a peak of about 80 percent in 1987, after you could write citations, I guess, in North Carolina. Was that a lack of enforcement when it dropped down to about 50 percent or something like that?

MR. HOYT: Yes.

MR. HURLEY: That's happened in every state where there's initial peak—particular with the media coverage on the enactment of the law and a perception that it will be strictly enforced in virtually every state I know. That has dropped off to initially with a secondary law about 50 percent and with a primary law, it's somewhere in the low 60s, unless there is active enforcement.

MR. PARKER: So that's a good message for enforcement.

MR. HOYT: It's an excellent message. When the legislature does anything to change the law, the public perception is they're serious about enforcing it and usage jumps up.

MR. PARKER: Chairman Hall, that completes our questions.

CHAIRMAN HALL: Very well. Table 5.

MS. ROEMER: Thank you. I'm Jane Roemer with the National Safety Council, and most of our questions have been covered as we've gone through the previous tables, but we do have a couple. When a state undertakes a program like North Carolinas or when we're trying to sell another state on a program like that, is it thought of as finite in time or are we to understand that it's—how does a state sustain a program like that? What behavioral changes become permanent? And what's the funding and commitment that's needed to do that?

MR. HOYT: The commitment is one—as Chuck pointed out, the commitment in North Carolina to highway safety is reflected by the fact that they were one of the first two states to pass a primary law. And our choice of North Carolina as a demonstration state was because there was a commitment at the state level to do enforcement. They were writing—as Chuck referred to earlier in the highway patrol alone were writing 11,000 citations.

What was missing in North Carolina was not political will, if you will, to do it, but a need to understand that high visibility enforcement was the way to move it from where it was to a much higher use level. And when the Governor committed, as he did to high visibility enforcement, then there was a significant increase. But in response to the question of is that sustainable and is it a finite program, the answer to that is, no. Canada still continues to do step enforcement.

They don't have to do it as often as they had to do it in the beginning to get usage up, but the public still has to remain convinced that enforcement will continue.

And so in the selection of the states that we went after in the Air Bag Safety Campaign and part of the difficulty we had, even though we had 39 states that responded positively to wanting to do enforcement campaigns, there were few of them that came back with a program that reflected that this is a program of, by and for my state. And that whether you come or not, we're going to do it. If you do come, you can supplement what we are going to do, but our commitment is to doing this program and to carrying on with it beyond what is added by your resources to the program.

The answer to your question is, it is not finite. It must continue. It must be a program that is of, by and for the individual state.

MR. HURLEY: Let me add one point to that. Sustaining a program like this is obviously critical. That's why the Insurance Institute set out to do this over a period of five years. The way it is sustained, however, is mainly by having these check points at a sustained level over a long period of time. It is the concept of periodic compressed high visibility enforcement.

The North Carolina patrol, as extraordinary as they are, could not have done this by themselves. In most of the checking stations, there were five, six, eight, ten agencies at the line. And by combining forces for periodic bursts of activity, it is certain that there will be strict enforcement.

So that is the way it's been sustained throughout Canada. Each of the provinces has a slightly different program, but these are self-maintaining. Once you get up into those levels, into the 80 and 90 percent, the public support for further enforcement doesn't decrease, it increases.

At 68 percent, you know, nationally, we are heavily subsidizing the 32 percent that refused to wear their belts, who are the same people who continue to drink and drive, who are the same people who often drive recklessly. As you get into the 80s and the 90s, the public support for reducing that subsidy becomes even stronger and that sustains the program.

MS. ROEMER: Is there sort of a point of critical mass where you think that we get a few more states doing standard enforcement and a few more states doing a North Carolina type of program, we'll start to see this becoming more wide-spread?

MR. HOYT: I believe there is. It always takes in almost everything where human behavior has changed significantly, it takes a few innovative leaders willing to step out front and make a change without knowing the answer to all the questions that are going to be asked.

Governor Hunt clearly reflects that kind of leadership. With a few more Governors to demonstrate that kind of leadership, we can get it going. Once we have the innovators on board, I think others will follow, but we have not reached critical mass at this point.

MS. ROEMER: And that was actually one of the objectives of the Air Bag Safety Campaign, was to fund six states, to have not one state, not two, not a little bit here, not an agency there—six states, so that we can go in and say, you can do this or you can replicate it.

The other thing is I'll just say about critical mass for passing primary laws. Louisiana—we're really going for the south here. Louisiana and Georgia are the most recent states to pass standard laws. And if we can do it there, surely to goodness we can do it in other places.

CHAIRMAN HALL: Please.

(General laughter.)

MS. ROEMER: No, I'm from Louisiana and that was what people told me. You did it there? I can't believe it. Is it fair then to assume that evaluation and publicizing your results are also critical components to getting this done?

MR. HOYT: Absolutely, Jane, and thank you for asking that question. The North Carolina initiative is in the process of being documented. Part of the effort when it was first conceived was that we would write an extensive report on the effort.

The states that we have gone after for additional support in the Air Bag Safety Campaign, we have included in that the need to write a report from the state, to have them write a report on the effectiveness of that program, basically talking to how effective was the program, what was accomplished by the program, because if we don't get that report written by the state—if it's written by an outside entity, if it's written by the Federal Government, then it's difficult to use that to leverage another state to do it. But if it is a report, again, of, by and for that state that says this is a positive program, it does two things. One, it gives them the impetus to continue to carry the program on beyond that. It also adds to the credibility of the argument of carrying that report in helping other states, who are not the innovators to make changes.

MS. ROEMER: And just one more question. Mr. Hurley mentioned the President's plan. Do we know what the plan will do and if it's covering the right elements?

MR. HURLEY: We won't know, I guess, until it's announced. We're very hopeful that it will be a strong substantive plan. Certainly, NHTSA has great experience and knowledge of what's proven to work, both in this country and around the world. It's our understanding that the plan currently is a very strong substantive plan, that it's being circulated in the Administration. And, hopefully, will be sent to the White House as soon as next week.

We're very hopeful, but we're never going to have this opportunity again. Back to Mr. Vos's question, are we going to get to 85 percent? We will only get there if we follow a serious, proven-to-work approach, and we'll never have that kind of opportunity again.

MS. ROEMER: Thank you.

CHAIRMAN HALL: Thank you. Table 6?

MS. STONE: Thank you, Mr. Chairman. I'm Judie Stone with Advocates. I know it's late in the day, but we have 36 questions here, each of which we would like to ask of each of the five panelists, but it shouldn't take very long.

(General laughter.)

MS. STONE: Actually, the fact of the matter is, all of our questions have already been asked, so we can say that we have no questions from table 6.

CHAIRMAN HALL: Oh, wonderful. Wonderful.

MS. STONE: Yeah, I thought you would like that.

(General laughter.)

CHAIRMAN HALL: Okay. Mr. Osterman.

MR. OSTERMAN: Dr. Ellingstad is going to ask my question.

CHAIRMAN HALL: Dr. Ellingstad is going to ask your questions. Okay. Mr. Arena?

MR. ARENA: Yeah, I've got a few questions, Mr. Chairman. Major Price, the Click It or Ticket campaign kicked off in mid-'93, which is nearly four years ago. It was an instant success. It is certainly very well publicized. Do you have any idea why none of the other 49 states have picked up on the model yet?

MAJOR PRICE: I would think, as the Senator spoke a while ago, Governor Hunt has never been bashful around a flashbulb—

(General laughter.)

MAJOR PRICE: —as well as some other politicians. And it has gone pretty well in our state. And I have no idea why they haven't. I would like to go back to revisit the question asked by table 4, when the rate jumped way up to 87. We went 14 months from inception of restraint laws, where we didn't write citations. We wrote warning citations, warning tickets. When that sharp jump came is when the money came with it. It quit being free. It started costing money. So that's when it shot way up and then it shot back down. That's when we got involved in '91.

But I don't know, to get back to your question. We've talked to South Carolina several times about it. They've shown some interest. Arkansas has shown some interest at some of our regional meetings we've had, but I just don't know.

MR. ARENA: Okay. My next question is for Janet Dewey.

MS. DEWEY: Yes.

MR. ARENA: Can you tell us the source and the amount of the funds for your campaign?

MS. DEWEY: Sure. The campaign is currently funded at $14.2 million. This is funded—this is the classic public private partnership. It's funded by the automakers, international and domestic. Seven of the major insurance companies in the country. It's funded by the occupant restraint manufacturers. We're working in partnership with NHTSA, DOT. Over 150 corporations around the country, including Jiffy Lube and U.S. Army, and just the broad gambit of corporations—American Academy of Family Practice, all health institutes and just about anybody we can get to provide information and wave the flag for air bag safety—buckle everyone, children in back.

MR. ARENA: Very good. And you mentioned that you had 39 applicants for six grants. And that you were quick to say with more time and more money, you could be more successful. Approximately how much money do you feel you need to have a successful campaign between now and the year 2000?

MS. DEWEY: I'm going—we're going to do this together. Tim?

MR. HOYT: I don't know if I know the exact number that it takes. In some states, it's going to take a significant amount of funding. My guess is that it's going to take in excess of the $500,000 per state that we are putting in there currently. In some states, it may take less than that.

What it really requires is the leadership to the commitment, if you will, at a state level to do it. As I will come back to a question or a response was given earlier here today. And it is, the money's not the magic. The magic is in a commitment from the leadership to do the effort. Now, that has to be backed up by resources.

It has to be backed up with NHTSA 402 and 403 funding that is dedicated and directed to the enforcement campaign as opposed to spending it on key chains or whatever else the state might want to do that seems like it's more politically palatable. And there is a need for some additional funding that can go into helping to generate the earned media and some of those kinds of things. It's not that you don't need some funding. But the magic is not in the funding. The magic is in a state leadership commitment to do the job.

MR. ARENA: I also understand with the—

MR. HURLEY: Let me just underline that, Jim. We have proven in this country that you can spend tens of millions of dollars—perhaps even hundreds of millions of dollars while saving very few lives. Most of the money that's been spent in this area has been spent on things not proven to work. And it is really essential that we focus on the proven models. And where the money really—the only purpose of the money is to implement a model that is not the focus in itself.

MR. ARENA: Well, after the $4 to $5 million investment in North Carolina, I understand that there was $15 million premium—insurance premium return to policyholders the first year, $19 million the second year. Is that correct?

MR. HOYT: The insurance commissioner makes a diligent effort to hold down the price of insurance. That's his job, and he's an elected official. So, he clearly has to make an effort to hold down the cost of insurance.

The state did do some adjustments. There were savings in premiums to the customers in the state of North Carolina as a result of the Click It or Ticket campaign. I think what you have to understand is that insurance rates are based on loss experience. And that it's difficult for us to get out ahead of ourselves frequently and give premium savings for or savings and losses that we haven't realized. But in the state of North Carolina, there was clearly some financial savings that came about as a result of the campaign.

MR. ARENA: I think there's a whole line of states that would be willing to volunteer to accept $4 to $5 million in an effort to help disprove that money doesn't solve all the problems, and I'll provide those names for you later.

(General laughter.)

MR. ARENA: But let me argue against myself for just a minute. We keep hearing about the North Carolina model. Yet, there were several other states that have attained 80 percent belt use; California, Hawaii, New Mexico, Puerto Rico, the Virgin Islands, Oregon, and the state of Washington with only a secondary law. Has anyone examined those strategies that were successful in those states in an effort to spread the credit around the country for getting the use rate up?

MS. DEWEY: Yes, we have, and the point starts with political will. I mean, I think it comes right down to it. In each of those states, the Governor, the head of the state patrol said, we will do this and did it.

MR. HOYT: May I just in response to the observation of $4.5 million? The original commitment was to put $4.5 million into North Carolina. The actual need for funding was substantially less than that, over the five-year period of the time.

It started out at that level, but when we got a lot of criticism for paid media, which was a substantial component of the original program in North Carolina and recognized that the real payoff that we were getting in North Carolina was with earned media, we were able to substantially cut back on the funding that went into North Carolina in subsequent years, because we didn't have to pay for a public relations firm to help us do the ad campaign or to pay for getting the ad campaign on the air. We took advantage of earned media. And that model has sustained itself on the basis of earned media.

MR. ARENA: My final question is for Senator Cullerton. We keep talking about political permission and we taut the Governor. What suggestions would you have for the coalitions that end up with the Governor and a legislature that are of opposite parties and may not necessarily follow the lead, shall we say, if the Governor raises his sword and says we're going to do this?

MR. CULLERTON: Well, I'll use my state as an example. We have a Republican Governor, a Republican controlled Senate, and a Democratic controlled House. Now, there is certain philosophical positions that the legislatures takes on this issue. Generally speaking, we get more Democratic votes on this type of legislation than Republican. But I don't think that the fact that there's divided leadership means that it can't happen. We have to put together budgets and even much more controversial issues than this at the end of our legislative years.

It's just a matter of whether or not the leader wants to make it a priority. You know, it's all big—one big favor bank. And if they have to use a lot of political will to get a tax increase through for education funding and a gas tax for more roads and by the time they're through with their efforts, there are just no more favors to pass out.

Well, then you don't have the commitment. But what I'm hoping is that more Governors would see what's happening in North Carolina where there's a political benefit to themselves personally. And I'm sure there's jealousies and pettiness, of course, that goes on in all legislatures, but I'm sure that enough votes can be put together to pass just about anything in this area, if there's leadership from the top. In the absence of leadership from the top, it can still be done with an effort like has been put together as Mr. Hoyt and Janet Dewey has described.

MR. ARENA: Thank you very much. Mr. Chairman, I have no further questions.

CHAIRMAN HALL: Mr. Sweedler?

MR. SWEEDLER: I have no further questions.

CHAIRMAN HALL: Dr. Ellingstad?

DR. ELLINGSTAD: Just one quick question. Mr. Hurley observed earlier that there do exist primary laws in every state with respect to child restraint. Could you very quickly comment on the adequacy of those laws? Are we doing everything that we ought to in that area? And does that present any particular problems for enforcement?

MR. HURLEY: The laws may not be perfect, but we shouldn't let perfection be the enemy of progress here. The laws are perfectly enforceable now. I think, again, what Janet said about unbuckled kids is imperative. I choose to call that zero tolerance of unbuckled kids. We have 50 states with primary child restraint laws up through age four. Twenty-two of which, I think, go up through age eight. And all the way up to Maine, at age 19.

It's an interesting thing in this country where so much of the issues are driven by the issues that cover adults. They are more interesting. There's more money behind them. There's more media coverage, often. We always say that child passenger safety is a top priority. And, yet, in very few states, is that actually made true by enforcement by programming.

We have the laws we need right now to protect most of the kids that had been lost due to air bags. We have the laws we need to not only solve the risks they face from air bags, but the primary risk they face by being unrestrained in crashes. And Dr. Martinez, I think put it very well the first day. He said, thus far, we've lacked the political will to carry that out. I think we're all hopeful that that is changing.

MS. DEWEY: I just wanted to follow up also in terms of public support for strengthening those laws. The campaign has been surveying regularly. And when we asked a question in December, we said, if you learn that 32 children that have been killed by a passenger side air bag, 28 of them had not been properly secured in a child safety seat or safety belt, which of the following statements come closest to what you think: You want status quo in the laws and enforcement, which 20 percent agreed to status quo. Additionally, 29 percent agreed to tougher enforcement, and 46 percent of the population agreed to stronger laws and stronger enforcement. So that's 75 percent of the public wanting stronger laws and stronger enforcement.

We have to go back and translate that into action and also strengthening those laws. The other thing I wanted to say is that Senator Cullerton was talking about the importance of having the leadership and state leadership and the Governor on board. You can do this in states where you don't have that leadership also.

And I'm just going to relate that in Louisiana, the Governor was not on board, and yet the bill in that state passed by an overwhelming majorities of 78 and 83 percent in the House, in the two chambers. Republican majorities were in a state where there was a Democratic Governor. And the reason that those bills passed was we simply helped them see that 13 young people had been killed because they were ejected from their vehicle in 60 days during that legislative session, and we were able to able to distill the message down to the essence.

And I had a legislator tell me, I do not want to vote for this bill for standard enforcement, but I cannot know what you have told me about young people and not support this legislation. That's what we have to do, is to get that message out.

DR. ELLINGSTAD: Thank you.

CHAIRMAN HALL: Well, let me ask a question or two here. And I have some member—George Black is here with us who has joined the Safety Board about a year ago. George, about a year ago. And George formerly was the highway engineer down in the state of Georgia. And he has a couple of questions here I wanted to ask, as well as give some comments.

And one of his was, what have been the effects of the people's concerns on crimes on traffic law enforcement? Is neighbor policing taking patrol officers away from traffic law enforcement? I guess, Colonel Price might be the best person to address that to.

MAJOR PRICE: He and I have already had many discussions on that. We have not seen—it has not proved in our state that the check points we do or step up in enforcement has had any effect at all towards taking away from other traffic type patrols.

Every department has screamed shortage—ours, included. Make no bones about it, though. Most everyone is cut to the bone. But when they find out they're going to have to do it, they find a way and find the time and find the manpower. And it's a matter of commitment. It's a matter if you want to do it. If you're determined to do it. It's like any other challenge in life, if you don't want to do it deep down in your heart, you can find a way around it.

We have not found that it has taken away from normal policing duties with our state, our response time, or anything else.

CHAIRMAN HALL: And should NHTSA dramatically increase funding for selective traffic enforcement grants, step grants to state and local governments? Would that be more cost-effective than the monies that's put into promotional campaigns?

MS. DEWEY: Yes.

MR. HURLEY: Absolutely, yes.

(General laughter.)

CHAIRMAN HALL: Well, you know, I guess an observation—your budget is $14 million. And I had to exclude myself, because we had to go up to this TWA-800 investigation, which we will have spent by the end of this fiscal year $27 million on. And our agency gets most of its attention, obviously, in the investigation of aviation accidents.

And I've been constantly trying to point out that we have on our highways every day, the equivalent of a ValuJet accident. Some 113 people died by last year's figures versus 110 that were lost in the ValuJet accident.

I would like to ask the Senator his observation on this, and I'm sad to say, but probably most of the progress that's occurred in traffic safety in Tennessee has come initially from the Federal Government providing monies either in the highway funds or by taking away the highway funds. And I don't know what the President's going to do with the ISTEA program, but with all the talk about unfunded mandates and the Federal Government dictating to State Governments on what to do—you know, what would be the type of incentives that we might see placed in the ISTEA program that might get the attention of the political leadership not just in Illinois, but around the nation to effectively address this issue?

MR. CULLERTON: Well, Mr. Chairman, I hate to be too cynical, because I'm starting my 19th year in the General Assembly, but, you know, we're in session right now. In fact, I was in session yesterday and we'll be in session again tomorrow. I think back to when we passed the seat belt law. We had lobbyists all over the place trying to pass that law. And it's been quite some time now and I can't remember all the details, but something happened at the Federal level that got the lobbyists down to Springfield, Illinois to try to pass this bill.

CHAIRMAN HALL: I think it was a concern about air bags, if I remember that correctly.

MR. CULLERTON: I think it had to do with passenger restraints and the car manufacturers were interested and other industry, people. And it was the action by the Federal Government that resulted in that happening.

The only time it didn't work was, as I mentioned, with the helmets for motorcycles, but only because of some phenomenal well-organized opposition. So, the Federal Government clearly can play a role to help us pass the legislation.

I also think that in individual instances, if there is a particular leader, a legislative leader, or a Governor that wants to pass a piece of legislation, he or she, if they make it their top priority, can do it. As a matter of fact, as I recall, Tennessee was the first state to pass the child passenger safety law. And I was told that it was primarily because of either a physician or a group of physicians that made it the top priority.

So, there are individual cases. And this is true for any piece of legislation. If one person makes it their priority and they have the power within that state to do the favors necessary to get people to want to vote for it, you can pass anything.

CHAIRMAN HALL: Are you familiar with the Safety Board's recommendation that a fund be put together at the state level, using a portion of insurance premiums and money from other sorted areas to be specifically applied to traffic enforcement and—

MR. CULLERTON: I'm not aware of it yet. I think, in general, this subject came up earlier about insurance premiums. I think that that's a very sensitive issue for constituents. And I think there's cynicism there. People say, well, are my insurance rates going to go down if you pass some safety legislation or is my insurance premium going to go up if I get a ticket?

Those things are hot button issues with constituents. I'm not aware of that particular effort, though.

CHAIRMAN HALL: Well, I'll send it to you. It hadn't made me many friends in the industry—

(General laughter.)

CHAIRMAN HALL: —but my feeling is and while $14 million is significant, obviously, I think that the Federal Government and the automobile manufacturers, as well as the insurance industry, the major players, have got to, you know, figure a way to address this situation. And it's got to be done somehow with some money for enforcement. That seems to be the one thing that is effective.

I had the opportunity to run the drug program in Tennessee. In 1986, they passed anti-drug program up here and put money in the states for enforcement purposes and we began to see an impact there.

MR. HURLEY: Mr. Chairman, on that point.

CHAIRMAN HALL: Yes.

MR. HURLEY: I think for that proposal to have any chance of actually happening, I think that it has to be broadened to include some other industries, to include the health insurance industry, who has gotten a completely free ride on highway safety for time and memorial. Has done absolutely nothing to promote prevention on the highway, and yet, in many areas like the drunk driving program and others have been extraordinarily benefited.

It probably should include some funding from the alcohol industry, who has contributed to the program for a considerable period of time. That it probably isn't fair just to focus on the specific ones that have been mentioned. I think—

CHAIRMAN HALL: Well, we expanded it. We're not—you know, not interested in picking out anybody.

MR. HURLEY: Right.

CHAIRMAN HALL: We're just trying to see—you know, basically either at the Federal level through cutting off the highway—you know, having some impact on the ISTEA money or at the state level where you can come up with a model to put some money into and do enforcement. That's really going to be, I think, the only way that's, obviously, what worked in North Carolina, to some degree.

You got some attention. You had to have the political leadership, and I agree with everything the Colonel said. You've got to have somebody willing to take the heat. But usually people are more willing to take the heat if they get some money out of it.

MR. HOYT: I'm sure that improves their motivation. The piece, I think, that concerns me with regard to that recommendation is that the funds, if they are established from whatever resource, need to be dedicated to accomplishing things that we know work. Just throwing money into a pool or creating a pot that can be drawn on for whatever purpose does not solve the problem. If we are really earnest about solving this problem, we have got to dedicate the precious resources we can find to things that work.

MS. DEWEY: Right. And we don't need to preach to the choir of folks who are already wearing their safety belts. It's the high risk folks that we've got to get buckled up and who are not buckling their kids up.

CHAIRMAN HALL: Well, I don't know that—when you've got only 50 percent of the—the only figure that I figure that I rely on is the fatalities. The rest of it is somebody, you know, looking in windows of cars. And the fatality figure is real. And that's—you know, we can put up here 68 percent and say we're doing real well, but the truth is it's 50 percent.

MR. HURLEY: And less for kids.

CHAIRMAN HALL: And much less for children. It's an opportunity—well, now, I've kind of just gotten into—I have an opinion on this, Senator, because I spent six years working in the Governor's office in Tennessee trying to—and we were always trying to figure out how to take the money the Federal Government gave us and use it for what we wanted to do with it.

(General laughter.)

CHAIRMAN HALL: So anyway, this has been a very useful panel. Does the Technical Panel have any other questions?

CHAIRMAN HALL: Well, let me pass it down—

MR. HURLEY: —60 seconds for a personal concern?

CHAIRMAN HALL: Well, I'm going to give everybody an opportunity for a last shot. And, Mr. Hurley, we'll just begin with you or begin with the Colonel and pass it down this way. I know he's a Major, but I promoted him.

MAJOR PRICE: I certainly appreciate that, if you've got the money coming with it.

(General laughter.)

MAJOR PRICE: I don't have much more to add. I would be remiss if I didn't recognize Joe Parker who is here. I just saw him about an hour ago. I didn't even know he was even here. He's been very instrumental. He's the chair of our Governor's Highway Safety Program.

CHAIRMAN HALL: And let it be noted that we invited Governor Jim Hunt to be here, and I regret that he couldn't be here. We've been trying to do everything we can to point to the North Carolina model, not that other states aren't doing a good job, but that's one that's been a cooperative effort that's worked.

MAJOR PRICE: Anyway, I wanted to recognize Joe. And I'll say it again, I think it's education, enforcement, continued education, and continued enforcement. Once the enforcement drops off, usage rates drop off. And we've proved that time and time again. And I've enjoyed it. Thank you.

CHAIRMAN HALL: Thank you.

MR. HURLEY: Just a brief personal concern, Mr. Chairman. These are some of the toughest, most complicated issues I think any of us have ever dealt with. And in recent months and in recent days, I think there have been unfortunately some sensationalized coverage in the media and some self-promoting statements by some witnesses here at this proceeding.

I think that does a disservice to the families that have lost kids. I think it does a disservice to the families whose kids are at risk across the country. The only way we're going to solve these very difficult problems is by lowering our voices and rolling up our sleeves. And talking about it won't change that. I mean, we need to start doing the things that we've been discussing here. And that sensationalized coverage and self-promoting statements, I think, they get in the way of that.

CHAIRMAN HALL: Thank you.

MR. HOYT: I understand, sir. Mr. Chairman, it is a sad history that brings us here today. I do not think it reflects in any way what—what has happened in the past does not reflect what is happening today. More importantly, it does not have to dictate what will be in our future. Air bags need technological improvements. And it's clear that the course has been taken to make some of those and there is a significant effort to go forward from even those things that are now being proposed and are available. Those changes need to be made.

Someone early in this process said we need to make a major cultural change with regard to occupant protection laws and their enforcement on the books. And Mr. Hurley has referred to the fact that we have never before been at a juncture where we find ourselves now, with a President who has committed to undertake a program, with the focus that we have in the media and otherwise on child passenger protection and the needs both from a technological prospective and from a behavioral perspective to address. I would only pray that we are successful in taking advantage of this very unique opportunity. And that we all roll up our sleeves, commit our resources, and make those efforts necessary to change what is before us.

The history, the lives that have been taken don't have to be lost. We don't need to see the kinds of losses that have brought us here today happen again. Many of them, most of them can be prevented. I hope that what we've done here today will have an impact on making those changes.

CHAIRMAN HALL: Thank you. Well stated. Ms. Dewey.

MS. DEWEY: I moved to Washington in June last year to take over the directorship of the Air Bag Safety Campaign and moved here from Louisiana after working years in child passenger safety and safety belt education. In February of this year, someone said, Janet, your attitude is not quite as southern as it was when you first moved here. There seems to be a little bit more directness in your conversation.

And I sat back and tried to trace what had happened. And I realized it happened in January this year when I was at my desk and got word that a child had been killed by an air bag and the child was riding on a lap. And I just really got sick, because, again, we've all tried to get kids in car seats for so long. And thought how much we've tried to educate.

And then a week later, another child killed on a lap. At that child, I got very angry and didn't know quite where to put that anger. And then a week later, it was another child on a lap. And with that one, I got very directed towards enforcement, and realized that there are people that will only learn by enforcement and we need to recognize that.

I think that the whole air bag issue and conversation over the past seven to eight months has made the country very aware of the potential trauma that is involved in a traffic crash. I really think that for a lot of us, it's very easy for us to think the crash won't happen to me. And if it does, I'll walk away with a scratch.

The fatalities that we've seen with air bags over the past seven months have made traffic crashes very real, and I'm very optimistic that we will have an opportunity to raise belt use rates through acceptance of enforcement and through stronger laws.

CHAIRMAN HALL: Senator Cullerton, thank you very much for being here. We really appreciate your attendance and your leadership, both in Illinois and nationally in this effort. We can all sit here and talk about political will and political leadership, but you have demonstrated. And, therefore, I think it's appropriate you get the last word.

MR. CULLERTON: Thank you, Mr. Chairman. I appreciate being invited. And I really want to also congratulate the people who have put together the Air Bag Safety Campaign, because both the car manufacturers and the insurance companies, I think they have done it without a gun to their head. They've done it to help pass some legislation that will save lives.

I also wanted to—maybe I gave a misimpression by trying to be pragmatic and candid with giving advice as to how legislatures vote and how you get bills passed. I don't want to give the impression that all legislators are just sitting around waiting for some lobbyist to walk up to them. I mean, there's just a lot of pressures being a legislator. There is thousands of votes that we take in a very short period of time, and there's a lot of concerns, and there's very few legislators that have made this a top priority.

I happen to have done so, because I just feel that there is nothing else that we do in a state legislature that directly has an effect on saving a life. And that, to me, makes this so important.

But I did want, at the same time, give my practical advice to people as to how to go about trying to change the laws, so that we can save those lives.

And once again, I want to thank you very much for giving me the opportunity to be here.

CHAIRMAN HALL: Well, thank you. And we have two panels tomorrow and a half day of work to complete. And I think as a reward to everybody, we won't start at 8:30 in the morning. We'll start at 9 a.m. and we'll try to stay on schedule.

And I appreciate, again, the participation of everyone at the tables, as well as the observers in the audience for being here today. And this will conclude today's session.

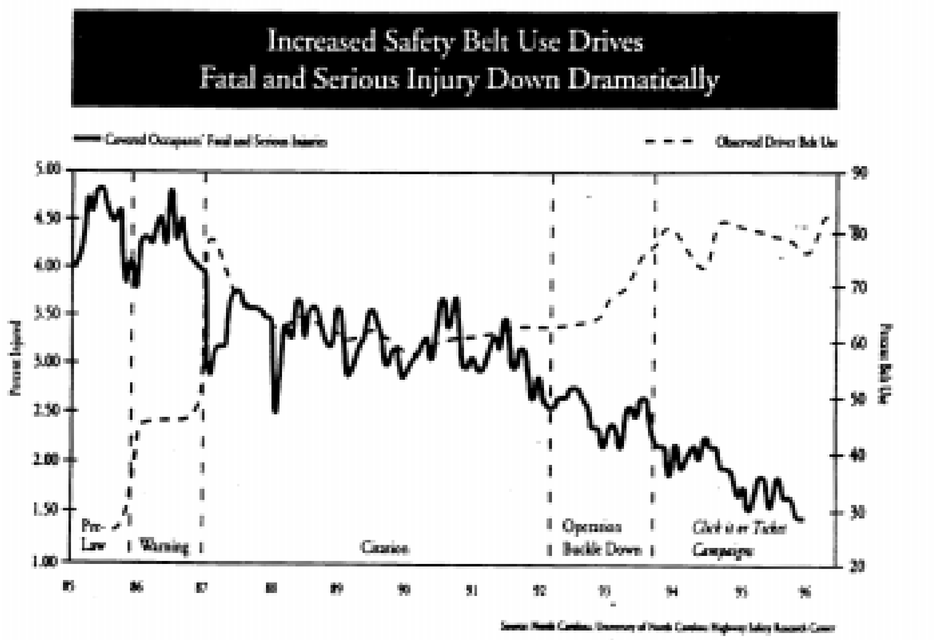
(Whereupon, at 4:48 p.m., the hearing was recessed. To be reconvened on Thursday, March 20, 1997, at 9:00 a.m.)

Increased Safety Belt Use Drives
Fatal and Serious Injury Down Dramatically

Standard Safety Belt Laws - The average safety belt usage rate for states with standard or primary enforcement safety belt laws is approximately 75% according to the National Highway Traffic Safety Administration. Data from North Carolina demonstrates that as safety belt use approaches the 70% range, fatal and serious crash related injury rates decrease.

High Visibility Enforcement - In North Carolina, "Operation Buckle Down" and more recently the "Click it or Ticket" campaigns resulted in dramatic decreases in injuries rates as part-time safety belt users and high risk drivers, including young drivers, began to buckle up. During the time period of October 1993 to December 1995, injuries to occupants covered by the North Carolina's occupant protection laws dropped by 14.8% while injuries to children age 0-5 decreased by 22.4%.

"Special Traffic Enforcement Programs" or "STEP" campaigns with focused waves of statewide enforcement linked to media coverage have been used successfully in Canada, North Carolina, Washington, Oregon and other states.



Slide 1. North Carolina data. (From Mr. Hoyt's presentation, March 19, 1997.)

Thursday, March 29, 1997

(Time Noted: 9:00 a.m.)

Panel 1

Design of Child-Friendly Back Seats

CHAIRMAN JIM HALL: On the record. I'll start this morning with a few brief comments for those of you who have picked up the *Washington Post* this morning. There is, on the front page of the Metro section, a story on three people killed in a collision on a rural Virginia road. Inside, another story about an individual who also lost his life to a drunk driver. So all we have to do in this job and in the positions that everyone in this room has is pick up the paper every day and find a reason for the work that we're doing both here and that all of you at the tables do so well in your particular chosen fields of endeavor.

As you know, I have given the panelists all an opportunity to have some closing remarks. At the closing session I would like to ask all the parties, not the tables, but give the opportunity to each party to also provide any brief statement that you might want to make. I want to mention that now so you have an opportunity to be thinking about it.

Obviously—I think we have about 12 different parties, so to work through those 12 people, and give everyone an opportunity to speak, it might be helpful if you either had some brief prepared remarks or had in your mind what you wanted to say, if you want to say anything.

Both panels today are on the subject of child-friendly back seats and child restraints.

The first morning of this public forum, we heard from both people saved by their air bag and people who had been hurt by their air bag, that children had to come first in designing safety devices for the car. Today's sessions will focus on children, what we can do to make the back seat of the car more child-friendly and how to make the car seats, themselves, easier to use. My children now are 21 and 19, but I can clearly remember how difficult the seats were, at that time. I was very interested and maybe a little concerned by the testimony yesterday of what's being done in Australia, and I would like to be convinced this morning that what we're doing in this country is as pro-active in looking after our kids as what evidently has been done in Australia. I will turn the session over to Elaine to begin then.

MS. WEINSTEIN: Thank you, Chairman Hall, good morning. For the record, I'd like to ask everyone on the panel to state your name and your organization. I will start with Mr. Baloga.

MR. BALOGA: My name is Tom Baloga from Britax Child Safety.

MS. MARTIN: My name is Artie Martin. I work for General Motors at the Safety Center.

MR. MAKEHAM: My name is Peter Makeham. I'm the director of the Federal Office of Road Safety in Australia.

MR. SHAPIRO: My name is William Shapiro and I work for Volvo in North America.

MR. WILLSON: I'm Howard Willson and I work for Chrysler Corporation in this country.

MS. WEINSTEIN: Thank you. I'd like to start out this morning talking about child restraints and compatibility with vehicles, and then we'll talk a little bit more about older children.

Mrs. Martin, I'd like to start with you. Can you describe the proposal for the universal child restraint anchorage system?

MS. MARTIN: Yes, thank you. This is the proposal that was proposed by NHTSA based on a petition submitted last summer by the domestic auto industry, a lot of the Asian auto industry, and the majority of the U.S. child restraint manufacturers, and we do want to thank NHTSA for their response and all the work they have also put in on getting this to this state.

Two parts, first of all, there's going to be some changes to the vehicle. And if you could put up the first overhead slide, please.

(Slide 1 shown.)

MS. MARTIN: What's going to go into the vehicle are two very small latch plates at the biteline of the seat. These are smaller than the ones that are used for the lap shoulder belt that everybody is familiar with, but of the same type of design. The third point—and if you'll switch slides, please?

(Slide 2 shown.)

MS. MARTIN: You can see that there is a top tether in the vehicle and that will be the third point that's in the car. And I'll talk in a few minutes about why this is there.

On the child seat, there will be special belts of some type. These are shown with a retractor and a buckle on them that will attached to that latch plate, and then a top tether on the child seat.

Very simple to use, very intuitive for the U.S. public. There was a study done of about 400 consumers at the beginning of last year, looking at each installation, we looked at this child seat, we looked at a number of other proposals, ISOFIX, the Canadian fix, and what we found was that of these 400 people, the majority of them were able to do this type of installation correctly, the first time, with just pictorial instructions. When they were asked for preferences, they also said this is what they liked best. We feel that this is because it is familiar hardware, it's easily used.

We've also found and NHTSA found when they did cost studies that this was a—an inexpensive way to make some major improvements for child seats. Performance-wise, this meets all the U.S. and the Canadian standards. It exceeds both. The performance is very good. Cost is relatively low and the time to get it to manufacture is relatively short, we're looking at a couple of years.

MS. WEINSTEIN: What problems will this system solve and also will you address what problems it won't solve?

MS. MARTIN: This should solve to a very large degree, the incompatibility issues that we see today. A three-point mounting is a very secure mounting, you have that for your forward-facing child. It will work very well for rearward-facing. There may still be some incompatibility there, but from the research we've done, it is greatly reduced when you compare to today's systems.

MS. WEINSTEIN: And are there any compatibility problems that it won't solve?

MS. MARTIN: Not that I am aware of.

MS. WEINSTEIN: Okay. Mr. Willson, are there other systems that are being considered in terms of a universal attachment?

MR. WILLSON: There is one other system that now bears the title "ISOFIX." It is essentially identical to the slides that you just saw, except that instead of a flat latch plate at the seat bite, there are presented two bars approximately 1/4 inch in diameter and about an inch long, and the other significant feature of the ISOFIX is that those two lower anchorages would be rigid rather than supported by belt material, in the long run; there might be some systems that have belts in the short term, but as—as vehicle designs evolve, they would be rigid.

We find that side impact performance and, for that matter, front impact performance is—is better with the rigid anchorages, and that ISOFIX design seems to be preferred by the European vehicle manufacturers and others. It would also have the tether anchorage and strap, and we have the Australian experience to look at there, and the Canadian.

MS. WEINSTEIN: Mr. Baloga, if and when a universal anchorage system is adopted, will it, in fact, be universal? Will all systems be the same or will there be variations on a theme?

MR. BALOGA: Well, by law, child seat manufacturers and car manufacturers will be required to offer at least the semi-flexible attachments in the vehicle, and child restraint manufacturers will have to accommodate this by having buckles on the child restraints, themselves. But the regulation as proposed, does allow for a rigid system, as mentioned by Mr. Willson, which would allow a manufacturer of a vehicle or of a child seat to have both systems, and this has a potential for confusion to consumers.

Depending on how you look at the attachments, there are advantages and disadvantages to both the rigid and the semi-flexible. But in answer to your question, there is a potential for confusion as to which system is best to be used by the consumer, which system will be used by the consumer in terms of whether the consumer uses all of the available attachments on the child restraint. The semi-flexible has a buckle on the left and a buckle on the right, and a top tether. The goal, of course, is to have all three buckled, which is what we all want, and hope for, and try to educate for, but there is a potential for some confusion. And I think the recommendation of this panel could be that this be investigated, and try to find a solution before a final rule is out. The proposal from NHTSA is still a proposal and they are asking for comments just such as these.

MS. WEINSTEIN: Is there a possibility that the tether straps and the straps on either side of the car seat are not going to be tightened enough? I mean right now we have a lot of problems with people trying to tightly secure their car seat. Is this going to continue?

MR. BALOGA: Yes, it will continue because the attachment of the uniform child restraint attachment proposed by NHTSA is a system that is a manual tightening. You could have automatic tightening with retractors. However, the question still remains how many of the systems with retractors that are more expensive will be actually put on child restraints. The expectation, I would say, of probably most in the industry is that the manual systems will be prevalent because they are least expensive and you are now expecting a parent or care provider transporting a child to attach an adult belt and buckle it in once. And with this new system, you will require three buckles to be attached and three to be tightened. At the minimum, the tether will have to be manually tightened. So, certainly, that is a concern of having child restraints that if all three buckles, hopefully, are attached, the next question is are they tight, which you lose performance, obviously, when they are not tight.

MS. WEINSTEIN: How badly is the performance degraded if one of the side buckles or the top tether, are misused?

MR. BALOGA: Well, obviously, I should mention that varies with the misuse. The performance, when the buckles are attached loosely, will not be terrible, it’s better than nothing, obviously. The worse case scenario is when a child restraint is not at all buckled. But when the child restraint is not tight, you lose some of that distance to the side of the vehicle in a side impact. The child’s head could strike the side of the car. The child’s head could strike the front seats. If the child restraint is in a front seat location, hopefully with the air bag turned off, obviously, the child could strike something in the vehicle if the child seat is not tightened.

MS. WEINSTEIN: Thank you. Mrs. Martin, did you want to make a comment?

MS. MARTIN: Just a quick comment going back to the science and going back to the clinics that were done. The percentage of misuse, of misinstallation with the rigid versus the semi-flexible, or the latch plate type anchorages, and this included tightening, was substantially less when the UCRA type system was used, and these were, again, non-trained people.

And things like not latching can be done with any of the systems that are proposed. There are technologies that may be available to give some indication back to customers, things like that, that child seat manufacturers and auto industry, are looking at to help with these potential concerns.

MS. WEINSTEIN: Mr. Willson?

MR. WILLSON: I want to point out that one of the recommendations of the Blue Ribbon Panel was that vehicle manufacturers provide training for their sales personnel to show customers how to install child restraints in their vehicles. And that training is underway at some of the domestic manufacturers now.

I feel that the ready availability of help in installing and learning how to install a child restraint in a vehicle is going to make a tremendous difference, when you consider misuse is sometimes just a matter of not knowing how to properly install a child restraint. I think there will be a big difference there.

MS. WEINSTEIN: Mr. Shapiro,

MR. SHAPIRO: Yes, I'd like to make two comments. One is the system that is commonly used in Sweden for child restraints is very different that in America. It's a vehicle-specific system of child seats where the child seat is attached securely to the vehicle. The system that we are describing here that has been proposed, is having a proposal to get the child seat that we use in America much more securely attached to the vehicle, specifically, in three specific points.

You can talk about the different systems that have been proposed and how people feel, but it's very important that when we move forward, that we educate people, educate dealers, educate the society, that they use the system that comes about in the proper way. That's a challenge for everyone in this room.

MS. WEINSTEIN: And an excellent lead into my next question. I was around in the '70s and '80s, when we had tethers the last time and they were extensively misused. We heard yesterday from Canada that they continue to have certain levels of misuse.

Mr. Makeham, in Australia, you don't seem to have that problem. Can you describe what's done to educate people and assist people in Australia with their tethers?

MR. MAKEHAM: Thank you. It's probably not true to say we have never had that problem. We have a fair low rate now, as I mentioned to you, 11% of some sort of maladjustment. But although the package has been in place since the mid-'70s, for 20 or so years, and has not changed fundamentally, for the first sort of 15 of that period, the clip was not specified in the Australian standard, which is the standard for the child safety seats and the other appliances. And what was specified in the vehicle scene was simply a 5/16ths UNC socket. So the appliance manufacturers provided in the kit with the seat or whatever it was, fittings to do that.

Now we found that there were people that were having difficulty in fitting those fittings to the cars. Although it would seem to us a relatively simple task, in many cases it wasn't. So in the early '90s, we reviewed the program—the main elements were the same but we specified in both the Australian design rule which applies to the cars and the Australian standard which applies to the seats and the bassinets and so forth, the clip which is now mandatory. And that is a very simple—the one I showed to you yesterday, the dog-lead clip, which, as I mentioned, was designed in the early '70s here in the United States. And that certainly has had a very, very powerful effect because it made a very big reduction in terms of the problems of fitting, because it's so simple to use and it's fail-safe.

So I think that covers the technical side. I think we did have a problem early on, but we've addressed it and I believe we've largely overcome it by making the device absolutely simple to use.

Now in terms of the fitting, the way it is done in Australia is that the State Transport Departments and the motoring clubs—we have a network of motoring clubs where you subscribe—you know, you pay your $50 for roadside service in case you break down. Now they provide a range of services to their members and included in that is a fitting station where they will check—fit or check your installation. So you've got a variety of—of state-operated and motoring club-operated.

Now these motoring clubs have got very, very extensive networks. Because they run a breakdown service, virtually, every town would have a local garage who would be affiliated with that motoring club that, you know, provides service for the motorist, and part of their duties would be this activity.

We also have public education materials which we direct at the child health centers, where the parents are and at the child health level, where parents are coming in. We also provide materials to doctor surgeries for display, so you sometimes worry about providing material, whether it's taken up or not, but by keeping it fairly simple and having other support mechanisms, it seems to have worked reasonably well, overall.

MS. WEINSTEIN: Thank you.

CHAIRMAN HALL: Now what are your opinions of the seat that NHTSA is talking about requiring in this company compared to yours?

MR. MAKEHAM: Well, the key element of ours has been the upper tether, and that was done for dynamic reasons to stabilize the appliance during a frontal crash sequence, so I'm a very strong believer in the—the upper tether. We use the seat belt for the rest of the restraint. Now the one I've seen described appears to be possibly even superior to that in the sense that it has very, very positive lower, provided it's correctly adjusted. The only thing I would make a plea is that it's simple to use. And I mean from what I've seen and heard, it is simple to use, because this simplicity is absolutely the key to the whole thing.

CHAIRMAN HALL: Ms. Martin, I guess, General Motors, in developing or looking into this system, looked at what Holden was doing and looked at what was being done in Europe, in coming up with this system?

MS. MARTIN: We did definitely look at what was going on in Australia and Canada regarding the top tether. In fact, it was the experience in both of those countries, which was contrary to what had happened here, that caused us to want to relook at that issue. And we were also involved to some extent with what was going on in Europe and what we had seen there. We had talked about what would be the next step, the next piece of information that would be needed to help drive the process towards a uniform anchorage and, in our opinion, that was to get a large sample of public data.

CHAIRMAN HALL: Mr. Willson, I was wondering why the Blue Ribbon Panel would have recommended that the responsibility for these proper restraint fitting systems or teaching people how to do this should be put on the backs of the automobile manufacturer rather than local government that are supposed to be responsible for public safety. And particularly since I have not seen or heard any stories of tremendous success that you can get a salesman who is working on a commission to sell an automobile and expect him to be trained to do 10 or 15 different things in addition to the one thing that's providing income for his family.

MR. WILLSON: We considered that and rather than the sales people, it's likely that another professional in the dealership would be the one to whom they would turn for that demonstration. At the International Auto Show in Detroit, I spoke to a salesperson—a woman who had been at a dealership for some eight years—and in discussing this, she said that she had the greatest longevity of anyone in the sales force and the one person next to her had been there for four months. So out of a staff of perhaps five or six people, most had been there for a matter of months. But then she and I discussed the alternative of perhaps having someone in the Parts organizations be the demonstrator and that's very likely.

As to why the vehicle manufacturers have accepted this responsibility, I think our interest began as long ago as the early '80's when, in the SAE Children's Restraint Systems Committee, we began to meet with the child restraint manufacturers to try and overcome some of the incompatibility problems. It's just that the emphasis has increased over the years and we are accepting that the way that we design our seats and belt assemblies, and there are obvious differences from one manufacturer to another, very much affects the way or the ease with which a child restraint can be installed.

Now with the new systems that we're considering, the child restraining anchorages are divorced from the vehicle adult belt systems and we can focus on the requirements for each, according to their use.

CHAIRMAN HALL: Were you here for the panel yesterday on the North Carolina experience where they, evidently, in their road blocks and everything, they were able to point out and correctly assist families if their children weren't properly restrained in restraints. I don't know if we're going to talk about the ISTEA money or the NEXTEA money and trying to get some money in enforcement, whether some of that might include trying to be sure that the law enforcement officials are there to assist and have this knowledge, as well. I think it's fine that the automobile manufacturers do it. I had some conversations with automobile manufacturers on the seats that are built in—what do you call those?

MS. WEINSTEIN: Integrated.

CHAIRMAN HALL: The integrated seats and they had trouble getting their sales people to understand the value of marketing that, and I can understand that.

MR. SHAPIRO: Just one quick comment. We were part of the Blue Ribbon Panel, also. But it's also very important in all of these issues to involve all parts of the society, the Government, the industry, private citizens, law enforcement. I don't think we should focus on one specific segment of the society. The fact pertains to this issue as well as others about child safety and passenger air bags.

CHAIRMAN HALL: But the recommendation, did that reflect that opinion or did it reflect that that's a responsibility of the automobile manufacturers?

MR. SHAPIRO: With regard to our involvement, the fact that our product is part of the problem, that's why we have become involved to the extent that we have. I've been involved in it for several years now, so I don't look at it as having changed very much, at least not for me. But I do see a tremendous emphasis now in training as many people as possible to show the customer how to properly install a child restraint.

CHAIRMAN HALL: Well, the problem, I think, you get into is that that's good initially, but then what happens when the child is ready to move to the next seat. I never had a problem with my kids, you know, in the infant seat, but then when do they go into the next seat and how were they properly restrained as they got older, that between being an infant and 12 years old. And I don't know where the continuum in being sure people have the right information is going to be.

Yes, sir, Mr. Makeham?

MR. MAKEHAM: I just want to make two points. In Australia, the owner's manual always has a section in it on how to install a child seat. Now the car companies will often tell me that that doesn't always work, people either don't read the manuals or, probably more particularly, don't have the mechanical aptitude to follow it. But that is certainly one course which is available for those that can.

The other thing, just to address the point you were just making, particularly with the bassinet, the child is really only in that for six to nine months, a relatively short time and a relatively expensive piece of equipment. And it is quite common in Australia for local government to have restraint loan schemes, which are subsidized by local government, where they are provided to the parent for that period for a relatively modest fee, and then, you know, they are hygienically cleaned and reconditioned, and passed on to somebody else, so the parents don't have to carry the full cost for that relatively short period.

CHAIRMAN HALL: That's good. Ms. Martin, is this seat compatible on an airplane, can it be used on an airplane?

MS. MARTIN: As proposed, it could be used with the seat belt on the airplane. As airplanes are designed today, there has been some preliminary discussions and looking at it by the FAA that say they might be able to put these same type of anchorages in an airplane. I don't know how far that has proceeded.

MR. MAKEHAM: I'm sorry to have to comment again, but in Australia, for intercity coaches, new coaches built since 1994 are required to have seat belts in them and that includes six seating positions with a child restraint anchorage, which is compatible with this, so there's no real difficulty in fitting it to the seat, and that could easily be, transferred to the aviation industry, I'm sure.

MR. BALOGA: Mr. Chairman?

CHAIRMAN HALL: Yes?

MR. BALOGA: If I could also add something to your question about the responsibility of the dealer versus the public health aspect and education. There has been a movement toward getting information from, for example, NHTSA, and from the health care providers and the pediatricians associations, and the academic people to getting this information collated and put together in videos. For example, NHTSA just released a video on protecting your infant. And there is a partnership that's on-going.

Materials are being received from these various sources and this helps alleviate the concerns of sales people who would be afraid to give out information for fear, of being sued if they give out bad information, and they certainly don't want to give out bad information, number one, because they don't want a child to be injured, but, number two, they don't want to be held liable. And with this partnership approach with information from NHTSA, as an example, and from the academic community, this information is—I wouldn't say untouchable, but it is coming from a source that is making the sales people much more comfortable, because it is a Government-approved and provided media.

So I think this partnership approach is working and there is a lot of influence on that.

CHAIRMAN HALL: I have a great respect for NHTSA and the individuals that are working their, and their commitment to safety. My experience, again, in State Government tells me that a lot of things the Federal Government tells people to do never gets down to Grundy County, Tennessee, and the only way you're going to get down to Grundy County, Tennessee, is through the sheriff, through the local automobile dealer, who is very popular. We were talking about $14 million yesterday and I compliment everybody, but there's billions of dollars in this country—there are several billion dollars spent just in the State of Tennessee on asphalt every year, and, you know, how we target some of that money to have effective programs, so many times these Federal programs, pilot programs get given to this section and then the State. Usually, in Tennessee, if it's a Republican governor, then all the pilot programs are in East Tennessee; if it's a Democrat, they're all in West Tennessee. So I mean the question is there a way to take just a small piece of this money and have what is the most effective way to get the information into the hands of the consumer, and I would agree with you that it's got to be a partnership, but it's got to also be effectively funded, and I think it's got to also have a State component to it. Yes, sir?

MR. WILLSON: I just wanted to add that there is an SAE Committee in the aerospace activity with members from FAA and from the airlines, and some of us from the SAE committee, that I chair, and we've been dealing with the issue of child restraints in commercial aircraft. The direction that seems to be taking now is the probability of the design and development of specific child restraints for that application, that would take advantage of the existing belt systems in aircraft seat. And the reason is it's just better to design specifically for that position and that restraint system.

Airline seats frequently are designed with a break-over feature that means that they are not compatible with rear-facing child restraints, for example, that are now used in automobiles. But there is an activity that's following that.

CHAIRMAN HALL: Thank you. Elaine?

MS. WEINSTEIN: I have one last question on the universal attachment and then we'll move to the older children. Can you retrofit both the vehicle and the car seat with the attachments that are being proposed? Artie?

MS. MARTIN: The car seat, itself, I can't address. That might be better at the next panel with the child seat manufacturers, unless, Tom, you want to address that one?

From a vehicle standpoint, there is a good probability that that will be able to be done. All the engineering is not done on it at this point, but there's high probability.

MS. WEINSTEIN: Mr. Baloga, can you address the car seats?

MR. BALOGA: Yes, I would say there is probably a zero chance of having a retrofit of older child restraints to the new system, the reasons being that there would be more reinforcements necessary at the attachment points. There would be new instructions necessary, new labeling. You would hope that when the child restraint has reached that point in its life where it's served one child, you would hope that it is passed on and not used much longer than that, to take advantage of the new technology. You want to use the latest technology to protect your children. And so for those reasons, I would say retrofit of child restraints is probably zero probability.

CHAIRMAN HALL: Are you all going to give a credit if I turn that old seat back in on a new seat?

MR. BALOGA: Thank you for that suggestion. We'll take it under advisement.

(General laughter.)

MS. MARTIN: One potential for the newer seats, with the older cars is for a large number of vehicles, provisions are in them already for top tethers, so that would be a possibility with—with older vehicles.

MS. WEINSTEIN: Mr. Makeham?

MR. MAKEHAM: Could I comment on that, Chairman, because many vehicles, particularly in the early days, were not fitted when the appliances first came out, were not fitted with the upper tether restraint, and the suppliers and the authorities, particularly Creslam and New South Wales did do a series of sled tests on popular models, which probably are not all that different in construction from what's in the United States. And with, you know, fish plates of a reasonable size—bear in mind, the forces for a child restraint are not excessive, they're not hard, they're much less than they are for a seat belt, you can get an adequate restraint which can be fitted by a competent mechanic to the floor pan and to the rear deck, provided there's metal in the rear deck, but the floor pan is no difficulty. So we've got a lot of experience with that and it doesn't appear to be any problems, provided they are competently fitted and there 's a reasonable fish plate behind it that'll spread the load.

MS. WEINSTEIN: Thank you. Mr. Shapiro, can you describe what Volvo's experience has been with the integrated seats in the back seats of your cars?

MR. SHAPIRO: Yes, I would be glad to. We have always been very concerned with child safety. And back in the mid-'80s—I think, specifically, 1987, we introduced an accessory as a cushion for the little older children. That was very well-received. We got a lot of good feedback about the safety of it. And then there was an evolution in the product development where in the early '90s—I believe in 1991, we started with the built-in cushion in the center rear seat of one of our sedans. First, it was as an accessory, and then it later became standard in some of our vehicles.

Talking to the Consumer Affairs people prior to this meeting, we got good feed-back. The consumers like it. What's very important also to mention is to use that built-in cushion in the center rear seats of our vehicles, you also need a three-point seat belt with it, which we have, and also a head restraint for that position. So in order to have that device, which does provide a high level of safety, you need to have other safety devices.

In addition to the safety aspects of it, what consumers said and what my daughter Jackie said maybe ten years ago when she was sitting in it, it's not only a safer position, but it lets the kids sit up a little bit so they can see out, and they also feel a little older and a little more mature. So it helps in that way, which is also very, very important.

MS. WEINSTEIN: Mr. Willson, Chrysler also has experience with the integrated seats. Would you discuss that experience and also what the thinking was from changing from using a three-point belt system to a harness system?

MR. WILLSON: I'm not sure I understand that last—

MS. WEINSTEIN: Didn't Chrysler originally have their integrated seats to be used with a lap/shoulder belt but then revised the system to use with an internal harness?

MR. WILLSON: We first installed the integrated seat in the second row seat of the mini van and on the left side. Both seats had a full harness. On the leftmost seat, it was possible to use it with the lap/shoulder belt, at that position, for older children, using it as a booster seat. In our more recent designs, we simply designed the system so that the five-point harness can be used until the child is in one instance 50 pounds, and in the other 65 pounds, depending on the vehicle. And, of course, we have the single center seating position—the child restraint is optional in the center rear seating position in most of our sedans, still available in the mini van as well, but we are not urging it's use with the three-point restraint. The belt doesn't fit as well as we had hoped, so we simply don't recommend it then.

MS. WEINSTEIN: The Chairman said this morning that the witnesses who testified on the first day unanimously said that we should be designing cars for children. I'd like to ask each of you, if you could make one change to the car to make it more child-friendly, what would that be? Let's start with you, Mr. Willson?

MR. WILLSON: Well, I think there should be built-in child restraints available. And I think the next step is the universal child restraint anchorage system, just as we were discussing earlier. That's probably the most significant thing that we can do.

MS. WEINSTEIN: Mr. Shapiro?

MR. SHAPIRO: Thank you. If I had to recommend one thing to do to help the safety of children, as Volvo has done, children should sit in the rear seat, being properly restrained.

MS. WEINSTEIN: Mr. Makeham?

MR. MAKEHAM: Children should sit in the rear seat, properly restrained. I think the universal seat mounting for children's seats in the rear seat—most parents want to do the right thing by their children and if the restraint mounting points were in the rear seat, that's where they'll put their children. I think it'll drive the policy along very nicely.

MS. WEINSTEIN: Mrs. Martin?

MS. MARTIN: I've got to agree with all three of my predecessors. We have to get children in the back. I think there's many things that all of the vehicle companies are doing today to try and make the child rear seats more friendly from belt anchor locations, things like GM does with its comfort guide, there's a multitude of things going on out there. But getting to the uniform child restraint anchorages and educating people to put their children in the back would be the two that I would put the most emphasis on.

MS. WEINSTEIN: Mr. Baloga?

MR. BALOGA: I would add to what my fellow panelists have said that I think as soon as practicable, all vehicles should have center rear lap/shoulder belts, and I say this as soon as practicable, because there are technical difficulties with putting lap/shoulder belts in the center position of the rear seats as far as anchorage strength. Station wagons are particularly difficult. Hat shelves have to be reinforced and so forth. But I think that the lap/shoulder belts have proven to be superior restraint systems. There are 13 manufacturers today that offer lap/shoulder belts in the center rear seats, so it is possible and it's happening. And these lap/shoulder belts are far superior to lap belts for attaching child restraints. Infant seats can take advantage of the shoulder belt routed around the front of the rear-facing seat to provide extra support. Lap belts with belt-positioning boosters are deadly for children, and we need to then educate parents and the legislators to require that everyone knows that children who are up to the age of eight, should be in some form of child restraint, and I think lap/shoulder belts in the rear could be a good start to that program, to get these children properly restrained.

MS. WEINSTEIN: Thank you for that support for the Safety Board's recommendation. I have one last question. Mr. Willson, Chrysler recently announced a large program to educate children about how important it is to be in the back seat. Will you give us a quick overview of how that program has been received?

MR. WILLSON: Well, we can't seem to keep the tapes on hand. They're being requested, even though they've been sent to all of the schools by now. But it's really an attempt on our part, and the others who worked with us, AAA among them, to bring about a cultural change. We want the children to be persuaded that it is cool to sit in the back seat and we'll show a little bit of the video and let you see it, and see what you think of it. But I've heard nothing but praise for the program and, frankly, I haven't had an opportunity to see the entire tape, myself, so can we show that tape now?

CHAIRMAN HALL: Sure.

(Video shown.)

MS. WEINSTEIN: Okay, Joe, can you turn the video off. I can't follow that video, so I'll pass it to the tables.

MS. MARTIN: If I could make just a quick comment, this film was excellent. I just want to clarify there are a lot of educational things being done with industry. There's a lot of partnerships being formed. GM's just contracted with National Safe Kids for a $10 millon and 5-year program of education. We've also been working on books and there's a video out and available to people, so there's a lot of this type of thing going on, along with what we've seen here today.

CHAIRMAN HALL: That's great, that's great. Let me ask you one last question before we move to the tables, what about pickup trucks, this attachment you showed, is that going in the pickup trucks or not?

MS. MARTIN: Yes, it will. The way the proposal has been written is if there is a cutoff switch, a way to turn off the passenger air bag, then there will be a position in the right front seat. If there is not a way to turn it off and if that truck has a rear seat, it will be put in a rear seat.

CHAIRMAN HALL: All right, thank you. Any more? Let's move to the tables then, Table Six?

MR. SANDERS: Thank you, Chairman. I am Robert Sanders of the Parents Coalition for Air Bag Warnings. I will be asking questions on behalf of three groups. First, from the Advocates for Highway Safety, a question for Ms. Martin and Mr. Baloga. If vehicles have the UCRA belt system only in the two outboard positions, could a child seat be installed in the middle position using the two inboard latch plates? Would this be an appropriate means of installing the restraint system?

MS. MARTIN: The vehicles that I have looked at so far, that is a very possible and probable way of installation. In fact, we feel that is one of the pluses from a vehicle manufacturer. You could use those two inboards and then the third position, the top tether, that will be there.

MR. SANDERS: Would there be a top tether in that middle position if you were using the outboard clips to secure it?

MS. MARTIN: Very likely, yes.

MR. SANDERS: The second question also from Advocates for Highway Safety, this is for Mr. Shapiro. If there were a built-in child restraint in the center position of each rear seat, would that improve proper restraint use?

MR. SHAPIRO: What I can say is about the Volvo experience with our built-in child restraint, that children do want to use that. It wasn't clear from the question if you were referring to children or restraint use in total of adults.

MR. SANDERS: The Advocates were interested in both situations.

MR. SHAPIRO: Right, the comment was about children and what we have seen, it gives the children and also the parents of the children that the child wants to use it. I really can't answer the question about adults.

MR. SANDERS: Finally, from the Advocates for Highway Safety, a question for Mr. Willson. For children too large for booster seats but too small to fit properly in a three-point belting system, it appears there is no appropriate restraint system for them. Upper adjustable anchorages are commonly used in the front seating positions, but not in the rear. Could you advise us as to what is being done to improve restraint fit for that class of children between ages 8 and 15?

MR. WILLSON: Well, first, there are belt-positioning boosters, which help fit the child up to perhaps the age of 12 or so, in the extreme. They raise the child and they usually, in fact, redirect the shoulder belt so that it fits better. As for adjustable anchorages, they are beginning to appear in the rear seating positions of vehicles. There are some on the road now.

MR. SHAPIRO: Can I can I make a comment about the question that was asked to me?

MR. SANDERS: Of course.

MR. SHAPIRO: Thank you. What we've also experienced is that if children are properly restrained, it's more likely that the adults are properly restrained, also.

MR. BALOGA: If I may make a comment, also, to the question about whether integrated child restraints would improve child protection, I am not aware of any integrated child restraints that will accommodate infants, that is birth to 20 pounds, and if you had an integrated child restraint and someone mistakenly installed an infant forward facing, this would most definitely be a dangerous situation. So with the caveat that these integrated child restraints are used properly, they have the potential for better use. But there is the possibility for misuse. You do need a portable child restraint for infants, until an integrated infant seat is designed and installed, which I'm not aware of.

MS. MARTIN: Mr. Sanders, you were also looking for design type things that could be done for the older children when they are out of a forward-facing child seat. GM has addressed that issue partially with the use and the encouragement of the belt-positioning boosters. When children have outgrown those or while in a belt-positioning booster, in many of our vehicles we also have what we call a child comfort guide which helps readjust the position of the belt for the child's comfort.

MR. SANDERS: Thank you, that's very helpful. Now from the Parents Coalition, a question for you, Ms. Martin. We understand that GM utilizes tethers in its child restraint systems in the Holden vehicles in Australia, and the testimony of Mr. Sparke the other day seemed to indicate that the field performance was outstanding. Can you explain, if you would, why it is that General Motors does not use tethers in its domestic vehicles?

MS. MARTIN: Provisions for top tethers are available in the vast majority of our vehicles here in the United States, if so desired by our customer.

MR. SANDERS: But it's not standard production feature?

MS. MARTIN: That's correct.

MR. SANDERS: Is it a standard production feature in Australia?

MS. MARTIN: I can't address that, I'm sorry.

MR. MAKEHAM: May I—

CHAIRMAN HALL: Mr. Makeham?

MR. MAKEHAM: What is standard in Australia is behind each rear seating position of a passenger car or large, four-wheel drive vehicle, they're all classified with the same standards. They have a mounting point which is 5/16ths UNC. It can be either on the rear deck, or in the case of station sedan on the floor or on the roof, but within a reasonable distance of the rear seating position, and that has a load requirement appropriate for the child restraint. So that's been mandatory in Australia since the early or mid '70s.

MR. SANDERS: Ms. Martin, as to the option of the tether in the United States, could you explain what promotional literature or information is available to consumers so that they are aware of the option?

MS. MARTIN: You are outside of my field, at that point, as far as specifics and I am afraid I can't address it.

MR. SANDERS: Mr. Willson, the Parents Coalition has been advised that the safest location for a child is in the middle of the back seat. Could you advise us as to whether Chrysler vehicles have a shoulder harness in the middle back seat of its vehicles?

MR. WILLSON: We do not have a shoulder harness in the center rear positions as yet. With regard to tether anchor fitting, though, we should point out that Canada has required provision for tether anchorages in sedans, and that provision has been made known in this country, in Chrysler products, in the owner's manual. We've advised our customers to go to the dealer for a tether anchorage kit to be fitted to the hole that is prepared for that purpose.

MR. SANDERS: But if I understand you, you're saying that Canadian Federal law requires that tether?

MR. WILLSON: Yes and will soon require that it be installed at the factory.

MR. SANDERS: But my confusion is, the fact that it's mandatory in Canada, what I don't seem to understand is why Chrysler does not place it in its domestic vehicles? In other words, do you need a mandate to do that or can you voluntarily do it in the public interest?

MR. WILLSON: I should say, first, that Canada some years ago asked the manufacturers to voluntarily make provision for tether anchorages and we did, we provided holes or locations where holes could be drilled for tether anchorages. And that was true for all of our vehicles, not just for those that were marketed in Canada. Now that their requirement is for a hole or a tapped hole for a bolt in those seating positions—all three seating positions in the rear of sedans, we have also made provision for them in our multi-purpose vehicles.

The difference is that in the near future, Canada, and for that matter this country, will require the tether anchorages to be in place and available, factory installed, not installed by the dealer or the owner as they are now. We do provide tether anchorage provisions and tether anchorages for those who wish them.

MR. SANDERS: I understand that, but given the apparent universal opinion that they are a very valuable safety device, I am confused as to why you only make the option available and don't simply put them in the vehicles. But that question is an esoteric one which can be put aside.

My next question for you then, Mr. Willson, is does Chrysler use pretensioners in the shoulder harnesses of models that are in Chrysler vehicles sold in Europe? Are you aware of any?

MR. WILLSON: No.

MR. SANDERS: Do you know of any other domestic manufacturers that place pretensioners in the vehicles that they sell in Europe?

MR. WILLSON: I am not aware of any, no.

MR. SANDERS: Ms. Martin, do you know whether GM places pretensioners in vehicles that it sells in Europe?

MS. MARTIN: I believe in some of our vehicles.

MR. SANDERS: Do you know what percentage?

MS. MARTIN: No, I do not.

MR. SANDERS: Do you know why then pretensioners aren't placed in vehicles sold in the domestic market?

MS. MARTIN: The pretensioner is not an item or a device that we have seen as necessary when developing the performance for vehicles.

MR. SANDERS: Is there a difference between the performance of the vehicles in Europe and in the United States?

MS. MARTIN: I cannot address that, I'm sorry.

MR. SANDERS: I had heard a disturbing piece of information, Mr. Willson, which I hope you can correct and tell me is not true. Do you know whether there are any American automakers who put pretensioners in their vehicles in Europe, but when they import them to the United States, remove the pretensioner?

MR. WILLSON: I am not aware of any.

MR. SANDERS: Ms. Martin, are you aware of any?

MS. MARTIN: I am not aware of it.

MR. SANDERS: And finally, on behalf of the Parents Coalition, a final question for Mr. Willson, you stated earlier that your product is part of the problem. Could you identify what features of your product make it part of the problem?

MR. WILLSON: The issues that came about as lap/shoulder belts evolved were things like the fact that buckle size was not fixed, and early on there were some child restraints that simply didn't have an opening large enough to accept some newer buckles that were being built, and I'm talking about back in the '80's when these problems were brought to our attention. Anchorage location very much affects child restraint performance, and anchorages were being moved more forward to improve restraint for adults. And child restraint designs were not changing and, therefore, there were incompatibilities. We began to address those voluntarily, and offered guidelines for both child restraint and vehicle manufacturers to minimize the incompatibilities.

MR. SANDERS: But am I correct that the contractors you place contracts with to design the different components do that according to your specifications?

MR. WILLSON: Yes.

MR. SANDERS: The incompatibilities you are discussing then are incompatibilities which arise from your instructions to your suppliers, is that the case?

MR. WILLSON: I don't know that we could say that the directions that we give to our vendors lead to incompatibilities. It was more a matter of awareness on the part of the vehicle designer that aside from his concerns about restraint use with adults, there were also child restraints using the same restraint systems. And we learned that we simply weren't aware of one another's problems.

MR. SANDERS: Thank you.

MR. WILLSON: So we began to meet for that purpose.

MR. SANDERS: I have only two other questions and these are from the Center for Auto Safety. They were just handed to me. If you'll bear with me, I hope I can present them properly. This is for Ms. Martin as well as Mr. Baloga. The proposed seat belt design does not address the fact that a significant number of people also fail to properly secure the child within the seat, itself. Some complain that the webbing becomes tangled in the harness clip—some complain that the harness clip is not used or used improperly. Has there been any thought given to this issue, either Ms. Martin or Mr. Baloga, or each of you, if you'd like to respond to that question from the Center for Auto Safety?

MR. BALOGA: If I understand the question correctly, it relates to adult belts that are currently in vehicles, is that correct, or the proposal for the uniform anchorage? If it relates to the adult belts currently in vehicles, then, yes, there is confusion, there are difficulties. As a parent of four children, I have scratched arms and so forth. It is difficult to use adult belts, they are not appropriate for child restraints, and that is the reason why the uniform child restraint attachment has been proposed by the industry and by NHTSA, so forth. So there is a problem and that's the reason for the proposal, to address that difficulty.

In terms of the potential for mixing up of webbing, on uniform attachments, the current proposal would minimize that, I would say, to the greatest extent possible. The belt webbing would be extremely short and relatively stiff, for easy handling. In terms of whether the proposal would minimize, this problem I would say, yes, definitely it would enhance consumer friendliness and minimize confusion and problems with webbing, yes.

MR. SANDERS: Also from the Center for Auto Safety, how will tethers work in a station wagon or a hatchback? And this is addressed again to Ms. Martin or Mr. Baloga.

MS. MARTIN: There's a number of locations and they are defined by law that we will be able to put top tethers. They may be able to go on the back of the seat, they may go on the floor pan in the back of the station wagon or a hatchback. It will be a design-specific, but it will be within the law.

CHAIRMAN HALL: Thank you. Let's move to Table Five.

MS. WALKER: Thank you. Lorrie Walker from the Blue Ribbon Panel and also the American Academy of Pediatrics, and I'm asking a question also from the Association for the Advancement of Automotive Medicine. First question, from my experience, the length of time that it takes for a parent to install a car seat generally has to erode the quality of the installation, and we've seen many parents struggle to get a car seat in. Based on your study, Ms. Martin, can you explain to us how long it took for people to put an average car seat in, compared to UCRA, compared to the ISOFIX?

MS. MARTIN: I do not have timing data. There was some taken when we did our study. I don't have it here and I don't recall the numbers, and it's a very subjective thing, as far as when they start, when they end. However, it was observed and people who have put it in typically comment that it is quicker and substantially quicker.

MS. WALKER: And what was the correct use rate among those three different samples? Can you just speak generally on that?

MS. MARTIN: We found about a 90 to 95% correct use rate with the UCRA type system versus about a 50% with the ISOFIX and a 70% with the Canfix system.

MS. WALKER: And with today's traditional seats?

MS. MARTIN: I don't have those numbers, but I have heard that it is well below 50%.

MS. WALKER: And what was the average age or educational level of your sample?

MS. MARTIN: Ranged from non-high school graduates to Ph.D.'s, it was a very varied group.

MS. WALKER: Australia has done a fine job of alerting parents about the need to place children in the back seat and they have also come up with a tether situation or a harness system for those children that must sit in the middle seating position, and I applaud you for that. I'm wondering what American manufacturers would do to encourage use of a tether for those cars that do not have a lap/shoulder belt system and is there any plan to encourage use of an existing harness system, such as the Easy On that's available now? I mean we're pushing children into the back seat, let's make sure that we're not pushing them into a lap belt only situation. Any plans, Mr. Willson?

MR. WILLSON: Tether anchorages are there now. It's a matter of installing the hardware at each of those positions, that's all.

MS. WALKER: I think we understand that, but I'm wondering what we've done to encourage people to use that. Is it in the instructions in the owner's manual or have we done anything similar to a book, like Australia has done, that really encourages use of that shoulder restraint for the middle seat?

MR. WILLSON: Using the tether anchorage for a harness, is what you're saying?

MS. WALKER: Correct.

MR. WILLSON: Beyond identifying the fact that the anchorage is there, we haven't emphasized it, but we certainly can change that as our owner's manuals change with regard to these new recommendations. There is only one product, is there not, that would employ the tether anchorage and serve as a full harness for a child?

MS. WALKER: I believe there's two now.

MR. WILLSON: Are there? Okay.

MS. WALKER: Basically, they've been used for the special needs child.

MR. WILLSON: Yes.

MS. WALKER: But there is certainly no reason that they couldn't be used for the child who is not A-typical.

MR. WILLSON: None at all.

MS. WALKER: But I guess what I'm saying is the education hasn't been there and not just from the industry, but from educators also, that is a viable solution? I would encourage you, Ms. Martin to look at the retrofitting of the anchor points. I know many parents are very anxious to improve the quality of their seating for the children in the back seat and you mentioned earlier that you're not sure whether that will happen, but I would encourage you strongly to do that.

We have another question in regards to the use of the tether. This is from the Association for the Advancement of Automotive Medicine. To follow up on Ms. Weinstein's question, there is tremendous concern regarding the lack of use of tethers based on past history. Is there any technology that would not require use of the tether and still give us the same performance right now?

MS. MARTIN: The proposal or the NPRM that NHTSA's put out has two levels of performance for any child seat with the UCRA anchorages. With the top tether, it would have to meet what is today the Canadian standard, which has a lesser head excursion. Without the top tether, it would have to meet today's U.S. requirement.

MS. WALKER: And last question, are there any plans for a universal anchorage in the front seat, other than in vehicles such as a pickup truck or a vehicle that doesn't have a back seat?

MR. SHAPIRO: Just a comment from Volvo. We strongly recommend that children sit in the rear seat.

MS. WALKER: But there are situations where families with more than three children will have to use a front seat position. That's just a regular fact of life. What will we do to encourage those families to provide a safe fit for those children?

MR. SHAPIRO: Remember that for some time, child restraints are going to have to be designed so that they can use either universal fitting or the lap/shoulder belt at a given seating position, so there will always be that.

CHAIRMAN HALL: Table Four?

MR. HUTCHINSON: Thank you, Mr. Chairman. Phil Hutchinson with the Association of International Automobile Manufacturers. Just two brief questions for Mr. Baloga. Could you please comment on how you see the responsibility of child seat manufacturers and retailers to provide instruction on the proper use and installation of child seats? And, in fact, do retailers have people available so that when you're buying one of these seats, they'll come out and show you how to use it in your vehicle?

MR. BALOGA: I can't speak for the other child restraint manufacturers but only for Britax and that is the retailers for Britax in the United States, about 300 of them right now, are trained in methods for teaching the proper installation of child restraints in various vehicles. They are provided with, for example, a test buck, which is a seat from a domestic vehicle with a certain type of retractor, and this buck is available to show customers the proper installation in the retail establishment. They are provided with videos. They are provided with literature. There is, obviously, an 800 number for questions. And I think a useful aspect from a child restraint manufacturer is that there is a box on the card that's returned for recall information, sent back to the child restraint manufacturer, and this box at the bottom of the card asks the question of the purchaser whether they were trained by the retail establishment when they purchased the seat, yes or no, and if that box is not checked, they were not trained, then there is a follow up made to that particular retailer and to that customer.

So in terms of what's happening out there, yes, there is a responsibility, in answer to your question, by the child restraint manufacturers and Britax is trying to aggressively pursue that, and I'm sure some of the other child restraint manufacturers have other programs.

MR. HUTCHINSON: It sounds very constructive. Thank you very much, Mr. Chairman.

CHAIRMAN HALL: Thank you. Table Two?

MR. VOS: Tom Vos, AORC. We have a couple of quick questions. For Mr. Willson, how widespread is the participation in the Blue Ribbon Panel by the range of child seat/infant carrier manufacturers as you're coming up with these proposed standards?

MR. WILLSON: Nearly all were participating and all are participants in the SAE activity, and many in the ISOFIX activity, as well.

MR. VOS: Thank you. Could you give us a sense of rough order magnitude the range of costs to customers between something like the standard anchorages versus the integrated seats.

MR. WILLSON: The cost of universal anchorages at the seating position as opposed to a built-in and integrated seat?

MR. VOS: Correct.

MR. WILLSON: Well, there's a considerable difference. It's a matter of dollars for the universal anchorage and on the order of $100 for a seating position as far as the purchase price is concerned for a child restraint.

MR. VOS: And the last question we have is do we have—and I'm not sure who I should direct this to, but do we have field data, at this point, to suggest the effectiveness of integrated seats as compared to the aftermarket seats?

MR. WILLSON: I don't know how many thousands of integrated seats we've sold and I'm not aware of an instance of serious injury or fatality in any of them.

MR. VOS: Thank you, no further questions, Mr. Chairman.

CHAIRMAN HALL: Thank you. Table One?

MR. BISCHOFF: Thank you, Mr. Chairman. Don Bischoff, NHTSA. First, I'd just like to say that NHTSA shares your belief that education should take place at all levels. As a matter of fact, the Blue Ribbon Panel recommended that NHTSA continue and expand its training efforts with many of the organizations that you mentioned, law enforcement and fire and rescue, and that's exactly what our Patterns For Life Program is designed to do. Cheryl Neverman will be on the next panel and hopefully she can describe in more detail for you some of those efforts.

I have a question for Mr. Willson. You said that side impact testing showed the superiority of the rigid system. Others have said that the flexible UCRA type attachment that allows a little lateral movement in a side impact crash may be more desirable. Can you explain the basis for your belief, what testing that you've done that shows the superiority of a rigid system in a side impact environment?

MR. WILLSON: There were tests conducted at the Transportation Research Laboratory in Great Britain, tests of both devices, and the—it's simply the case that the dummy responses in the seat that was rigidly restrained, the ISOFIX was considerably lower than those of the other flexibly restrained system. And there have been similar impact simulations conducted in Australia that showed the same result.

MS. MARTIN: A quick point on that, please. Although, there were test differences, most of these test were single incident tests. And when you start looking at test variation, those differences in many cases came very close to wiping each other out.

MR. BISCHOFF: Question for any of the three vehicle manufacturers, the NHTSA proposal is for two UCRA systems in the rear seat. Do any of the manufacturers have plans for also putting a UCRA system in a third seat position, if the vehicle accommodates three seating positions in the rear?

MR. WILLSON: Chrysler is considering it, yes. We are free, of course, to put them in other seating positions, especially in multiple seat vehicles, such as large and small vans.

MS. MARTIN: I was going to say that's an option that our platforms can look at and consider, and are, but with at least the semi-flexible, we've also got the option by having the third top tether of it is a single child, using the two inboard anchorages to support a child in that location or a child seat.

MR. SHAPIRO: We're looking at that, but no decision has been made. I mean it's still a proposal and many things can change from the proposal to the final rule.

MR. BISCHOFF: Also for the three vehicle manufacturers, as the title of this session suggests more child seat friendly back seats, a number of the rear seats right now are deep buckets, they are pretty narrow and sloping cushions which, in many cases, exacerbate the difficulty in installing child restraints. Is any research going on or any design changes that we can look to in the future that would make the rear seats a little more friendly towards child restraints?

MR. WILLSON: I think there is much greater awareness now than there was before in those concerns. The vehicle manufacturer also has the option of simply recommending that a child restraint not be used in a given seating position. And at least at point of sale, making it clear that it is not to be used with a child restraint.

MR. SHAPIRO: The only comment I can make about that specific issue is in our development process, we take into account concerns of children of different ages, as well as adults, for all of the seating positions.

MS. MARTIN: A very similar comment in that the awareness of child safety and the issues is very much in the forefront in the design process. That we also evaluate and do dynamic testing with child seats, with small children right through large adults, and also using the SAE fixture to help look for the incompatibilities, and all those things are being done in the design process.

MR. BISCHOFF: Thank you, Mr. Chairman.

CHAIRMAN HALL: Table Three?

MR. BUTLER: Paul Butler from Ford Motor Company for the American Automobile Manufacturers Association. I've a question for Mr. Willson. I think Mr. Sanders asked about, why tether anchorages are not available in U.S. vehicles and I think there are millions of vehicles on the road in the U.S. that have them, but how many child restraints are currently marketed in the U.S. with top tethers and about what percent of child restraints on the road now have tether straps that can use these built-in anchors?

MR. WILLSON: I'm not aware of any that are marketed with a tether strap in the carton. There is at least one manufacturer that offers a tether strap that can be purchased by mail from that company and added to that company's products. Most of those marketed in Canada, because of the difference in the excursion requirement, are marketed with tether straps installed. And it's simply not the case in this country. The standard was written in such a way to discourage the use of tether straps some years ago.

MR. BUTLER: I have another question for Mr. Willson. Do you believe that the differences between the U.S. and European anchorage requirements, particularly the long, slow loading of FMVSS 210, makes it difficult to put center rear shoulder belts in vehicles that don't have a sedan package tray?

MR. WILLSON: Yes, I do. I am aware that Volvo, for example, has a station wagon with a folding rear seat back, which is fitted with center lap/shoulder belt. I'd simply indicate that a concern in the industry is for the considerable weight that would be involved with the structure to support that. Nonetheless, I expect to see lap/shoulder belts in center rear seating positions in vehicles manufactured in this country before too long. I think they're being strongly considered for all new vehicles.

MR. BUTLER: And a question for Mr. Baloga. You recommended that center rear lap/shoulder belts be included in all vehicles, but Mr. Makeham of Australia showed an add-on harness that could be used in the center rear with a tether anchorage to protect a child in a vehicle that had a lap belt, and that system was available in the past in the U.S. Have you evaluated this type of harness?

MR. BALOGA: No, I have not evaluated that type of harness. The thrust of my recommendation for center rear lap/shoulder belts as soon as practicable was to take advantage of the belt-positioning boosters and infant seats on the market today that can use those to the best benefit, not to go in the direction of something that was unique and specific, and maybe not so easy to find.

CHAIRMAN HALL: Thank you. Any other questions from the technical panel at the front table? Hearing none, let me just make one comment and then ask any of you to make any closing comments you might choose.

Obviously, in this area, as in all our safety areas, we're trying to make progress, learn as we go, advance, and I applaud all that. I do think that we have a special obligation, now that the Federal Government and everyone has joined together with this Kids In The Back seat campaign, to try to do all we can in our manufacturing process to make that real and while it clearly is a safer place now, but make it an even safer place in the future, and I hope that the automobile manufacturers, internationally, will try to address the question of what can be done with the automobiles currently on the highway. It's just a fact in our country that as cars are traded, there is a huge used car market, families that have kids, the average income in the State of Tennessee where I come from is about $23,000, and there are a lot of people with large families that are put in smaller cars and telling them to go get a mini van or go do something else, you know, I'm sure they'd all like to, but the reality is they have to drive the vehicle they can afford. And if there are any improvements that could be made in the products on the road, as well as the future, I'm sure it would be appreciated by the American public. So let's start with Mr. Willson, any final comments or thoughts any of the panel would like to have?

MR. WILLSON: I hope that we can all stress that children should ride in the rear of the vehicle. I think that's very significant, very important.

CHAIRMAN HALL: Let me thank Mr. Shapiro. The letter I read yesterday from the woman in California that owned the Volvo, I asked Mr. Shapiro to call her and he called and had a 20 minute conversation with her, and I appreciate that very much.

MR. SHAPIRO: Thank you. Just a quick final comment, we believe very deeply that all levels of Government, industry, private citizens, should work together in resolving these issues of air bags and children. We should continue to work with the children, educate children, and hopefully when they grow up that it will be more a part of their life about safety, buckle up, sit in the rear seats. It does take time, but it's very important to do that today, so the problem will be resolved in future years. Thank you.

CHAIRMAN HALL: Mr, Makeham, we appreciate you coming. Surely, you and Mr. Sparke have come the longest distance to participate in this panel and we really appreciate it.

MR. MAKEHAM: Thank you, Chairman. I've found the whole seminar to be very interesting and it's been a pleasure for me, also. The messages I would give is get the children in the rear seat, have a universal system, but above all, keep it simple and support it in the field through education and enforcement. In Australia, the penalties for being a driver and having a child unrestrained are about twice what they are for having an adult unrestrained, so that you need the support through penalties, as well.

CHAIRMAN HALL: Thank you. Ms. Martin?

MS. MARTIN: Again, to support having everybody buckled. We need to have the children buckled appropriately, but the adults also must set the example and take the responsibility, and that's an important fact. Hopefully, all of us here are going to be able to help encourage that and work with it both from an education standpoint, from a regulatory standpoint by working towards the uniform anchorages and science-based regulation and also enforcement from the State and the local level.

CHAIRMAN HALL: Thank you. And Mr. Baloga?

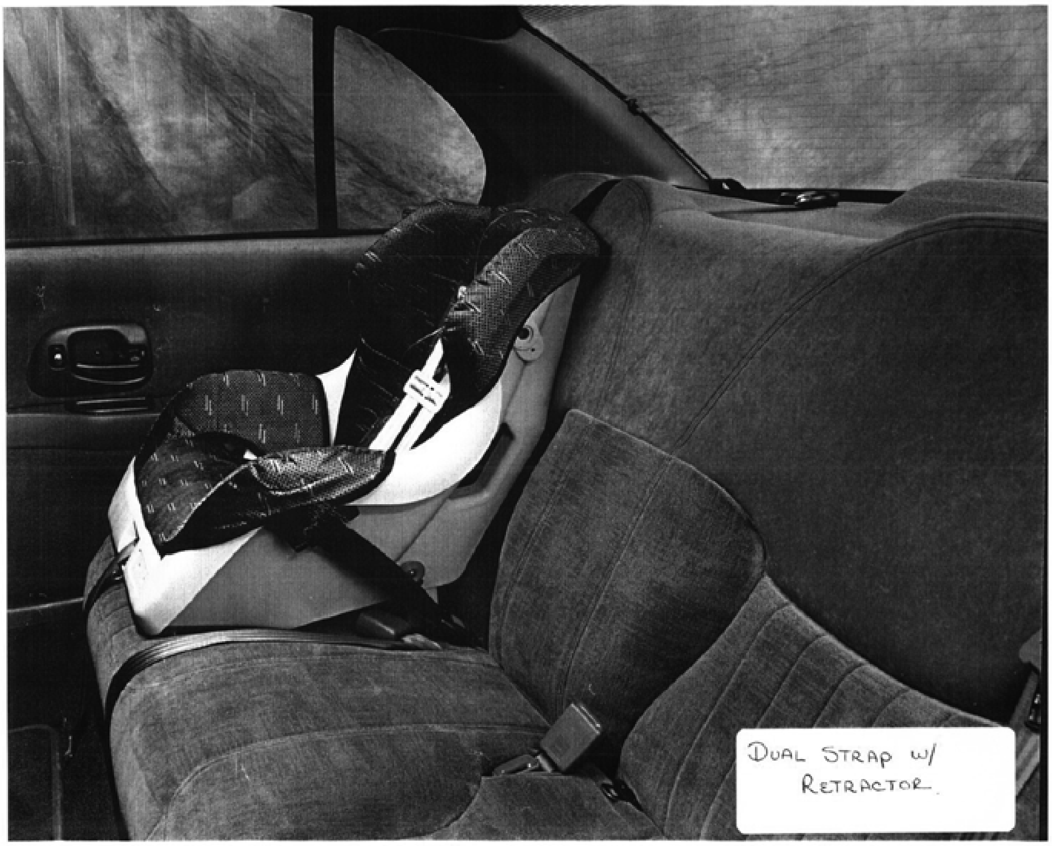
MR. BALOGA: Yes, Mr. Chairman. First, thank you to the NTSB for raising this important issue and giving a healthy push to get some issues resolved. And just very quickly, I would like to tell you that the uniform child restraint attachment issue has been an issue that has been aggressively worked on within the industry, and I can tell you some people sitting here in the audience and up at this table were meeting at 5:30 in the morning for video conferences to speak to Japan, and to speak to Sweden, and to Germany, and the United Kingdom, with the gracious help of General Motors Tech Center, their video conferencing, there was an awful lot of work done to promote uniform child restraint attachments, and industry and the Government have stepped up to the plate to make these child restraint attachments more user-friendly, and we need to make it unacceptable for an unbelted or unrestrained child in the rear. Thank you.

CHAIRMAN HALL: Well, I don't know that it's appropriate for me, but on behalf of the kids of America, I want to thank each of you for your work. You all obviously are dedicated in this area, as are most of the people in this room, but these two panels are, I think, extremely important due to the message that we're all now given on kids in the back seat.

We'll take a short break so we can continue on schedule and come back at 11:00.

(Whereupon, a short recess was taken at 10:45 a.m.)

Slide 1. Soft anchor. (From Ms. Martin's presentation, March 20, 1997.)



Slide 2. Dual strap with retractor. (From Ms. Martin's presentation, March 20, 1997.)

Panel 2

Design of Child Restraints

CHAIRMAN HALL: Well, we're trying to round up the other panelists before we begin here and then we'll be read to start. So I apologize for having to rush this break up but, I figured we are all going to want to try and stay on schedule as close as we can.

Let me again remind the parties that there is an opportunity for brief concluding comments, if you have any, at the end of the session. And in order for everyone to have an opportunity to speak, we need to be sure that those are as brief as possible.

Frank, I believe you have this panel and if you would do the introductions and proceed, we'd appreciate it.

MR. GHIORSI: Yes.

CHAIRMAN HALL: This last panel of the public forum is on the design of child restraints.

MR. GHIORSI: I'd like to welcome the panel and I would like to ask them to introduce themselves and give their affiliation, starting with Dr. Agran.

DR. AGRAN: I'm Phyllis Agran. I'm at the University of California, Irvine, a professor, Department of Pediatrics. I am also Director of our Pediatric Injury Prevention Research Group at the University. I'm a member of the American Academy of Pediatrics and on our Injury Prevention Committee, and I'm also this year President of the AmericanAssociation for Automotive Medicine.

MR. BALOGA: I'm Tom Baloga from Britax Child Safety.

MR. CAMPBELL: Dave Campbell from Century Products Company.

MS. NEVERMAN: Cheryl Neverman, National Highway Traffic Safety Administration.

DR. STALNAKER: Dick Stalnaker and I'm formerly from Ohio State University, no longer affiliated with them as of a few months ago, so I'm on my own now in the real world.

MR. GHIORSI: Thank you. Some of the design issues were covered in the previous panel, so we're perhaps going to concentrate on design issues that relate to installing the child in the child seat. However, feel free to add any other design issues that weren't covered in the last panel.

I'd like to start by requesting that the manufacturers describe what their most challenging design issue is in today's market.

MR. CAMPBELL: Well, in terms of talking about installing children in the child restraint, some of the challenges we have are designing restraint systems that can be very easily used by the care givers who are caring for the child and putting them in the child restraint, so they're used properly. And there is a lot of attention and focus paid to that so that they can be easily done with higher probability of correct use. The adjustability of the restraint systems to adjust to the different sizes of children. Children are coming home from the hospitals heavier than they used to, children are much healthier and weigh more than they have in the past, they're growing quicker, and when you take into consideration snowsuits and the size of restraint systems to accommodate the real use of your child restraint, those provide us with some significant challenges of putting the children in and designing for the ability to put them in easily.

MR. GHIORSI: Mr. Baloga?

MR. BALOGA: Another significant challenge, of course, is compatibility with the vehicles, the various seating configurations, the cushion angles, the different belt systems that are out there with different latch plates and locking mechanisms and so forth, and getting child restraints that perform properly and can be, as Mr. Campbell mentioned, properly installed is a significant challenge, conveying that information to the care provider in a manner that is straight forward and direct, and easy to understand is a very significant challenge.

MR. GHIORSI: Does the industry get any feedback from the real world experience in crashes, the performance of car seats in the real world crashes?

MR. CAMPBELL: We get a lot of response from consumers who use our product. We get many, many letters every week where people have been using our product, they've been involved in an accident and we get pictures of their children who were either uninjured or had a very minor injury as a result of the accident they were involved with. Quite often, the parents are very significantly injured, but the child comes through the accident very well.

We also get feedback, you know, on injuries that were involved. Typically, if there is an injury, there is probably a misuse of the child restraint or there is some intrusion into the vehicle compartment where that happens. So we do get a lot of communication and we take that very seriously, and it's great to hear the good news, but we have to really look at the injuries very carefully.

MR. BALOGA: Britax Child Safety has a very large development center in Germany and the center there goes out and visits accidents, does reconstruction, catalogs cases, and has a significant data base of accidents involving the Britax child restraints, uses that information, obviously, to go back into the product to see where things instructionwise, designwise, and so forth, need to be improved. That is a very, very critical step in the design process, this feedback from the real world. And, yes, it is being done.

MR. GHIORSI: It's reported that over 50% of child seats observed in accidents or at police checkpoints, are misused or improperly installed. Do you know, precisely where the misuse is, the major part of the misuse? Is it installation of the child in the seat or is it installation of the seat in the vehicle?

MS. NEVERMAN: Our patterns of misuse study that was conducted two years ago looked at a number of varieties of misuse. What they found in the study was that there was very rarely only one misuse, it was usually a combination. And, of course, that misuse can vary, depending on the combination of the child seat you're using, the seating position, the vehicle, the kind of belt system, the design of the seat, it really enters into a lot of different varieties. But the study pointed out that it was very rarely that it was just one misuse mode, it was often multiple modes.

MR. GHIORSI: Multiple modes.

DR. STALNAKER: Yeah, it tends to be, I think, two areas and I think you mentioned both of them. I think there is a number of misuses that are related to the interface between the child restraint system in the vehicle, and that's very high. If you got rid of that one, which is probably part of what we're here for, obviously, the integrated—or the universal seating positions—or seating systems and so forth, that would do a tremendous amount, to get rid of a lot of the misuse problems.

The other problem then is the one that's inside the actual child restraint system itself and its harnesses or whatever kind of tethering device there is, if there is one. Those two areas are primarily the misuse areas, and if we could get rid of those two things, we'd do pretty much everything that needed to be done as far as getting rid of the misuse problem.

Also, I'd like to throw in that, some of the research has shown that—and this is what gets into education that we've talked about earlier, a lot of the misuse—a lot of the people who are misusing the devices, you say, you know, you're misusing this and they go, yes, I know I'm misusing it, but I think it's better this way, so it's not just—I mean it's not just that the people don't know about it, it's that they know about it and decided willingly to do something else that they wanted to do, even though it's written on the child seat, or in the manuals, or in your automobile manuals. I don't know how you handle that, when they just say I don't like the rules, I'm going to do something else. But those are sort of the three areas that I've seen problems with.

MR. CAMPBELL: If I might add to what Dr. Stalnaker had to say, and that's the 50% misuse that you hear and the checkups can range anywhere from a minor misuse to a very significant misuse, can vary from not using a locking clip when one should be used. That contribution to an accident could be very minor, depending upon the situation. If the belt is loose because of that, then it could be a major effect. So that's a sum total of the use—misuses that are there.

I think one of the things that I'd like to add, too, as we talk about misuse is we're talking about air bags and issues with air bags, and we're bringing a lot of attention to that, but there are a number of other misuses that occur, that in putting the child into the seat are of significant issue, like using a rear-facing child restraint forward facing. That is a very significant misuse. And some of the work that we're doing can tend to overshadow that communication and we have to be careful as we go forward to recognize the key issues, and also include those.

MR. GHIORSI: Thank you.

MS. NEVERMAN: I just had one more point. What Dave just said about the forward facing seat, in our focus group study when we developed our air bag alert, that was one of the biggest issues we found was that parents would commonly respond to moving the child to the back seat, to face them forward so they could still see them better, and that's one of the problems we're really concerned about in the back seat message is that we have to—and we've worked very, very hard with the American Academy of Pediatrics to get a strong message across that it's still okay to have the child rear facing, but it is a real big problem because parents will assume if I have to move the baby to the back seat, I still want to see the baby.

MR. GHIORSI: Could you please describe, Ms. Neverman, the—NHTSA enforcement—education effort in the area of child restraint devices?

MS. NEVERMAN: In two days or less?

(General laughter.)

MS. NEVERMAN: Our education effort, which has certainly been enhanced greatly by our earmarked funding Patterns For Life over this, hopefully, three year period of time, is addressing a number of national organizations that we feel we can most effectively work with, and that addresses some of the questions you had earlier about how are we getting to local governments. One of the two groups that we've been working with an aggressive program are both the law enforcement community and the fire and rescue community. They are in every community. We feel very strongly that public safety education and awareness is vital at the community level and, therefore, we've designed two separate curricula, one is for the law enforcement called Operation Kids, the other one is for the fire and rescue community called Buckle-Up Kids. And that information in that curricula has now been expanded more recently to develop a brand new technical program that will be available and offer certification for instructors and technicians who take a much longer course. And we think that by creating awareness in a number of organizations, we're going to have people who are interested in doing this.

What we want to do is create a lot of people at the community level who know what they are doing, that includes emergency nurses, law enforcement, fire and rescue, Safe Kids coalitions, AAA, American Academy of Pediatrics, the Highway Safety Office networks that are out there, advocates who work with us on a regular basis, child care providers—we're doing a very aggressive program with child care providers and the Health and Human Services Department right now, too. It's a very extensive program effort.

MR. GHIORSI: Thank you very much.

CHAIRMAN HALL: How are you implementing that program effort, Ms. Neverman?

MS. NEVERMAN: How are we implementing the program?

CHAIRMAN HALL: Yes.

MS. NEVERMAN: We're working first to train people—

CHAIRMAN HALL: Do you go to their communities, how do you do this, I guess, from just a grassroots standpoint my commentary, again, on this is I've seen a lot of times you send out a video in the mail and some instructions, and tell people that, you know, go and do good and they don't have any money or they may not have the time. What is in place that makes you feel that this will actually be done in counties and communities across our country?

MS. NEVERMAN: I think what's new is that we have both the money and the time, and we have an incredible amount of interest, whether it's on the basis of what's happened with air bags recently or the incredible attention paid to misuse in the last couple of years. I think we have an opportunity here—a window of opportunity that we've been able to take advantage of with this earmarked funding. And the fact that our program aim or goal is to get it to the local level, it's not to create a few people at the national level that know something. We are creating a new technical curriculum that can train as well as a master trainer, it can train a technician who actually has a certificate in their hand, through the certification process, that says I've taken a standardized course in this, it's something that everybody else has taken, and I can conduct a child seat checkpoint, I can do this activity in my community whether it's with—in partnership with an emergency nurse and a local dealer, whether it's a Safe Kids coalition conducting activities with groups in the community, whoever it is, we have something for everyone, and we know that not everyone will be doing the same level of education. So what we're doing with the police is a little bit different than what we're doing with somebody who is willing to go a step further.

MR. GHIORSI: Thank you. Dr. Agran, should we be designing child restraints for the largest and smallest size child or the average size child for infant seats, toddler seats, and booster seats?

DR. AGRAN: To quote an often used statement, one size doesn't fit all, and if you look—you know, as a pediatrician, we have children of varying ages, varying sizes, we have little kids that approximate the size of larger kids, so you can't have one particular restraint, it's got to be adjustable and adaptable.

But I would like to add to the misuse comment, and for the record I think the gravest misuse is failure to use and we need to address that, as well. The other issue is when some reports say 50 to 80% of misuse out there, that's alarming for any device where we, as public health officials, medical officials, governmental agencies, and the private sector have, as a matter of policy, children must travel restrained, we get a product out there and we see 50 to 80% misuse, I'm alarmed.

And, obviously, there's multiple modes of misuse, as has been articulated here, but I would like to throw out for your consideration regarding child restraints as an assistive device. You don't give somebody crutches and send them out and say, here, use them. If any of you have tried, it's really complicated, and where you have initially a broken foot, you may end up with a broken hip because you don't know how to use the device. The same thing with child restraints. Parents need instruction and I would like to compliment NHTSA and I would like to compliment the Emergency Nurses Association for their stance that there need to be specially trained experts who know how to train parents to use these assistive devices. And I think as a matter of policy, I would like to see every newborn nursery, birthing center, and public health nursing center have a trained person who will see that that child goes home from the hospital properly restrained and has appropriate instruction, and I think that's just a starting point. But I would like to compliment those who have taken this forward-thinking position.

MR. GHIORSI: Thank you. Dr. Stalnaker, what has your research revealed regarding design and performance of child restraints when you're analyzing collisions?

DR. STALNAKER: I think there are several areas that have come up over the years in looking at child restraint system design. I think one of the first things is that the use of the child seat in the first place is primary, and I don't mean that you have to have it installed perfectly every time. I see many, many accidents with child restraint systems that are misused to a lower level and they still offer good protection. So they need to be used very well.

The number two thing, I think, is the simpler to use it, the better. The more complicated, the more belts you have to hook together, the more actions you have to do with the system, the more complex it becomes and the more chances for error occurs.

Number three, I listed, was the child seat needs to be tied to the car. To get the ultimate or the best performance, it has to be tied to the car so that it gets the benefit of the ride down that occurs from the crushing that's occurring to the front of the car, if it's a frontal collision. And that means that ideally, what you would like to do is to bolt the child seat to the floor, and then bolt the child to the child seat. And if you could do that, that would be the optimum position.

That is necessary when you start getting into severe accidents. When you get into the 30 mile an hour and above delta-V's, then you start to have to really take advantage of that extra two or three inches of ride down that you have in the car. You have to start taking advantage of having the child properly secured to the system and the child in the automobile.

And the last thing, I think, that I want to mention that was important from our research that I've done in the past is that child seats don't make the crash go away. I think what we need to do and what we need to understand is, and I think this is very important, is that there is a biomechanical limit to what your body can stand. You will start to come apart under certain forces, in certain directions, at certain levels. The energy is there and the potential for injury is still there, regardless of what kind of system you're in. And by going from an infant seat that's rear-facing to a child restraint system, a toddler system which is forward-facing, to a two-point belt, to a three-point belt in the car, each one of those systems are changing the load path that's going into your body, but it doesn't make the forces that are going in your body much different. It doesn't get rid of the energy.

So what happens is, we wind up changing the load path. We end up saying, okay, now the person no longer gets this kind of an injury, but because of design, they now get another type of injury. And so what I'm trying to say with this is that when we go to making changes from one type of restraint system to a completely different systems, like we're talking about using the three-point belts—I mean the three-point connection points for the child restraint systems, things can happen that we don't think of if we don't have the right tools to do the measurement, and I'm getting to dummies and biomechanical data, neck injuries, chest injuries, this kind of stuff. You need to be measuring the appropriate things with the appropriate types of dummies when you start going from one type of child restraint system to another. I mean right now we're talking about booster seats for child restraint systems and we're recommending booster seats—belt-positioning boosters for child restraint systems.

Those are being evaluated with a dummy that measures head injury criterion, when the dummy doesn't hit anything; it measures head excursion with a shoulder belt that can't go anywhere; and it's measuring chest deflection—I mean chest accelerations when the belts are putting direct chest loads on the dummy. So those three numbers that you use to decide whether that system is effective or not really had nothing much to do with the type of injuries a child would get with a three-point belt.

So as you go from one system to another, you need to have the biomechanical tools to look at and evaluate those injuries, and I think that's something we don't want to forget and just go on without taking a look at those things. I think that sort of summarizes the main point of what I've sort of put together over the years in research.

MR. GHIORSI: Thank you. Elaine, I think you have a question?

MS. WEINSTEIN: Yes, thank you. Right now, we have harness only seats, and we have harness and T-shields, and we have harness and full-shield seats, and we're talking about going to a universal attachment system to put the car seat into the car. I'd be interested in your comments on whether or not we should be considering a universal harness system, so that it would be easier for advocates to explain to parents how to restrain the child and easier for parents to put the seat in. I see Dr. Agran shaking her head, so we'll start with you.

DR. AGRAN: Okay. Again, as a pediatrician and as an advocate for parents and kids, you know, I see children every day in the office, and the parents will put the kid on the table in the car seat and I have to undo this thing and get the kid out to examine him, and it's complicated. You know, we're asking a lot of parents. We're asking them to be readers, to understand what they read in terms of the manuals, we're asking them to make sure they have a practically flawless performance when putting the device into the car seat, to tighten the harnesses, to make sure it's attached to the vehicle, and, you know, parents sometimes frequently have multiple children, the kids are squawking, they don't want to be restrained, it's a difficult task. So I agree with what you're saying and essentially I think the concept that I believe in is that we have to make this system as failsafe as possible and as easy to use as possible, and I would throw out maybe not to this audience but audiences that I speak to, how many have actually sat down and read their owners manual when they're not in trouble and don't have to. And if you have, do you really understand all the ramifications.

Now these owners manuals are very, very well-written, but I would contend that the average person, without expertise in the field, really doesn't understand it. And, again, I would urge a failsafe system. And I'd like—in fact, I wrote a note just before you made your statement, Elaine, about could there be retractor systems on the internal harness such that you avoid the issue of tightening the harness system.

CHAIRMAN HALL: Which do you think is more difficult, the child restraint or the VCR?

(General laughter.)

CHAIRMAN HALL: It sounds like we have about an effective use of both percentage-wise in our country.

DR. AGRAN: The VCR? Well, my child does that for me.

MS. WEINSTEIN: Mr. Baloga, do you want to comment?

MR. BALOGA: I think in terms of consideration for standardizing the attachment of the child in the seat, I think it's premature to do that right now. I agree with Dr. Agran that it needs to be as failsafe as possible. It needs to be simple. It needs to be as obvious as you can make it, without allowing the child to unbuckle themselves, for example. And it needs to be done in a manner that is as foolproof as possible. Parents are busy. Parents are under stress and so forth. But I think there still is a responsibility that, for technical reasons, children need to be restrained with belts in the proper position and as much as we would like to, we cannot stand there and put the belts in the proper position. The parents still need to remember to belt the child seat into the vehicle. Unfortunately, in Boise, Idaho, that was not the case.

We definitely have a responsibility to do everything technically possible to make it failsafe, easy to understand, easy to do, but there are limitations. And that's one of the reasons why we have to have good instructions, labels where necessary, and I think the market has a very strong voice to tell manufacturers this type of attachment is unacceptable, and manufacturers must respond, and I think manufacturers do respond—child restraint manufacturers to make attachments as easy as possible. The consumer has to be listened to for that development.

MS. WEINSTEIN: Thank you.

CHAIRMAN HALL: Ready to move to the tables?

MS. WEINSTEIN: Yes.

CHAIRMAN HALL: Okay. Well, we'll begin with, let's say, Table Five?

MS. ROEMER: Sorry, a little unprepared. Jane Roemer, National Safety Council. The comment is there is agreement with Dr. Agran that hospital personnel should have training, but should they really have certification. Does this not create a possibility of false confidence among nurses, at this time?

DR. AGRAN: Are you asking me?

MS. ROEMER: Yeah.

DR. AGRAN: Well, I do believe in certification as an ultimate policy, because then it assures some quality in instructing parents. If you've ever watched someone that's not certified to perform a task that they are required to do and failure to properly secure a child in a car seat can have fatal consequences, then I would have to go along with certification.

Of course, you're getting into liability issues which, you know, are not going to be avoided totally. But, yes, people need to be trained to train others how to use these devices, and I challenge any of you to go out there with a seat that's not known to you and a car that's not known to you, and get that kid properly restrained with all the systems properly secured and fastened. Again, you know, I'd throw out it's an assistive device.

MS. ROEMER: I think there is a lot of confusion over when a baby is too big to be switched from an infant seat—infant-only seat to a convertible seat, and from rear-facing to forward-facing, and I'm wondering how we can clear that up for the parent, and are we designing the seats that can keep the child rear-facing as long as possible?

DR. STALNAKER: I'll take a shot at each part of that, at least try to. There's a question with infants of development, and what we're talking about in the forward-facing direction is that what we're really doing is we're now supporting the child with the shoulder straps and some kind of a torso device, and we're letting the head and neck be free. And that's not an age thing. It's not necessarily a size thing. It is really a matter of coordination, which means that under the dynamic loads of an impact, the forces are being just transmitted right straight through the spinal column, they are being transmitted also through the muscular system that's around the neck which is tight and in some kind of a semi-constricted position. So if the child really has no muscle tone in the neck, then he's not able to carry any loads through there, and most of the forces then are put right straight through the spinal column, which then causes stretching and neck injuries.

So to say, okay, the child is so many months old or so many days old or so many pounds really doesn't say whether that child is able to hold its head up and has enough muscle strength. So the way I try to get around it is just to put it as high as possible. I mean you don't—I mean there's no problem with having the child too strong facing forward-facing, it's a matter of having them too weak. So we've just changed the Standard 213 from 20 pounds where they turn the child around, to 22. I think that's probably still too low. I would prefer something like 25 pounds. I'm not in that area of actually going out and testing children, and knowing exactly what their muscle strengths are, but from what experience I have had, it seems like by the time the child's 25 pounds or an equivalent to 25 pounds for a mean weight for age—25 pounds might be a heavy child. When I say 25 pounds, I'm talking about the average weight for a child's age, which is 25 pounds, so that I think that number, that age is probably enough that kid's muscle tone and muscle development in his neck is probably about as good as it's ever going to get as far as being developed.

So what I try to tell people is to turn the child around and let them be rearward-facing as long as they possibly can. I have three people that are involved in either my company or in my direct household area and they're still running their children at above the 22 pound limit in the rear-facing, restraint systems that are the toddler type where the child's head is well down inside the structure. I check it every couple of weeks, and won't have them turn those children around until I am convinced that there's a problem with them in that child restraint system.

So I think, you know, something like 25 pounds. Right now, it's sort of 22 pounds is what the Government has decided is sort of a break point, but the manufacturer can go ahead and test their child restraint systems above the 22 pounds. They can run it rear-facing with the 30 pound three-year-old dummy, a 33 pound dummy, and then go back and specify something above that. And I think that's what you're going to see in the future, at least some of the companies that I'm familiar with will be extending those limits above the 22 pounds, because I think rear-facing is better.

CHAIRMAN HALL: I need to ask the panel to try and keep their answers as short as possible.

DR. STALNAKER: I used to teach and when I start talking, it's about 45 minutes.

(General laughter.)

CHAIRMAN HALL: I understand.

DR. AGRAN: I'd like to just add to that. Cheryl and I serve on the American Academy of Pediatrics Committee on Injury and Poison Prevention, and we spent hours and hours recently coming up with a revised statement on selecting and using the most appropriate seat restraints for children. And that statement, along with a nice diagram by age and weight characteristics, I can leave a copy with Elaine. It's in the *Journal of Pediatrics*, May 1996, and this was our best shot with multiple areas of expertise represented on that committee.

MS. ROEMER: Can the manufacturers respond to that, and also tell us how we can deal with a really young baby—a four month old or five month old that's already reaching that 20 or 22 pound limit, what can we do about that?

MR. CAMPBELL: Well, I can say that one of the issues we face and what's part of the confusion is because the weights of children range dramatically based on age. You can have a year-and-a-half old child that weighs 20 pounds and you can have a five-month-old child that weighs 25 pounds, so it's quite dramatically different, and the development of that child is quite different also.

There are seats coming and will be on the market that can be used up to 30 pounds rear-facing in the very near future. I can tell you that. We're recommending any seat that's out there that's currently used should be used the way the manufacturer has prescribed. And if a consumer with a child that has a need to be rear-facing longer because of their weight, they need to go and buy a seat that's capable of doing that.

MR. BALOGA: Our recommendation is to keep the child rear-facing as long as possible, and what that entails is you don't obviously want to have the child's head above the restraint, so the child cannot be too tall. You cannot exceed the weight limit of the child restraint by a large factor. Obviously, if the child restraint is recommended for up to 20 pounds, if you put a child 20.3 pounds in, there won't be a failure. But there are certain child restraints that are more sensitive to overload, for example, if it's being attached only with a lap belt as opposed to the support from a shoulder belt around the back, the shoulder belt provides extra support and could allow for an overload.

But, physically, the child needs to fit in the rear-facing child restraint, the legs can't be too long, the child will be unhappy and complain, and you just have a special condition maybe where the child at four months is 20 pounds and that has to be taken into consideration with some other kind of child restraint for special needs, a larger child restraint, for example, that can accommodate that child. But the physical development at four months, the head size versus the neck strength and so forth, I agree with my colleagues, that child should not be forward-facing. Physically, is not able to be forward facing.

MS. ROEMER: Thank you.

CHAIRMAN HALL: Any other questions?

MS. ROEMER: No.

CHAIRMAN HALL: If not, let's move to Table Four?

MR. HUTCHINSON: Phil Hutchinson with the Association of International Automobile Manufacturers. We had a question concerning age, weight, and height that Dr. Agran probably has responded to in her paper, so we'll look at her paper. Thank you.

CHAIRMAN HALL: Thank you. Table Three?

MR. WILLSON: To Mr. Campbell—

CHAIRMAN HALL: And if you could please identify yourself again, at least for the written record.

MR. WILLSON: I'm sorry, I'm Howard Willson of Chrysler Corporation. And for Mr. Campbell, Mr. Makeham showed an add-on harness, and we spoke of it in the last session as well, for the center rear seat that would work with a lap belt and a tether anchor. Century used to market such a device with its Safety-Ride booster. Do you know why it's no longer offered?

MR. CAMPBELL: That was before my time.

MR. WILLSON: I understand.

MR. CAMPBELL: But I believe what occurred is there was a change made to 213 which required that a child restraint that utilized a tether must also pass all the requirements when tested without a tether, and as a result of that regulation change, that product was taken off the market.

MR. WILLSON: And for Mr. Stalnaker, you mentioned the need to evaluate restraint systems biomechanically. Do you think the dummies that NHTSA requires for child restraint testing are biomechanically accurate?

CHAIRMAN HALL: Now does NHTSA have dummies? I thought they didn't have dummies? They have dummies?

MR. WILLSON: For child restraint testing, yes.

CHAIRMAN HALL: Okay.

DR. STALNAKER: The dummies that are now available, that are being used today, I think are not very biomechanically correct. But there is a lot of work going on, as Mr. Willson knows is that the new six-year-old Hybrid 3 dummy, the Hybrid 3 three-year-old, both of those dummies, along with the CRABI dummies and so forth, there is a whole new dummy family that's being developed right now that needs to be gotten into the system and gotten into 213 as fast as it can.

Started the design on the six year old dummy in '87, I think it was, maybe '89 when we finally got to it on a panel that I was on, and it's still being kicked around and trying to come up with criteria and stuff to get it going.

But I think the dummies that we're using now are not adequate. The ones that are on the line should be for a while.

CHAIRMAN HALL: Any other questions from Table Three?

MR. WILLSON: Just one other for Mr. Campbell. This wasn't my question, by the way, but do you think that compatibility of child restraints in vehicles is still a major problem now that passive belts have been pretty well dropped from vehicles and vehicles are required to have belt that locks to tightly secure a child restraint?

MR. CAMPBELL: I really believe that the compatibility situation has improved with those changes. We still have some issues that exist that those haven't addressed, and I think in the last meeting we talked about the contoured seat cushions and the humps in the center of the seat, and we're trying to put child restraints there and they're not very stable. And the forward belt systems, these belt systems are coming back. We're still dealing with the older ones on the market.

MR. WILLSON: Yes.

MR. CAMPBELL: But a lot of the newer vehicles are much, much better.

DR. STALNAKER: If I could just quick, with respect to the belts and the conversion of ELR's to ALR's, which Howard was talking about, there's no publicity on that, that I know of. I've seen nothing. I've never met anybody yet that knows that they could take their belt out and click it, and put it back. I mean it's sort of one of the great secrets, sort of like the three-point belts. That's my opinion. But I haven't seen much on it, so I haven't seen them being used. The people I've bumped into are not using them and don't know about it.

CHAIRMAN HALL: Okay, thank you. Let's move to Table One?

MR. BISCHOFF: Thank you, Mr. Chairman. Don Bischoff, NHTSA. We recently added the six year old, nine month old, and newborn dummies to FMVSS 213 and they're not as biofidelic as we'd like, probably, as Dr. Stalnaker has pointed out, but I'd like to—and we certainly have—are looking at the new Hybrid 3 dummies and will move just as quickly as we can to incorporate them into the standard, if that's judged to be appropriate.

What I'd like to ask the child seat manufacturers, have you had to change your designs of your child seat as a result of the addition of these dummies, and, if so, what kind of design improvements have you been considering?

MR. BALOGA: I'm not aware of any design changes that were made at all to accommodate the dummies. The child restraints by Britax are designed also for European dummies, so they perhaps have more flexibility or different characteristics, but I am not aware of any changes.

MR. CAMPBELL: I can think of a couple of changes that occurred as a result of that. One was now that we have a dummy that evaluates the size of the restraint system, we did have to make some minor adjustments to the sizing of the restraint system to fit the dummy that's been specified. Prior to that, all of our evaluations have been done with real life kids. But we have to pass the requirement with this dummy and we did have to make some adjustments.

Secondly, with the introduction of the six year old dummy, we have a belt-positioning booster seat that has an integrated harness, that the rating on that product was changed from 45 pounds for the harness system down to 40, because we were required to meet 213 with the harness system, and with the six year old sitting higher and the performance, we were not confident enough that every one of them would always pass, so we took the weight down.

MR. BISCHOFF: We also recently amended 213 to accommodate belt-positioning booster seats. I think we were only seeing something like 6% usage rate for booster seats in those age children who should have been in booster seats. Since the amendment, are consumers purchasing these seats now for the older children? Have you seen any change in sales level?

MR. CAMPBELL: We've seen an increase in the sale of booster seats for our company with this belt-positioning booster/harness booster combination, and the volume continues to grow. But it is not significant. We are not seeing the larger percentage of the population riding as you would have expected.

MR. BALOGA: There is good interest in the booster seats on the market from parents, as long as they are informed of the importance of using them, which I think is the critical issue. Most parents obviously want to protect their children and the usual answer is I didn't know, I thought that the law in my State said that children up to four years must be in a child restraint and after their four years, then they could be in an adult belt. When they are informed of the difficulties of lap belts across the tummy and so forth, parents are very interested in doing what's right for their children. But the key issue of education is something that needs to be addressed very aggressively to get the word out and also to change the legislation to address this gap where children is, one State I am informed, up to one-and-a-half years, they are covered by child restraint law and then they can be put in an adult belt—one-and-a-half years. I think these archaic laws have to be changed and the word has to get out.

MR. BISCHOFF: Dr. Stalnaker, you've talked some about the injury mechanisms that might occur to children and some of the dummies that are available to evaluate that right now. What injury measurement would you specifically suggest be added to 213 to evaluate the injury-producing effects of belt-positioning booster seats?

DR. STALNAKER: Well, the belt-positioning boosters, when you put a belt on a child, I think what becomes important is chest deflection, because that's where the load path is through the child; neck loads, particularly the lower neck loads, say, or the one that bends over the shoulder; and also then correct submarining evaluation capabilities, a biofidelic pelvis with biofidelic interaction between the skin and the pelvis, so that you get a real measure of the chances of submarining with that child or child booster system. So it would be pelvis, realistic thorax, and neck loads. I think those are the primary ones that we need to look at that we're not.

MR. BISCHOFF: Thank you, Mr. Chairman.

CHAIRMAN HALL: Thank you. Table Six?

MS. STONE: Thank you, Mr. Chairman. I'm Judie Stone with Advocates for Highway and Auto Safety. Our first question is to Ms. Neverman and to—also to Dr. Stalnaker. Should Standard 213 be upgraded to reduce the permissible forward excursion of the child's head, and should child seat upper tethers be mandated?

MS. NEVERMAN: Go ahead, I'll follow.

DR. STALNAKER: Okay. As far as mandating the tethers, I think that's probably in the future. I think that's probably what's going to happen and I think that's probably a good idea. Its time has come, I think. We went through all the problems in earlier years when people didn't use them and I think it's time. There is enough publicity, there's enough education on that, that I think the time is probably now for that.

The head excursion limits, I don't know that the numbers we have now are any—I mean if you do go to an upper tether restriction, that is going to pull the dummy back. It's going to load the dummy's chest and neck more, and that's why I say we need the new dummies to evaluate that. I think you have the Australian experience, you have the Canadian experience, which say these aren't problems, but that's not to say that you can't take a manufacturer who comes into the United States and decides that they want to start doing something different with the child restraint system that they didn't do in Canada or in Australia. And because shorter is better with a tether, you could say I beat the standard by 2 inches, and somebody else comes along and says my product is better, I can beat the standard by 3 inches, and as you pull back and back, you then can also start loading the neck improperly, and that's why you need to evaluate it.

So, to just arbitrarily say this is what we want to do, I think you have to be careful, because you can actually do things wrong if you don't have some way of monitoring what's happening as you go ahead and do that. So, you know, I don't think you should just make straighter, shorter head excursions without really looking at what the consequences of those are. You don't need them, actually, in the vehicle if you're going to not hit anything, so the real question becomes what do you need if you're in the back seat, you've got plenty of room, why tie the kid back as tight as you can and really snap the head over, why not let him have some ride down. So I think you have to look at it closely. I wouldn't go along with that, but I think the tethers are coming.

MS. NEVERMAN: I would agree with Dr. Stalnaker in the last part of the statement, and obviously we've already included the tether in our proposed rulemaking, so it's part of the picture now and potentially would be part of the picture very, very soon. I don't think anybody disagreed that the tether offered some enhanced protection and—some enhanced performance, excuse me, in the seat. It was eliminated in 1986 primarily because of the non-use of the tether or the misuse of the tether, at that time. It was asked of the child seat designers to come up with a seat that would meet the performance standard without the use of a tether and they have done so very well. But I think in our opportunity to move forward, this is a good opportunity to reintroduce the tether in a user-friendly manner.

MS. STONE: Okay, thank you. Dr. Stalnaker, you stated before that there are varying modes of misuse. The current child seat proposal addresses one of these modes, which is certainly a first step. However, has any thought regarding a solution to improving proper placement of a child within the seat, itself, been given? Other than consumer education, are there any design change ideas with respect to the harness and the harness clip?

DR. STALNAKER: Well, the harness clip, I think—I guess my opinion is the harness clip is a safety factor. Harness clips are not designed to do anything but to position the belts up close to the chest so that they are there in case of a crash. I said earlier people do not adjust the straps properly sometimes, pull them tight and get them properly adjusted, the harness tie helps correct that if you're not willing to put the belts on correctly.

If you put the belts on correctly, then the position of the belt is held properly. For example, in Europe, in regulation 44 it's not allowed, you can't even use it over there. They make it work through the belt harness adjusting system, so that the harness system, I don't think, is relevant.

As far as the belts, themselves, I think they've got to be made simpler. And that's that the emphasis has got to be put onto making it so that the—for example, the European buckle, again, has a self-ejection. You cannot false latch a European buckle. You put it in correctly, and it latches. If you don't put it in, it pops out in your face. So you cannot put it in and have it not latch. And I think things like this which makes it so that it becomes harder to misuse the belt systems, whatever belt systems they are, are going to make them so that they work better. So I think the emphasis should be on being able to adjust them with a little hand strap, being able to put the buckles together so that they cannot be misused is a way to go and improve that.

The problem we have over here is that we do have comments like we talked about, do we need to adjust the systems to optimize to each child's size. But when you do that, then you have to start taking the systems apart, because you need different size holes to do it. When you start dismantling them, then you've got yourself a real problem, because people just don't, in general, put them back together right. And when they don't put them back together right, then they don't work right. And so, you know, you've got on one hand you'd like to make it easy to adjust and easy to use; on the other hand, you want to make them fit one size changes around to fit the kid better. So you have a problem there. But simpler is better, I think, and I don't think one belt design system is going to be optimum for everything. I think it has to be to whatever kind of device you have.

MS. STONE: Thank you. I have two other brief questions from our table. For Dr. Agran and perhaps for Dr. Stalnaker, can you compare add-on child restraints with integrated child restraints in terms of both ease of installation and also safety performance?

MS. AGRAN: Well, obviously, I think that the integrated seat offers less opportunity for misuse versus add-on.

MS. STONE: Okay.

CHAIRMAN HALL: Good answer.

MS. STONE: Yeah, really.

DR. STALNAKER: He likes it because it's short.

MS. STONE: I think we're getting to the end.

DR. STALNAKER: I think as far as performance, if the systems are used properly for the right size child and so forth, I don't think there is any difference between the integrated and the add-ons. As far as ease of use, I think it's sort of obvious, we've removed one of the factors of installing the device in the automobile and so that would lend itself toward the integrated systems. But, again, you have then the problem of having one system that fits all, so you've got to optimize it. So, you know, I think they both have possibilities for misuse, but the integrated is probably better.

MS. STONE: Okay. And last question is what is the cost of newer seats—and I guess this would be probably for Mr. Campbell and Mr. Baloga. What is the cost of newer seats that will accommodate the larger, less developed infant? Are there plans to make this advantage available in a low cost seat, such as the Century 1000 or the Britax product?

MR. CAMPBELL: Right now, Century is going to be producing our Smart Move car seat, which will be rated at 30 pounds rear-facing. It is a more expensive seat than the 1000, but it is because of its unique design that allows us to do that. We will not be doing it in our 1000 series car seats. They won't perform the same way.

MS. STONE: Okay.

MR. BALOGA: Yes, Britax will be offering child restraints that will accommodate heavier children, but as far as cost, I don't know whether I could call them inexpensive. They are probably more expensive than you would expect because of the design configurations and features and so forth.

MS. STONE: Thank you.

CHAIRMAN HALL: Thank you. Table Two, the clean-up position?

MR. GREENHAUS: Doug Greenhaus from the National Automobile Dealers Association. Two hopefully short questions. The first one, Cheryl, do you know of any vehicle manufacturers that currently sell child restraints directly through the dealer body?

MS. NEVERMAN: The only one I'm aware of is Mercedes and that's a special system that was designed specifically for the vehicle. There used to be a number of them, but I'm not aware that anybody does. Go ahead, Howard, can you—Volvo? I'm sorry. Volvo sells their own. I apologize, yes.

MR. GREENHAUS: Okay. And that sort of leads me to the next question which is as certain smart air bag systems may utilize some form of a smart child's restraint, while it's early on, does the panel expect that these will be designed and marketed exclusively for the front passenger seating position, or will they also be useful and marketed directly for the rear seating positions, as well?

MR. BALOGA: The baby smart system that's used in Mercedes requires a baby smart compatible child restraint that's made—produced, manufactured by Britax, and the addition to that child restraint are two electronic devices that do not make it incompatible with any other seating position. In other words, you're not forced to use it in the front seat, but when that system is available in a vehicle, you can use it in the front seat to turn off the air bag. So the addition of the electronic device does not make it unsuitable for other locations. It's very transparent to the user, except for the name and descriptions and warnings, obviously, on it.

MR. CAMPBELL: We would hope, depending upon the technology that's selected for this going forward, that the cost impact to the child restraint would be very modest so that it could be a general mass-marketed product for use in any place in the vehicle.

CHAIRMAN HALL: Very well, questions from the table? Mr. Arena, or Mr. Sweedler, or Dr. Ellingstad?

MR. ARENA: If I can take just one minute, Mr. Chairman, to underscore Dr. Agran's concerns about the alarming problem of misuse. That's been around for a while. It's not just the United States, but it's in countries around the world. And the recent Safety Board investigation reports have focused on the human technology interface and how is that working. And with a 50 to 90% misuse rate, that's alarming, and I certainly support Dr. Agran's concerns. We really must solve this misuse problem.

MR. SWEEDLER: I have a couple of questions. One, we heard so much about the Australian tethered harness and there was an answer that was given here that was a little surprising, that cannot be used in this country because of current regulations. Do the panelist believe that the regulations should be modified so that type of a system can be used when the child's at an appropriate stage of development? Who would like to comment on that.

MR. CAMPBELL: You may have misunderstood my comment. Tethers can be included in the U.S. However, based on the historic pattern of misuse of the tethers, the Federal regulation was changed that if you have a child restraint designed which includes a tether and uses that for the performance, it must also meet the standard without the tether.

MR. SWEEDLER: Well, but obviously the harness would be useless without the tether, so it could never pass the standard. That's what I'm saying, should the standard be modified to use a system like this, because it's pretty obvious there's not a system without the tether?

MR. CAMPBELL: That's correct. I think in the new proposal that we have and in the NPRM that came out provides for testing to be done with the tether and the additional testing be done without the tether. But it still would preclude that particular design.

MR. SWEEDLER: Should the regulation be modified, that's the question.

MR. CAMPBELL: Well, I think it should be reconsidered, based on the new information that tether anchorages will be provided in the vehicle. That is new. That has the chance to change the pattern of misuse that caused it to go the other way.

MR. SWEEDLER: Okay. One other area, how does the consumer who owns a certain vehicle get advice on the best fit of the various child safety seats that are available in this country? What does the consumer do, please tell them?

MS. NEVERMAN: Right now, the consumer calls anybody they can call to get the answer. But we do have lots of solutions and progress, and one of the things we're doing and we've done it with a great deal of cooperation from both the vehicle and the child seat manufacturers and that's develop a CD-Rom program that we have actually tested the child seat in the vehicle in various seating positions, and once we work out the bugs in the program, so that everybody can use the program, we feel that it will be extremely helpful in replacing that individual conversation that takes a great deal of time.

MR. SWEEDLER: And how will that be made available? If the owner of a vehicle goes to the dealer where they bought that vehicle, would that be available?

MS. NEVERMAN: We'll make it available at the dealership, at the point-of-sale for the child seat. We would make it available to the customer service reps from the manufacturers. It would be on the hotline. It will be on the internet. It will be in the pediatrician's office, anywhere that they want to go.

CHAIRMAN HALL: Well, let me—I think that's so important. I really compliment you. If you can, I hope, move as quickly as you can on that, because the one thing I've learned, I guess, is all these seats don't necessarily—like we learned with air bags, one seat might not fit in a particular vehicle and how do you know? How much do these things cost now? My kids are grown.

MR. BALOGA: Well, up to $150.

CHAIRMAN HALL: Yeah, you drop $150 and you buy the wrong seat for the vehicle you own, trying to do the right thing. That's difficult. What do you think, Ms. Neverman, about the Australian, have you all looked at their tether and that system, what's the name of the system? Does that make sense, are you all taking a look at that or could you take a look at that harness and see whether that's something that—

MS. NEVERMAN: Well, I think we're—I think the agency is extremely responsive, at this time, to anything. We're certainly moving very, very fast with a lot of our rulemaking and a lot of our decisions, and I think that we're open to looking at anything. We do, however, currently allow the use of, for example, the Easy-On type of harness with a tether because it's for a special needs child.

CHAIRMAN HALL: Right. Well, let me thank, as I thanked the last panel, let me thank each one of you individually for what you do for the kids and kids safety in our automobile vehicles, and I'll ask any of you that have any remarks, Dr. Agran, if you would begin and we'll just take it down the road. If you have any closing comments that you'd like to make?

DR. AGRAN: I'll speak fast. First of all, thank you very much for inviting me. I'm honored to be here. I know many of you for over 20 years, you have a long track record in advocating for kids and their safety. Progress has been made by Governmental agencies, by the private sector, by consumers, by the public health and medical societies, and by the motor vehicle manufacturers, and it's by working together that I think we're achieving some solutions.

When I speak on this topic, I show a slide, which I probably should have brought, from the Sears 1947 catalog, showing the initial child restraint systems, which were not designed for safety but designed to just let the kids see out of the car. They had no structural integrity. And then in the '50s—and some of you may have been in these seats where there is a steering wheel in the child restraint system for you to hit your chest against. So there has been tremendous—

CHAIRMAN HALL: I remember that.

DR. AGRAN: Do you? So do I. Anyway, we've made tremendous progress and I can see that the field is alive with innovators who will make further progress. Two issues that I'm concerned with that didn't come out. One, you mentioned the resale of child seats. I'm sure you will all agree, for a variety of reasons, resale is risky because you don't know the history of that seat, you don't know the crash history, you don't know whether the devices are all there. Frequently, the manual is not sold with the seat, so as a matter of policy, I do not advocate resale. And a friend of mine brought me a used car seat she got at a garage sale and it cost her 50-cents, and unfortunately someone threw it away, but I wanted pictures of it, it had no attachments what so ever. It was a seat with a piece of plastic. And, unfortunately, parents, not knowing, are purchasing these.

The second issue that I didn't hear come up this morning that I'd like to mention is that we are a multi-cultural, multi-linguistic nation, with varying economic levels and varying education levels, and we really, in my opinion, have not adequately targeted all levels in this society with the informational materials. We haven't addressed the costs and whether certain groups can afford them, and I think while we're here at the forefront of developing appropriate seats, we have to backtrack a little bit and target those particular groups that may not be users or may be high risk for improper use. And, again, thank you.

CHAIRMAN HALL: Thank you. Mr. Baloga?

MR. BALOGA: I would just like to say amen to what Dr. Agran just said that if we can have enforcement, enforcement, enforcement and easier to use systems, I think we will go a long way.

CHAIRMAN HALL: Mr. Campbell?

MR. CAMPBELL: I would just say that, you know, in listening to the discussion today and hearing all the topics, that one of the challenges we have are we're faced with a lot of demands. We're dealing with air bag issues. We're dealing with compatibility issues. We're dealing with trying to come up with universal child restraints, anchorages to go forward, and these are all consuming our time and our communications that go out there, and it needs to take a lot of coordination, a lot of very careful communication so that we get the message out and we get it out right, and that we deal with and don't make mistakes going forward, creating more compatibility problems, that the seats are easy to use and both for the user who has the new vehicle as well as the user that has the older vehicle out there in trying to use these child restraints.

CHAIRMAN HALL: Okay. Ms. Neverman?

MS. NEVERMAN: First, I'd like to say that effective partnerships have brought us probably to the point where we are today. I think that we've never seen the people in this room talk to each other so freely or so often as we have in the last couple of years, and I think that's—that's really helped everyone. We can't—no one agency, organization, industry or advocacy group can work alone. And the fact that we have been working in partnership has helped us to really move forward with a number of issues.

Secondly, I'd like to, if you don't mind, bring a message from Dr. Martinez, who asked me to pass this on to readdress the issues that were opened up on Monday, and that with the children who have been killed or injured in air bag crashes, his statement to you is this, that most all the children were totally unbelted and some improperly belted. We recognize that children like to move about and that keeping both the lap and shoulder portion of the belt on properly is very difficult to do, despite the parents' best intent. That is why we have said that the safest place for children is the back seat, and that's why we are taking additional steps to make it easier to restrain children, such as better adjustments and easier to install child seats. We are pleased to see manufacturers re-examine ways to make the back seat friendly, and he says thanks very much.

CHAIRMAN HALL: And thank you for bringing that message. Please take my regards back. Dr. Stalnaker?

DR. STALNAKER: Yes, first I'd just like to thank you all for having me here and I'm very proud to be able to be involved with this program. The main comment I think that I've really seen over the last number of years is people and groups can get things done, if all the groups want to get it done, and that's the cooperation that we see that's going on around here, and I'd like to just keep encouraging that and say that let's all get together and work on it, and get it done. Thank you.

CHAIRMAN HALL: Thank you. Well, what I'd like to do now, if the panel wouldn't mind just keeping their seats for a minute, is to go through the parties to this forum and give them an opportunity for any brief closing remark or no remark at all, of course, is accepted as well. And then the Chairman will have some brief closing statements and we'll bring this public forum to a close.

I'll just begin with the Center for Auto Safety. Is anyone here from the Center for Auto Safety?

MS. ASHUTOSH: Yes, I'm here from the Center for Auto Safety. My name is Anu Ashutosh. Just very quickly, we thank you for the opportunity to participate in these discussions over the past few days, and everything has been said pretty eloquently, especially by Dr. Agran and Ms. Neverman. Thank you very much.

CHAIRMAN HALL: Thank you. The Association for the Advancement of Automotive Medicine? They are not here—

MS. WEINSTEIN: No, Dr. Agran is here.

CHAIRMAN HALL: Oh, right, right. Right, Dr. Agran, do you have anything else? I think you were very eloquent in your remarks.

DR. AGRAN: Thank you. And I can't be a party participant, because I'm a panel participant now. Thank you.

CHAIRMAN HALL: Okay, good. The American Automobile Association? Are they—their representative still here, yes.

MR. TERRY: Can you still hear?

CHAIRMAN HALL: Yes, sir, there.

MR. TERRY: I'm Tom Terry from General Motors, speaking on behalf of the American Automobile manufacturers. We also thank you for the opportunity you provided for getting these diverse groups together, particularly I think you should be proud of the experts that you've assembled. I think you have your pulse on who knows what about what, and we think we've all learned from them.

We think this forum has provided really a focus on two separate but really integrated issues. They are both the engineering issues, of course, which we have a prime responsibility on, and the human behavior issue, which we're finding more and more is extremely important.

As far as the engineering issue, we're looking forward to accepting the challenges before us. We have one on depowering. We're going to go at that as soon as we can. We're going to continue to work with the NHTSA and our suppliers regarding the advanced technology that you've heard about today or in previous days. However, we caution everybody, there are trade-offs to be made and have to make those trade-offs, and hopefully we'll do that with all the interest in mind.

We've recommended a priority system by which consideration will be made, and our recommendation is that the belted occupant first, do no harm to the children or others, and then deal with the unbelted as best we can, giving the emphasis on the first two.

Whatever advancements are made, we want to make sure we identify the issue first before we charge into the technology. There is always a tendency to go technology first because it's interesting for engineers, but we need to identify the issue first. We are working with diverse groups and many of them are here today sitting at the tables on either side of us, and NHTSA, to help us establish that proper approach.

If rulemaking is needed, we think there are some models that we've heard of in the last four days that we ought to look to, particularly in the Canadian and Australian experience. And while not necessarily rule making, we did visit through the experiences of Australia, the issue of NCAP. The Australian model would support the efforts to really protect the community at large, including the children who are the focus of this forum, and it appears that the NCAP test works against that goal, and so we perhaps need to revisit that.

And then the final two panels have talked about the challenges we have ahead of us in accommodating the children in the rear seats and we're accepting those challenges.

The other main issue, the human behavior issue, we also, while we're hardware oriented, accept the responsibility in that area and we are participating in a number of efforts supporting the education and awareness which, in the near term, is going to get there probably faster than the hardware.

We'll continue to support those efforts and the legislative initiatives to get the primary belt use laws which we all think are extremely essential to moving the checker forward.

And, finally, as I think Chuck Hurley mentioned, we think those efforts on the behavior issues, are looking at also the successful models and the North Carolina experience was particularly of interest to all of us, and hopefully that can spread through all the states.

The issues of engineering and behavior seem to have one common thread and that is get everybody buckled up every time they get in the car, and kids in the back.

Finally, as was just noted by the current panel, one thing we've noted is, and we've been part of it, a number of very interesting coalitions have cropped up the past couple of years that weren't here before, and perhaps some of them got strengthened during this forum and perhaps new ones got formed during this forum, and I think that's quite an interesting observation and necessary. Someone mentioned the other day that leadership is essential and I think these coalitions are providing that leadership, so, hopefully, five years from now, we will not find it necessary to have another forum like this. Thank you.

CHAIRMAN HALL: Thank you very much. The Parents Coalition for Air Bag Warnings?

MR. SANDERS: Chairman Hall, words cannot adequately express the appreciation that our members feel for you, personally, the members of the Board, and your hard working staff. You are to be commended at the highest level for what you have done in putting together this forum.

Our comments really come in the form of two requests. The first request is to the domestic and foreign automakers. At present, there is a tremendous lack of information upon which parents can make intelligent decisions with respect to whether to purchase a new car that has air bags and, if so, how to—whether to exercise the right to deactivate it and the like. These decisions are presently—are going to have to be made in a vacuum. We would request and we would ask that you put in your submission to this hearing that will be filed within the next month, your response to our request which is that you consider supplying to the public-at-large your crash data that reflects the response of your air bag systems to all size occupants. The Federal Safety Standard, at the moment, unfortunately, does not deal with child size crash testing or a short adult woman crash testing, but we understand that you conduct those tests. We believe that information is urgently needed by the consumers and most particularly by parents.

We would also request in the way of information that you provide, in some form or another, information on a vehicle-by-vehicle basis, regarding air bag design specifications, given the huge variance in the current designs of air bags on a vehicle-by-vehicle basis. By way of example, we think it is urgently needed that the public know as to each vehicle things like the level of deployment force, the threshold, the excursion in to the compartment, the tethering of the bag, and the location of the module. These very fundamental pieces of information, we believe, are urgently needed in terms of consumer decision-making.

Our second request is to the National Transportation Safety Board. We believe this hearing has been extremely valuable in terms of discussing prospective measures to improve the design of air bags and child restraint systems. But as you have repeatedly remarked, Chairman Hall, there are 30 million vehicles on the road as we speak with passenger side air bag systems. Additionally, there are 1 million being added to the highways on a monthly basis. Obviously, it is of vital importance that there be some measures adopted promptly to deal with the hazards that these vehicles pose as they move in the stream of commerce. It is our recommendation that all new vehicles coming off the factory line under Federal mandate have on/off switches both on the driver and passenger side, with appropriate instructions to in what instances the consumer should have the bag activated and in what situations the consumer should not activate the bag.

And in addition, it is our request that the Federal Government also mandate that all existing vehicles presently on the road, the 30 million odd vehicles with passenger side air bags, that the owners of those vehicles have the right to have their vehicle retrofitted with an on/off switch. And we believe, although I think it may dismay our friends at Table Three, but we believe the expense of that should be incurred by the automobile manufacturer.

Again, I—I know I speak for all of our members in expressing to you our heartfelt gratitude for your efforts and we thank you so much.

CHAIRMAN HALL: Thank you very much. The National Association for Governor's Highway Safety Representatives?

MS. HARSHA: Thank you. I'm Barbara Harsha. I'm with the Governor's Highway Safety Reps. I just want to reiterate some points that were made, that have been made over the last couple of days, three points in particular.

One thing that was said yesterday, I think there is a tremendous amount of interest among the American public in these issues and there's interest in Congress and by the Board, and we should take advantage of this opportunity to continue to come together and discuss these issues, and come up with positive solutions on which there is consensus. I think the Blue Ribbon Panel is really a model for that approach and I think we ought to look to that model in other areas.

Second point is that I think throughout all this, we need to keep the solutions in perspective a little bit. And what I'm concerned about is that we expect too much from our technology. The technology, whether it's universal languages or smart air bags, will solve an awful lot of problems, and I think the Government ought to be commended for moving in the right direction on those issues. But there may be some unintended consequences and we should be cognizant that technical and engineering solutions won't solve all the problems.

And the third point is that there are a lot of problems out there, but we need to set priorities. Where we have limited resources and limited staffs, we're in an age of downsizing, and we just can't do everything all at the same time, so we really need to set priorities. And I think getting kids in the back seat and urging everyone to buckle up is a good place to start.

Again, I would like to echo the thanks for having us participate in this forum and we look forward to the written publication. Thank you.

CHAIRMAN HALL: Thank you very much. The National Safety Council?

MS. ROEMAN: Yes, Jane Roemer. Thank you, Mr. Chairman. I also would like to thank you and your staff and the NTSB for holding this forum. We think it's very important. We have been working along with many other organizations to address the safety concerns that were brought up this week. But even with all our best efforts, I think it goes without saying that the public may still be fearful, may still be confused over what to do. That's why it's especially important that the NTSB is doing this now. I think you bring a great deal of credibility and authority to the table, Pierre Salinger notwithstanding, and we welcome your findings on this subject.

We certainly hope that when you do produce your findings, you do so with the public in mind and with the mission of helping to bring some clarity to the table. Thank you.

CHAIRMAN HALL: Thank you. The Insurance Institute for Highway Safety?

MR. LUND: Thank you, Mr. Chairman. The Insurance Institute also thanks you for including us as one of the parties in this and the opportunity to participate. I'd also like to say that, personally, I've been very impressed with the honest and productive exchange of ideas that have occurred here. I must admit that I don't think I thought it was possible beforehand, so I congratulate you and I also congratulate my fellow participants and parties.

I do think there are a few things I would like to emphasize as we close, especially after some of the rhetoric from yesterday. I think it's very important that the message get out in no uncertain terms that air bags are saving lives. They are saving the lives of drivers and they are saving the lives of passengers. The tragic side effects which are relatively rare incidences, let's remember that we're talking about 60 in more than a million deployments of air bags, they are tragic but they can and are being dealt with. Air bag depowering will reduce the problem. At the same time, we'll also see an increased effectiveness of air bags for belted and unbelted occupants.

The main issue, I think, here is that we need to agree as an industry and as a regulatory bodies and so forth on new guidelines for evaluating air bag injury risk, in order to move this forward. In this instance, I would urge Dr. Martinez and NHTSA to break another rulemaking record in getting dummies approved and getting guidelines for assessing air bag injury risk.

The comment was made that NACP may be a problem in this regard. I think what we need to recognize is that NACP isn't so much of a problem, but what we are dealing with here does suggest that all the emphasis in developing more crashworthy cars cannot be placed on the restraint system. There will need to be some structural improvements of the vehicles as well, including perhaps the addition of some crush space in the front to absorb the energy.

What's the most important thing, though, that the public can go away with, I think, is that they need to understand that they can virtually reduce the chances of life-threatening injury from air bags to virtually zero by buckling up and putting their kids in the back. It is extraordinarily important. If they do that, they can have the full confidence in the vehicles that they have purchased to be safe.

And I think we should also keep in mind another thing. If everyone buckles up, not just those people with air bags, we will prevent additional thousands and thousands of life-threatening injuries. Thank you.

CHAIRMAN HALL: Thank you. The Association of International Automobile Manufacturers?

MR. HUTCHINSON: Thank you, Mr. Chairman. Phil Hutchinson with the Association of International Automobile Manufacturers. First, we would like to say that the policy, as outlined by Ms. Petrauskas of Ford Motor Company and as reiterated by our colleagues at AAMA, really must be agreed upon by all of the parties as a first step, because this is going to guide the design of vehicles and restraint systems in the future.

Secondly, for the current vehicle population, we think education plus the increase of seat belt enforcement is the best use of the scarce resources that we have.

Thirdly, we have a number of our member companies who have parents in Japan, and these companies have asked their parents if they would provide information to the NTSB on the situation in Japan on some of the issues that have been addressed here today and we're hopeful that we'll be able to flush out the record for you with the Japanese experience.

And, finally, I would like to join all of the other speakers and thank you very much for the honor of participating at this hearing. It has been very constructive and your personal chairmanship has been very equitable and excellent, and thank you very much for the opportunity to participate.

CHAIRMAN HALL: Thank you very much. The Advocates for Highway and Auto Safety?

MS. STONE: Thank you, Mr. Chairman. I, too, want to thank you on behalf of our Board of Directors and members of Advocates for Highway and Auto Safety. I certainly have, personally, learned a lot at this hearing and I think it has been extremely useful. So thanks, again. I just want to leave you with one thought, which is that I really think that all of us in this room, you know, have a lot of ideas about what to do and I think we do know what to do. I think there are a lot of things out there that can be done to solve a whole host of problems. I just would like us to go away thinking that we can build on the political will. That's something that I think is sometimes missing, certainly present company excepted. But we need to do more of that, I think, at all levels of Government and industry, and I think the American people are looking for it, they're looking for the leadership from a lot of people who are right here in this room and others. And especially because of NEXTEA, the highway legislation that's going to be taken up this year, I want us to think big and I want us to think tough. Thank you.

CHAIRMAN HALL: Okay, thank you. The Automotive Occupant Restraint Council?

MR. VOS: Thank you, Mr. Chairman. Tom Vos on behalf of the Automotive Occupant Restraint Council, I'd like to thank the NTSB for the opportunity to participate in this meeting. AORC is always willing and anxious to work with the auto manufacturers and the Government to seek ways to improve the protection of all occupants in vehicle crashes. I would support Ms. Claybrook's cautionary comment on Monday, reminding us that as we're evaluating air bag effectiveness, for the most part, the field data reflects a performance of the first generation high-volume production air bag. And though we're delighted with the overall performance and reliability of our product, we certainly recognize the need for added features and performance improvements. We consider meetings like this essential as a formum to discuss the field data and the difficult task of establishing an industry-wide consensus regarding these necessary improvements. Thank you very much.

CHAIRMAN HALL: Thank you. Now have I gotten everybody, other than NHTSA. The dealers, I'm sorry. I'm checking off here and the Dealers Association.

MR. GREENHAUS: Thank you.

CHAIRMAN HALL: National Automobile Dealers Association.

MR. GREENHAUS: Thank you, Mr. Chairman. It's Doug Greenhaus with NADA. On behalf of the Nation's 20,000 dealers, we would certainly again, as others have said, like to thank NTSB for the opportunity to participate in this very fruitful hearing. I've certainly learned a number of things and have a number of recommendations I'll be taking to our Board as they meet next week.

Dealers, as you know, are located in virtually every community across the country and we recognize their unique position in being able to educate consumers, not only at the point-of-sale for new motor vehicles, but also with respect to the numerous used vehicles that they sell, and the fact that they are involved with consumers at the point-of-service and the work that they do in body shops for consumers. Of course, they are also involved in numerous efforts out in the community. A number of our dealers speak in the schools and, as was mentioned earlier, work closely with emergency nurses to try to promote better child restraint use.

In addition to this educational effort, we do and will continue to support strong efforts to improve state seat belt and child safety use laws, as well as to increase enforcement as appropriate. So those are our main focus. I will just say one thing with respect to the deactivation issue is that, again, I would urge NTSB, along with its other recommendations, to suggest that any deactivation be carefully tailored so that it will increase the safety of the motoring public to the greatest extent possible and not risk decreasing the safety.

CHAIRMAN HALL: Thank you. And then finally, the National Highway Traffic Safety Administration, or NHTSA.

MR. BISCHOFF: Thank you, Mr. Chairman. Don Bischoff. On behalf of NHTSA, I'd like to thank you for the opportunity to participate in this public forum. I think it has been very informative and has contributed greatly to the store of knowledge.

What to me has come through clearly and repeatedly is that we all face a number of complex problems and that there are no easy solutions. We need to attack them from a number of different view points, and I think you've heard from Dr. Martinez that we at NHTSA believe we have a comprehensive approach that attacks both the behavioral and the technological aspects. We need solutions for vehicles that are on the road now, as you like to say, the million that are coming on the road every month, and the vehicles of the future. I think the one thing that everyone here is agreed to is, is that the quickest and most effective way of addressing this problem is to get everyone buckled up and to get children in the rear seat. I hope that this forum has re-energized everybody in that regard and that they'll redouble their efforts to make that happen. I think a great example of that is the air bag coalition where a number of people have come together and are working toward that common goal.

I believe NHTSA has put together a comprehensive vehicle regulatory program that will address many of the technological issues and we have an aggressive research program for developing advanced air bag systems. I agree with AAMA that there are many issues that need to be addressed before we can have restraint systems that are truly optimized.

I've sensed, Mr. Chairman, on your part, that one particular issue that's caused a lot of anxiety for you is the advanced dummy issue and so I'd like to just, if I might for a moment, dwell on that. I think I may have, in my initial presentation, may have caused you more concern about that than you really need be. Hybrid 3 dummies exist right now for the 5th percentile female, 95th percentile male, 3 year old and 6 year old, and they have been used by NHTSA and others for some time for research purposes. For example, we've used them in our depowering research program that we've conducted over the past year. And I think all would agree that they are fine in a research program where, say in the example of depowering, you are looking for directional effects, what happens when I depower the air bag, how does it affect the injury measures on the dummy? But when we move to compliance in a regulatory environment, the burden on the dummy increases greatly and we ask a manufacturer to certify that his vehicle complies, that 5 million vehicles, in the case of GM, comply with the design requirements that we set, we have two additional requirements come in and those are repeatability and reproduceability. When we use that dummy, we do repetitive tests on the same vehicle under the same circumstances, we have to be assured that we're going to get the same reading both times, and then we have to be concerned about reproduceability when we build the second one of those dummies, that it gives the same reading as in the first. And what's going on right now, through the SAE, I think you heard from Dr. Mertz from GM, we have a series of round robin tests, we were looking at the repeatability and reproduceability of the dummies, and that's to be completed in May. And hopefully, if all works well, and we find that the dummies meet those expectations, then we'll move aggressively to incorporate them into our rulemakings. I think the bottom line is that the dummies are not going to be the critical path, but they will be—the advanced dummies will be on line and they'll be on line in the time frame that will not hold up any of the advancements we're talking about.

We also believe that the test procedures have been agreed to largely through ISOFIX so that the test procedures will be in place as well. The real challenge, as Mr. Terry alluded to, is to optimize these restraint systems for a whole variety of sizes of occupants, under a myriad of crash conditions. And that's where I think we all have to work together to decide where we're going to tackle that first, and what are the logical first steps, what does technology allow us to do and how can we get the biggest benefits in the quickest manner.

I also agree with Dr. Lund that what the forum has brought home to me is that the air bag has really saved many lives. It saved over 1,800 lives to date, but that there have been a limited number of adverse circumstances from side effects that are just totally unacceptable. They're unacceptable to NHTSA and they're unacceptable to everybody that is here, I'm sure, and that we need a comprehensive approach to preserve those benefits of the air bag while eliminating those risks. And we look forward to working with the NTSB and all of our other partners to solve this very difficult and complex problem. And thank you again for the opportunity to participate.

Closing Remarks

CHAIRMAN HALL: Well, thank you very much. Let me say before I begin my closing statement that I appreciate the kind comments directed at the Chairman, but those comments really rightly belong with the staff of the Office of Research and Engineering, and the Office of Surface Transportation, who have put this public forum together and who do the day to day hard work at the Board in keeping on top of these issues.

We have had three and a half days of thought provoking discussion. Our aim was to have an open and full discussion about air bags, present all sides of the issues, and help the American people make informed decisions.

Most importantly, this was the first time we feel that all of us, Government and private industry alike, were given an opportunity to lay our cards on the table and show the American people what we know about air bags and what we don't. I think that was accomplished. A lot of good information has been brought forth and been put before the public. And I thank the media for their assistance in getting the information out.

Certain points have become clear from our discussion over the past few days. We are dealing with a difficult problem that will require hard work and a sustained effort by everyone who participated in this forum. There is no quick or simple solution.

The one size fits all approach to air bag design is obsolete. Air bags need to be designed to protect all people.

With regard to cars on the road today, children clearly need to be in the back seat, everyone needs to be buckled up and seated away from the air bag. And as stated by our first panel who had real life experiences with air bags, we need to put children first in the design of automobile safety equipment.

We believe that the National Highway Traffic Safety Administration owes it to the American people to move quickly on a decision regarding air bag deactivation. We don't have reliable data on the consequences of air bag deployment and it takes too long to acquire it. We need to do a better job of collecting this vital data.

And finally, and perhaps most importantly, societal attitudes have to change in our country with regard to seat belt use. We are far behind other countries in seat belt use, as was pointed out in the forum, and pay a high price for it in terms of lives lost, damages, families torn apart. Our political leaders need to take responsibility for tough enforcement programs and our Congress needs to consider financial incentives, as well as our State legislatures, if we are to be able to effectively raise seat belt use.

On behalf of the National Transportation Safety Board, I would like to thank all the parties who have participated in such a cooperative manner during these proceedings. I understand they only got out of control when Mr. Sweedler was in charge.

(General laughter.)

CHAIRMAN HALL: The quality and number of questions from the parties indicate everyone's concern and interest in answering the public's questions and their desire to improve on existing technology. And I would like to also express the Board's sincere appreciation to all the panel participants, this panel and the other panels, for sharing their knowledge and thoughts on this most important issue.

All the parties are encouraged to submit any additional information they consider appropriate for the record. Fifteen copies should be transmitted to the Chief, Highway Division, National Transportation Safety Board, Washington, DC, 20594, within 30 days after the close of this forum. We would ask that you also send a copy to each of the parties. The proceedings of this forum will be issued in about two and a half months. The Board will consider all pertinent information gathered during the forum and will look at what further safety recommendations we can make to improve air bag and child passenger safety. These safety recommendations may be made at any time.

Again, let me thank all of you for your efforts in informing the American people about what air bags are capable of doing and how to properly protect themselves and their children.

This public forum is now adjourned.

(Whereupon, at 12:40 p.m., the hearing was concluded.)