

PETITION DP92-017

"INADVERTENT RELEASE OF SAFETY BELT BUCKLES"

**BASIS:**

Mr. Benjamin Kelly, President of the Institute For Injury Reduction, petitioned the National Highway Traffic Safety Administration (NHTSA) by letter dated September 11, 1992, requesting that the agency initiate a defect investigation and a rulemaking proceeding to recall and preclude from sale in the future, certain designs of safety belt buckles. The petition alleges that certain designs of buckles are susceptible to "inertial actuation" to cause them to separate during a motor vehicle accident. The petition states, "The defect appears to involve seat buckle designs with release buttons on the front face of the buckle ('front release'). It has been found in seat belt configurations spanning about three decades, including new car designs."

The petition specifically requests four items for action by the agency:

- "1. Initiation of a defect investigation of the design, leading to appropriate recall and corrective action by manufacturers whose belt systems have utilized it;

2. Initiation of a rulemaking leading to amendment of Federal Motor Vehicle Safety Standard 209 to preclude such designs in the future;
3. Issuance of warning and other information necessary to alert the public to the existence, nature and magnitude of such designs, and the hazards they represent.  
[; and,]
4. Issuance of guidelines to safety researcher, police investigators and others reporting crash-related and crash injury-related information that the presence of an unlatched belt following a car crash does not mean per se that the belt was not being worn prior to the crash."

**BACKGROUND:**

There are many different designs of safety belt buckles in motor vehicles. All have a release button that must be manually depressed for release. In the particular style that is the subject of this petition, the female portion of the buckle is a rectangularly shaped assembly, typically 1-3/4" by 2-1/2" in size and 3/4" thick. The male portion of the buckle is inserted into the top end of the buckle, the portion that is about 3/4" thick. The release button is on the 1-3/4" by 2-1/2" side of the buckle and is referred to hereafter as a side release buckle. The petitioner refers to this type as a "front release" button.

Another principal style of buckle uses a different location for the release button. The female portion of the buckle is also rectangular in shape, however may be slightly thicker, about 1-1/4 inches. The release button is on the top end of the buckle, and next to the slot for inserting the male portion of the buckle. This type is hereafter referred to as an end release buckle.

Both styles are widely used by the automotive industry.

The internal designs of these two styles of latches are different by necessity. The direction for pressing the release button of the side release buckle is perpendicular to the direction for insertion of the male latch plate. In contrast, the direction for depressing the end release buckle is in the same direction as the insertion of the male latch plate.

All motor vehicles sold in the United States must comply with Federal Motor Vehicle Safety Standards (FMVSS). In particular, safety belts and buckles must meet the requirements specified in FMVSS 209, "Seat Belt Assemblies." This standard acknowledges the importance for all buckle release mechanisms to be accessible to the occupants. Section 571.209, Section 4.1(e) states, ". . . seat belt assembly shall be provided with a buckle or buckles readily accessible to the occupant to permit his easy and rapid removal from the assembly. Buckle release mechanism shall be designed to minimized the possibility of accidental release."

Another design consideration that is important for encouraging occupants to wear their safety belts is the ease of use and comfort. In recent years, 42 states and the District of Columbia have passed safety belt mandatory use laws and the rate of usage of safety belts has risen from 11 percent in 1982 to a level that is now approaching 70 percent. Manufacturers recognize higher safety belt usage rates are often accompanied by consumer demand for easier to use, more comfortable belt systems. Accordingly, many owners are responding with different designs to accommodate their customers. A noticeable trend is the increased number of vehicle model that are equipped with the end release-style buckle.

#### **APPROACH:**

To evaluate this petition, the agency has conducted an extensive review of its data, performed new crash and bench testing of buckles, and has requested information from motor vehicle manufacturers, manufacturers of safety belt buckles, and safety belt buckle patent holders. The following specific actions have been taken during this evaluation:

- o Wrote letters to 8 motor vehicle manufacturers
- o Wrote letters to 5 safety belt manufacturers
- o Wrote letters to 7 safety belt buckle patent holders
- o Analyzed real-world accident data
- o Reviewed agency crash data
- o Evaluated and interviewed ODI accident complaints alleging buckle release

- o Conducted vehicle and laboratory testing at VRTC
- o Conducted telephone interviews with callers to Hotline

The report of this evaluation is provided in the following sections.

### **VEHICLE MANUFACTURER RESPONSES:**

The agency formally requested information from certain manufacturers regarding the alleged defect of inertial unlatching of safety buckles. Information requests were sent to General Motors (GM), Ford, Chrysler, Toyota, Honda, Nissan, Volkswagen, and Volvo. Each manufacturer was asked to provide complaints, accidents reports, and lawsuits pertaining to the alleged defect. Furthermore, they were asked to describe all tests, studies, and surveys pertaining to the alleged defect.

These responses are summarized below:

General Motors: GM's response stated, "GM has had very few reports alleging inertial unlatching of seat belt buckles. In most cases where the occupant reports that the seat belt buckle unlatched in an accident, it is not clear from the allegation whether the belt may have been released from 'inadvertent contact with the release button by external objects', whether it is alleged that the buckle release was caused by inertial forces, or whether some other condition is being alleged."

In response to the question of testing done with respect to the alleged defect, GM reports that it is aware of only two reports of buckle unlatching during its vehicle crash and sled testing that may relate to the alleged defect. Both incidents occurred in tests conducted during 1991. It reports that it conducted more than 749 crash and sled tests with belted occupants in 1991. Since 1970, GM has performed about 30,000 crash and sled tests, most with belted test dummies.

Ford: Ford reports that it has ". . . located a number of allegations that a seat belt had inadvertently opened or released during an accident. While some of those files contain occasional references to 'inertial unlatching', few, if any, contain sufficient details to determine with certainty that they allege '. . . inadvertent release or opening of a safety belt latch due to inertial loading of the release button or latching mechanism caused by external forces acting on the back side of the latch housing.'" Ford did not report any safety belt buckle unlatching incidents associated with inertial forces during its crash and sled test programs.

Chrysler: Chrysler reports that it has only one complaint report that may relate to the alleged defect condition of "inertial" unlatching. In this case Chrysler found the "seat belt was intact and functional -- nothing to indicate that seat belt was in use at the time of the accident." Furthermore the case went to trial and the jury found that the complainant was not wearing the seat belt at the time of the accident. Chrysler has provided several other complaints alleging buckle unlatching but finds no evidence that

seat belt was in use or evidence of a defect in the buckle. Chrysler did not report any safety belt buckle unlatching incidents associated with inertial forces during its crash and sled test programs.

Toyota: Toyota reports that it has received "only 7 lawsuits that pertain to the alleged defect, and no other owner complaints, field reports, etc.". Toyota also reports it has made no modifications that could relate to the alleged defect and has issued no service or technical bulletins or other communications pertaining to the alleged defect. Toyota did not report any safety belt buckle unlatching incidents associated with inertial forces during its crash and sled test programs.

Honda: Honda has reported no complaints and field reports and only two lawsuits alleging that a seat belt buckle unlatched. Honda is aware of no investigations or surveys.

In response to the question concerning design changes, Honda's letter states that there has been one modification that "could be related to the alleged defect." Honda provided further clarification of their response by saying that its design change was not in response to allegations of "inertial" unlatching, but rather to reduce the latch spring force making the buckle easier to release while the belt is under tension. This was done in to increase its margin of compliance with the buckle release force requirements in FMVSS 209, "Seat Belt Assemblies". Honda had taken a broad interpretation of the

question to include any changes to components that are significant to the performance of a buckle when subjected to inertial forces.

Finally with regards to the safety performance of end release buckles compared to side release buckles Honda reports, "We do not recognize any difference in safety between the end release type and the side release type." Honda did not report any safety belt unlatching incidents associated with inertial forces during its crash and sled test programs.

Nissan: Nissan reports it "is unaware of any accidents, subrogation claims, or lawsuits which specifically pertain to the alleged defect in the subject vehicles". However, they have submitted four complaints alleging unlatching of a buckle. One complaint alleged unlatching of an empty child seat but it indicates that the claimant "admitted that she was not positive that the seat belt was hooked properly to secure the infant seat." Nissan reports that the alleged defect has not occurred in any of the variety of tests conducted to assure compliance with FMVSS's and other standards in other countries.

Volvo: Volvo reports, " Volvo has never seen the alleged defect occur in its many years of conducting laboratory crash testing. Volvo is aware of no real-world accidents, allegations, or lawsuits pertaining to the alleged defect." Volvo did not report any safety belt buckle unlatching incidents associated with inertial forces during its crash and sled test programs.

VW: Volkswagen has found no complaints, field reports, studies, surveys, investigations, or technical bulletins that relate to the alleged defect. It also reports, in all of its testing for compliance with US standards, European Certification, and its own test requirements, that "there has not been one incident related to the alleged defect."

Table 1 shows a summary of complaints provided to NHTSA in the manufacturer responses. The reported vehicle population is given for vehicles from 1970 to the present. The computed rate of complaints per 100,000 vehicles with side release buckles is shown for each manufacturer. The manufacturers reported complaint rate for alleged unlatching of side release type safety belt buckles is extremely low.

Table 1  
 Summary of Manufacturer's Complaints  
 of Inadvertent Release  
 1970 to Present

MFR	SIDE RELEASE BUCKLE		
	REPORTS	VEHICLE POPULATION (MILLION)	RATE PER 100K
GM	63	119	0.05
FORD	48	67	0.07
CHRYSLER	13	38	0.03
TOYOTA	7	15	0.05
HONDA	2	8	0.03
NISSAN	2	12	0.02
VOLVO	0	1*	0
VW	0	3	0
TOTAL		263	

\* 1977 - 1992 data

The manufacturers analysis of their complaints and lawsuits alleging unwanted buckle unlatching shows a lack of evidence to demonstrate that "inertial" unlatching occurs in the real world. Contributing factors unrelated to "inertial" loading may be responsible for an unlatching complaint. The crash and forensic analysis of the vehicle, the buckles, and the injuries show that in many cases the buckle is in good condition with no identifiable defects and that there is no evidence to indicate that the occupant used the safety belt. Several reports indicate that there was no evidence of belt loading or witness marks on the belt indicating that the belt was worn during the crash. During the random motion that occurs in some vehicle crashes, the possibility of inadvertent contact with the release button cannot be dismissed. Some accident reports mention occupant involvement with alcohol and conflicting testimony regarding belt usage. Given the extremely large numbers of buckles in use, and although not specifically reported or identified by manufacturers, the possibility of partial engagement of a latch may occur on rare occasion and this could produce a complaint of unlatching in an accident.

Chrysler provided an analysis of inertial loads and compared this to a simulated crash test. They show that impact to unlatch a buckle greatly exceeds the acceleration loading on a buckle during an accident simulation using a test sled. The buckle acceleration peaked at 100 g during 1500 lbs of tension at the retractor. The buckle system requires 145 g to release with no belt tension, however increasing belt tension greatly increases the engagement force of the latch and increases resistance to inertial movement of the release button. Their

analysis shows more than a 6 time increase in release button force with a increase of belt tension from zero to 25 pounds. Its data shows, with the belt under tension such as occurs during a vehicle crash, that the crash forces do not generate the necessary impact acceleration loading on the buckle to overcome the engagement forces resulting from the belt tension. This finding is consistent with the results of the agency testing discussed later in this report.

The automotive manufacturers uniformly report that their test programs conducted as part of research, development, and certification of vehicles has not shown any problem associated with inertial releasing of buckles in the vehicle crash environment that would indicate an important safety risk in the real-world.

In summary, the information received from the manufacturers on the performance of safety belt buckles indicates. An absence of a real-world problem with unlatching of safety belt buckles during crashes. The scope represented by these responses includes millions and millions of vehicles over many years of vehicle usage. These responses indicate a very low complaint rate of alleged unlatching of buckles. There have been no design changes in response to allegations of "inertial" unlatching. Additionally, the manufacturers vehicle

crash and sled testing programs have not supported the existence of a real-world problem. In summary, the information provided by the vehicle manufacturers clearly demonstrates the absence of a real-world problem concerning alleged "inertial" unlatching of safety belt buckles.

## **SAFETY BELT BUCKLE MANUFACTURER RESPONSES:**

The agency sent letters to the five principle manufacturers of safety belt buckles (latch assemblies) for vehicle produced for sale in the United States. Each manufacturer was asked to describe its latches, provide drawings, reports of complaints and lawsuits, provide all tests and studies with respect to the alleged "inertial" unlatching, and describe all modifications made in response to the alleged "inertial" unlatching problem.

These responses are summarized below:

Takata Inc.: Takata responded with only one reported lawsuit involving a 1983 GM vehicle. The vehicle was involved in a frontal collision. Takata reports, "Examination of the belt and vehicle found no defects." It reports that this type of buckle was supplied to GM for vehicles from 1977 through the present for application in several vehicle platforms (A, F, G, H, J, L, N, W and X-body). Takata has not made any design modifications to this latch that relate the subject condition of "inertial" unlatching.

General Safety Corporation: General Safety has manufactured one type of latch assembly, the GM Type 1, from 1970 to the present. This buckle has been used for Cadillac, Buick, Pontiac, Oldsmobile, and Chevrolet vehicles during that period of time. It is unaware of any complaints, field reports, accidents, lawsuits, studies or surveys that

relate to the alleged defect of "inertial" unlatching. No modifications have been made the design of the buckle in during this period of time.

Indiana Mills and Manufacturing, Inc. (IMMI): IMMI reports receiving no complaints, field reports, lawsuits, studies or surveys that pertain to the alleged defect of "inertial" unlatching. No changes have been made to its products that relate to the alleged defect and it has not had latches open because of inertial actuation.

TRW: TRW reports no complaints, field reports and only two lawsuits. Both lawsuits alleged a possible inertial actuation of the latch to release the latch during an accident. In one, the court found "no credible evidence of a design defect." The second incident, which occurred in October 1990, is still under investigation. TRW states, " On September 19, 1991, the plaintiff in [name deleted] filed a Second Amended Complaint naming TRW as a defendant. In response to interrogatories propounded in November 1991, the Plaintiff responded for the first time on September 14, 1992 that '. . . we contend that the seat belts opened during the rollover sequence because of a phenomenon known as inertial actuation or because the release buttons were inadvertently pushed.' The plaintiff has not provided any factual basis in support of his contention."

TRW has not identified any test information that relates to the alleged defect of "inertial" unlatching. No changes or modifications have been made to buckles in response to the alleged defect.

Allied Signal/Bendix: Allied-Signal reports receiving no complaints or field reports, but received four lawsuits claiming alleged inertial with side release type buckles. It states that in three of the four lawsuits, the inspection of the vehicle and buckle reveals that the injured individuals were not wearing the safety belt. The fourth lawsuit concerns an suspected aftermarket installation of a safety belt manufactured by Irvin Industries (now Takata) using an alleged Allied design. Allied has not yet inspected this vehicle or buckle.

As part of the design and development of its buckles, Allied conducts sled testing but has "no evidence that such buckles have released inertially during such testing." Its buckles are also tested by independent laboratories, Hunt Laboratories and United States Testing Testing, and they have never informed that an Allied buckle released inertially.

In summary, the information received from these safety belt buckle manufacturers does not support the allegation of a real-world problem with unlatching of safety belt buckles during crashes. The notable lack of complaints and few lawsuits fail to demonstrate a problem in the performance of these buckles. Consistent with the vehicle manufacturers responses, there have been no design changes in response to allegations of "inertial" unlatching. Testing of the buckles, as either performed by the buckle manufacturers, or that which the buckle manufacturers are otherwise aware of, has not provided an indication of a unlatching problem that could be associated with the alleged defect.

## PATENTS OF END RELEASE TYPE BUCKLE EVALUATION:

The agency sent letters to the holders of seven patents for end release-type buckles. These patents imply a concern for possible inertial releasing of latches. The following manufacturers have been asked to respond to the concern of "inertial" unlatching as it relates those specific patents that mention inertial releasing.

Allied Signal/Bendix: Allied reports having no knowledge of inertial release of side release buckles in accident conditions. According to Allied, in the late 70's and early 80's European competitors used the parlor trick to induce customers to purchase end release buckles that were more resistant to the trick. Development of the end release patents resulted from customer's specifications for an end release buckle. With respect to side release buckles, Allied explains that "web tension acts a restraining force and significantly influences the amount of button force required to cause latch movement. Latch movement can also be induced by acceleration forces if the resultant inertia force on the buckle is in the proper direction and also is capable of overcoming internal (pre-load, spring rate, frictional and damping forces) and external (web tension) restraining forces acting on the latch." Allied is not aware of any type of accident that could generate the necessary forces to cause "inertial release". The end release patents were not developed because of any known deficiency causing them to be susceptible to "inertial" unlatching.

GM: GM responded by reporting, "although all buckles can theoretical become disengaged by inertial forces at some levels of acceleration and direction relative to the buckle, General Motors does not believe that buckles are susceptible to inertial release under normal conditions of usage, including under accident conditions." In response to the question of whether GM developed the patent to present a solution to the alleged defect of "inertial" unlatching, GM reports that all of its buckles, both side release and end release types, have been designed to "overcome inertial forces in real world use situations, and to avoid unwanted buckle disengagement." GM did not indicate that the incorporation of inertial considerations in the patent was indicative of a real-world problem of "inertial" unlatching.

Takata, Inc.:

TRW: TRW indicates that the inertial forces are resultant from the use of the latch in a special application with a pyrotechnic belt pre-tensioning device. The TRW patent seeks to correct the conditions resulting from the pyrotechnic device and not from accident conditions. The TRW patented features are new and not yet on vehicles sold in the United States. It states, "There is no evidence that real world accidents, in and of themselves, will result in buckle accelerations or occupant to buckle impacts sufficient to inertial release a buckle using a conventional side release button configuration."

IMMI: IMMI reports, "There were no theoretical, actual or alleged instances of inadvertent buckle release due to inertial actuation forces that led IMMI to develop the buckle covered by the patent." IMMI explains that it has developed the subject features in the patent to minimize the "theoretical risk of release due to inertial forces. This would also make the buckle usable with pre-tensioners, which may eventually come in our application."

## NATIONAL CENTER FOR STATISTICAL ANALYSIS :

The agency has reviewed the crash files maintained by the National Center for Statistical Analysis (NCSA) for reports of possible "inertial" unlatching of buckles. Three searches were made of the computerized National Accident Sampling System (NASS) database from 1988 through 1991 to identify specific crash investigations which suggest that the safety belt buckle released and for which "hard copy" files were available. Cases were selected that indicated that a manual belt buckle opened, that the manual or automatic buckle failed, or that the occupant was restrained by a manual safety belt but was ejected. These searches identified a total of 34 cases for review of the "hard copy" investigation file.

The 34 reports provided no evidence of inertial buckle unlatching. The reports indicated examples of extreme vehicle damage that resulted in tearing away of the doors, the B-pillars, the belt anchorages at the floor, cutting of the webbing, shattering of the buckle housing, and structural failure of the retractor mechanism.

The agency also has conducted statistical analyses of its accident data files to determine whether the data contains any evidence of a difference in occupant crash protection between vehicles equipped with end release buckles compared with vehicles equipped with side release buckles. The analyses utilized the Fatal Accident Reporting System (FARS) files for 1985 through 1991 and selected state accident data from the CARDfile for 1988 through 1990 (the three most recently available years). The data were analyzed to assess ejection,

fatality and incapacitating injury rate between side release and end release buckles.

Descriptions and summaries of the analyses conducted by NCSA are included in Appendix A.

The FARS analysis compared specific vehicles from model years 1985 and later that were equipped with either side release or end release buckles, but did not include vehicles with passive belts or air bags. Vehicles from model years 1985 and later were selected because the agency had available data to indicate whether those vehicles were equipped with end or side release buckles. A list of those "specified vehicles" studied in this analysis is given in Appendix B. Since the analysis included several categories of vehicles, differences in driver and vehicle characteristics were accounted for in the analysis. Further analysis was conducted of accident data for specific vehicles that had a production change from side release buckles to the end release buckles, but with no other vehicle changes that could impact the effectiveness in the belt system. These vehicles (referred as cross-over vehicles) changed from a side release buckle to an end release buckle. Three sets of cross-over vehicles were analyzed -- Ford Taurus/Mercury Sable, Lincoln Continental, and Plymouth Voyager/Dodge Caravan. These vehicles were subjected to an additional analysis to determine whether the data suggested any discernable difference in crash protection provided by end versus side release buckles in essentially identical vehicles.

The analysis of fatal crashes for the cross-over vehicles shows no significant, consistent difference in the ejection rate. Only the Caravan/Voyager produced a higher fatality rate for

side release buckle vehicles. There was no significant difference between side and end release buckles in the fatal injury rate for the Taurus/Sable or the Lincoln Continental. In fact, the fatal injury rate was slightly lower for the side release buckles in the Taurus/Sable and the Lincoln Continental compared to the same models with end release buckles.

The analysis of fatal and incapacitating injury rates in the state data files showed no difference between side and end release buckles in the cross over vehicles.

Analysis of all "specified vehicles" for fatal crashes, including complete ejections, found a small but significant difference showing a lower ejection and fatal injury rate per occupant involved for those vehicles with the side release buckle. In general, the analysis of state data files showed no significant difference between the two types of buckles.

In summary, real-world crash data shows no differences that would indicate a defect trend associated with one type of buckle release mechanism over the other. The NCSA report concludes that "there is little evidence in the crash data to support the allegation related to inadvertent unlatching for side-release systems."

**AGENCY CRASH DATA:**

The agency has accumulated a large body of crash test data using safety belts to restrain test dummies in both vehicle and sled tests. This includes testing of child safety seats as well. The testing has been conducted in three programs areas; the Office of Vehicle Safety Compliance (OVSC), Research and Development (R&D), and New Car Assessment Program (NCAP). In order to identify and understand any occurrences of the alleged problem of buckles unlatching, the agency conducted a comprehensive review of all its testing to locate specific reports of buckles unlatching during these tests.

Crash the testing with belted test dummies includes front, rear, side and vehicle roll over impacts. In the frontal and side impact category, tests were conducted at both 90 degree and oblique impact angles. Table 2 shows a summary of agency crash and sled test data involving full sized belted occupants.

Table 2  
Agency Crash and Sled Tests  
with Belted Test Dummies

Type of Test	No. of Tests	No. of test Dummies	Latch Openings
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Frontal 90 degree	1,353	2,491	8
Front Oblique	53	104	0
Rear	409	811	1
Roll Over	17	17	0
Side	235	307	0
Total	2067	3730	9

A total of nine buckles have opened during agency testing with belted test dummies. Three openings were associated with defective latches. These buckles were end release type buckles and were recalled after an investigation conducted by the agency's Office of Defects Investigation. Four buckles opened during the rebound movement of the dummy when a portion of the dummy body contacted the release button on the buckle. Each of these events occurred during frontal testing under the NCAP program and the impact speeds were 35 mph. The dummies were restrained during the initial impact and the recorded injury level of the dummy at the seating position of the released buckle was not significantly different from the injury level of a restrained dummy at the other seating position. None of the four buckles were side release-type buckles. Three were end release buckles with an active 3-

point restraint. One was a door mounted buckle for a 2-point passive restraint and the buckle release mechanism is located on the top side of the buckle. Only two of the nine buckles that opened during the agency's testing were side release designs. One occurred during a frontal 30 mph barrier crash test of a 1979 International Scout II. The vehicle was equipped with a lap belt only and the buckle was found to be in an open condition during the post crash inspection. The crash test film shows the buckle not out of position but resting in the lap of the dummy. If the buckle had released during the initial impact or during any other phase of high deceleration, the belt and buckle most likely would have been forced out of position, rather than resting in a normal position on the dummy's lap. It appears that the safety belt restrained the dummy during the initial impact but released upon rebound. The other side release buckle opened during a 35-mph rear impact test of a 1980 Honda Prelude. The dummy was not restrained and it moved rearward upon the initial vehicle impact by a moving barrier. It does not appear from the kinematics of vehicle during the rear impact and the reactive motion of the dummy that the back side of the buckle was impacted during the initial period of this test when the apparent buckle unlatching occurred. The possibility of improper latching of the buckle by test technicians cannot be disregarded in this test.

The agency has conducted a comprehensive review of all of its dynamic sled testing of child safety seat tests in order to identify all reports of motor vehicle buckle unlatching. The results of this review is shown in Table 3.

Table 3

### Agency Sled Tests with Child Safety Seats

Type of Test	No. of Tests	Latch Openings
Frontal 90 degree	238	2
Front Oblique	1	0
Rear	0	0
Roll Over	0	0
Side	0	0
Total	239	2

Only two motor vehicle buckles have opened during testing of child safety seats. Both buckles were the side release type. One buckle failed when it broke into two pieces due to a bending load applied to the buckle. During the test, the buckle was pulled across the metal bar of the child safety seat while its two ends were subjected to a tensile load in opposite directions approximately 90 degrees apart with respect to each other. The resulting bending moment on the buckle fractured the female end of the buckle at the webbing attachment point. The other buckle release occurred to a child safety seat that was tested for interaction with a passenger side air bag. The rear facing seat was intentionally positioned close to the

air bag housing to test the dynamic interaction between the air bag and the child safety seat -- this is contrary to all manufacturer's warnings and instructions for positioning a child safety seat in a vehicle with a passenger side air bag. As the air bag deployed, the air bag impacted the back of the child safety seat, depressing the safety belt buckle under the edge of the child safety seat and into the bottom seat cushion, at which point the buckle released. Based on the direction of the application of the initial and reactive forces, there is no indication of an impact with the back side of the buckle that would be indicative of an alleged "inertial" unlatching.

A summary of the above reported latch openings during agency testing is attached in Appendix C.

In summary, the agency has reviewed all of its testing of restrained occupants in search for evidence of alleged "inertial" unlatching of buckles. This review encompassed testing of a total of 3,730 belted test dummies and 239 child dummies in child safety seats. No evidence of buckle release due to alleged "inertial" unlatching was found.

#### **TESTING IN SUPPORT OF PREVIOUS INVESTIGATION EA7-040**

In June 1977, an Engineering Analysis (EA7-040) was opened to investigate a single complaint alleging that the seat belt buckle in a 1975 Chevrolet Monza would open if a sharp

impact was applied to the back of the buckle. In support of the investigation, a test program was initiated on sample buckles from a Monza and other vehicles. The purpose of the testing was to duplicate and observe the unlatching when the buckle was impacted by a rubber mallet on the front and rear surfaces of the buckles. An impact device was constructed to provide a repeatable impact force. Testing was expanded to include other vehicles from model years 1971 through 1978. This testing included the passenger seat buckles in a total of 225 vehicles.

The testing demonstrated that the buckles from the Monza would unlatch if impacted with a sharp blow to either the rear or the front face of the buckle. The expanded testing of other model years also showed that many buckles would open when hit on the rear surface with a sharp impact. It was noted in the results that 50 of 225 buckles opened during the tests. Also, none of the buckles from Chrysler vehicles unlatched in the tests.

The test device did not simulate the portion of the body that is in contact with the back of the buckle when the buckle is worn. Also the impact was not selected based on a correlation of the force that might be applied by the body to the back of the buckle during a vehicle accident. The primary intent of the test device was to allow for the gathering of empirical and repeatable data that would demonstrate, in a laboratory setting, the phenomena of buckle unlatching due to a non-accident-related impact force.

While the testing demonstrated that impacts on the buckle could open the buckle, there was no correlation made to the dynamic forces that are present in real-world accidents. Thus, the theoretical demonstration did not establish a risk of buckles opening and did not offer a solution to the concern of alleged inadvertent release of buckles due to inertial crash forces. The Engineering Analysis report indicates that there were no additional complaints in the ODI consumer complaint file of the alleged problem of buckle unlatching. Based on the lack of evidence that the alleged problem might be present in the real world, Engineering Analysis EA7-040 was closed.

### ODI COMPLAINTS:

A search was conducted of the ODI consumer complaint data base for complaints of buckles unlatching in motor vehicle accidents. The search included a review of 1,886 records of all types of complaints concerning all types of safety belts. The search was conducted on all complaints received prior to September 10, 1992, the date of the "Street Stories" television report. If information in a report was ambiguous or additional information was needed for complaint analysis, a follow-up telephone call was made. From this review, a total of 35 complaint reports were identified that alleged that a safety belt buckle unlatched in an accident.

The complaint reports were analyzed by type of buckle, type of accident, severity of accident, and severity of injury. The type of buckle reported is either a side release or an end release buckle. The underlying presumption for the "inertial" unlatching to occur is that the impact necessary to release the buckle must be applied to the opposite side of an side release buckle. Accordingly, the reports were reviewed to determine the type of accident by principal location of impact. The location of the vehicle impact determine the initial direction of forces applied to the vehicle, occupant and the buckle, and provides strong indication of the likelihood of whether inertial unlatching could occur.

Table 4 shows a listing of the complaints by model and model year. The majority of the complaints are single complaints on a particular make and model vehicle. The complaints are widely distributed among many makes and models, and over many model years. Of the 35 reports, 24 were for vehicles equipped with side release buckles and 11 were for vehicles with end release buckles. A rate comparison was made of the number of complaints for both buckle types by dividing the number of complaints by the vehicle population for each particular vehicle. The rate for side release buckles is 0.7 per 100,000 vehicles and the rate for end release buckles is 0.9 per 100,000 vehicles. No significant difference was noted between the complaint rates for side release buckles compared to end release buckles.

Table 4

List of Complaint Vehicles

MODEL YEAR	MANUFACTURER	MODEL	REPORTS
1980	FORD	CAPRI	1
1981	GM	CHEVETTE	2
1984	FORD	BRONCO	1
1984	GM	CELEBRITY	1
1984	GM	CUTLASS	1
1984	FORD	ESCORT	1
1984	GM	REGAL	1
1985	GM	ASTRO VAN	1
1985	GM	BLAZER	1
1985	GM	ELECTRA	1
1985	FORD	ESCORT	2
1985	MAZDA	GLC	1
1985	CHRYLSER	NEW YORKER	1
1985	GM	SPRINT	1
1985	GM	SUBURBAN	1
1986	GM	CAMARO	1
1986	GM	LESABRE	1
1986	MITSUBISHI	MIRAGE	1

1986	GM	NOVA	1
1986	GM	FIREBIRD	1
1986	MAZDA	323	1
1987	GM	SAFARI VAN	1
1988	GM	CORSICA	1
1988	GM	CUTLASS	1
1988	GM	CELEBRITY	1
1988	GM	REGAL	1
1988	CHRYSLER	SHADOW	1
1989	FORD	PROBE	1
1990	GM	CORSICA	1
1990	CHRYSLER	DYNASTY	1
1991	FORD	EXPLORER	2
1992	GM	METRO	1
		TOTAL	35

The vehicle age at the time of the alleged failure of the buckle to remain latched was considered in response to allegation that over time, buckles may be more vulnerable to "inertial" unlatching because of weakening of the buckle release spring. Table 5 shows the relationship of complaints to vehicle age. No significant aging trend was noted to indicate that possible aging contributes to a increase of alleged opening of safety belt buckles in motor vehicle accidents.

Table 5

Complaints by Vehicle Age  
At the Time of Alleged Failure

VEHICLE AGE (YEARS)	REPORT S
9	1
8	0
7	0
6	2
5	6
4	1
3	3
2	8
1	6
1	8
TOTAL	35

Only 2 motor vehicle safety recalls were identified on four of the complaint vehicles. The recalls were on the Firebird, Camaro and Explorer vehicles with end release buckles. Recall 90V-105 included the 1982 through 1990 Camaro and Firebird. Recall 91V-113 included the 1991 Explorer. With these recalled vehicles removed from the list of complaint reports, the complaint rate for end release buckles is not significantly changed -- 1.1 per 100,000 vehicles.

The impact location to the vehicle was also considered. Because the buckle position is at the side of the occupant, an impact to the side of the vehicle would likely transmit the most direct impact from the occupant to the buckle. Table 6 shows a comparison of impact location on the accident vehicle by the type of buckle. For both the end and side release buckles, most of the reported impacts were to the front and rear and not the side of the vehicle.

Table 6  
 Vehicle Impact Location by Buckle Type

IMPACT LOCATION	RELEASE BUTTON LOCATION	
	SIDE	END
FRONT	8	6

REAR	4	2
SIDE	8	2
ROLL	4	1
TOTAL	24	11

The reported vehicle damage or accident severity ranged from moderate to severe. Injuries were reported in 33 of the 35 accident reports. The type of injury varied and is shown in Table 7. The seriousness of the injury as measured by the type of treatment (where reported in the complaint or determined by follow-up telephone calls) is shown in Table 8.

Table 7

Type of Injury

NONE	2
ABRASION	7
LACERATION	2
BROKEN BONE	7
TRAUMA	7
CONCUSSION	2

UNKNOWN	8
TOTAL	35

Table 8  
Type of Treatment

NONE	6
EMERGENCY ROOM	5
HOSPITALIZED	8
FATAL	0
NOT REPORTED	14
TOTAL	33

Of the 35 complaint reports, eight alleged that a child seat was released by the vehicle buckle in an accident. Of the eight, five were side release buckles and three were end release buckles. The complaint rate associated with the alleged release of child seats for the side release buckles is 0.5 per 100,000 vehicles sold compared to 0.8 per 100,000 vehicles sold

for the end release buckles. Again, no significant trend is noted to indicate an "inertial" unlatching phenomenon of the side release buckles.

In the four days immediately following the "Street Stories" show, which was broadcast on nationwide television, the agency has received approximately 4,800 calls to the agency's toll free Auto Safety Hotline. These recalls represent inquiries to the Hotline requesting consumer information on a variety of subjects, including child safety seats, New Car Assessment Program crash test results, Uniform Tire Quality Grading System, drunk driving literature, etc. Additionally, these calls include callers who either want to discuss a safety issue with a Hotline operator or file a consumer complaint about a safety problem they have experienced with a motor vehicle or item of motor vehicle equipment. These include Hotline calls in response to the "Street Stories" and "CBS Evening News" presentations. When compared with the total phone calls received by the Hotline over the same Thursday through Monday time period for the preceding 6 weeks, the 4,800 calls are very close to the average 4,400 calls over that 6-week period.

As another comparison of the public's response to the claims of safety belt buckle unlatching as portrayed by the media, the agency looked at the number of consumer calls to the Auto Safety Hotline in two other instances where the Hotline telephone number was illustrated on national television. After a February 1990 child safety seat segment on "Good Morning America," the agency received over 8,000 calls during the next 5 days. After a February 1992 ABC broadcast concerning child safety seats, nearly 10,000 calls were received by the

Hotline. Additionally, after agency press releases announcing the availability of consumer information on such subjects as the Uniform Tire Quality Grading System, the New Car Assessment Program, and Child Safety Seats, the agency received between 9,000 and 25,000 requests for the information, depending on the subject.

The relatively few number of calls to the Hotline concerning safety belt buckles as a result of broad national publicity can be taken as one more indication that the alleged defect is not a real-world problem.

More important than the total number of consumer calls to the Hotline, however, are those calls actually reporting a safety belt problem. Of the calls that were in response to the "Street Stories" and "CBS Evening News" presentations, the vast majority were from those consumer who either expressed concern over what they had seen on television, including a number of persons stating "I could make me safety belt so what the show indicated," or requested information from the agency on safety belts. To date, only 47 callers actually reported complaints related to safety belt performance. Of the 47 complaints, 30 involved accident situations, and only 18 of these specifically alleged that the safety belt became unlatched for some reason. None of these complainants indicated or suggested that the reason for the unlatching was an impact to the back side of the buckle. Like the complaints received before the "Street Stories" program, these complaints include vehicles equipped with end release as well as side release buckles. Four of the 18 complaints were on vehicles with an end release buckle. Two reports indicated that a vehicle buckle failed to hold a child

safety seat -- one report each for side and end release buckles. Serious injuries were reported for both the side and end release buckles. Four reported injuries required hospitalization, three were in vehicles with side release buckles and one was in a vehicle with end release buckles.

One fatality was reported. The vehicle involved was a 1991 Oldsmobile Calais which has side release buckles. The driver lost control of the vehicle at an estimated speed of 60 mph on a two lane rural road. The car departed the right side of road and the front of the car engaged an embankment causing the car roll over on its side, to spin 180 degrees, and slide on the driver's side door. The car it traveled about 60 feet in a reverse direction until the rear of the vehicle impacted a tree at a point several feet above the ground. The impact ejected the driver from the car through the open driver's window. The door did not open. The vehicle came to rest on its roof about 20 feet from the impacted tree. The cause of death is reported to be head injury from an impact with the outside surface of the "A" pillar of the car. The police report indicates that the safety belt was not buckled. The belt was found in its normal a retracted position against the door. No other witnesses were present to provide positive testimony concerning whether or not the driver was wearing the safety belt. The safety belt had no evidence of loading due to impact, and the autopsy report did not report injuries that could be associated with loading of the belt by the driver's body during the accident.

It is apparent that calls to the Hotline were not significantly affected by the publicity associated with the "Street Stories" and "CBS Evening News" broadcasts alleging safety belt unlatching due to inertial loading. Further, consumer complaints concerning belt unlatching in crashes have been extremely low in number. Based on the volume of calls to the agency's Auto Safety Hotline, and more specifically, the small number of consumer complaints specifically addressing unlatching of safety belts in crashes, it appears that the public correctly understands the benefits of safety belts and the protection they provide to vehicle occupants in real-world crashes. Additionally, the complaints of buckle release that were received fail to show any indication of a possible "inertial" release phenomena. Complaints have been reported on both the side and end release buckle designs, but no significant difference was noted in the complaint rate between side and end release buckles for alleged unlatching incidents. Interestingly, most complainants report the unlatching occurred during a front or rear impact, which is contrary to the direction needed to cause the alleged inertial unlatching of side release buckles. Finally, the complaints are distributed among vehicles representing a broad range of makes, models and model years, with no indication of a specific vehicle involvement trend.

#### **TESTING:**

The Agency initiated a test program to measure the performance of side release-type buckles under various conditions. The purpose of the testing was to: 1) determine the dynamic physical conditions necessary to cause side release buckles to release under inertial loading from a sharp impact to the back side of the buckle; 2) measure real-world crash conditions

and compare these to measured and predicted conditions that would cause a buckle to unlatch under inertial forces; and, 3) measure in-vehicle conditions using a human volunteer and metal frame child seat. The full report of testing is attached as Appendix D.

Testing included full scale vehicle crash tests; bench testing of sample buckles using a drop weight; hitting the back of sample buckles with a human hand and hip and a video cassette; and in-vehicle testing of buckles using a metal frame child seat and a human volunteer's hip. A computer model was developed to predict the required impulse, acceleration, and pulse width to the buckle that would cause a buckle to unlatch under inertial forces.

The bench testing consisted of dropping an 8 lb weight from selected heights onto the back side of a side release buckle. The buckle was stretched horizontally between two posts and placed under tension. The belt/buckle tension was held at 5, 50 and 500 lbs. The back of the buckle was impacted with and without padding. Three types of padding were used, two types of foam and 1/8th inch of the material uses on the skin of test dummies.

Accelerometers were placed on the safety belt buckles in several full scale crash tests to gather laboratory crash data for comparison with the modeling and the bench testing data.

The full scale vehicles tests included the following:

- o 20 mph side impact, 1985 GM pickup truck, 2 - 50 percentile test dummies

- o 30 mph side impact, 1985 GM pickup truck, 2 - 50 percentile test dummy and 1 child seat with a 3-year old test dummy
- o 30 mph front impact, 1993 Chrysler pickup, 2 - 50 percentile test dummies
- o 50 mph oblique front impact, 1989 Taurus impacted with a 20,000 moving test buck, 1 - 50 percentile test dummy
- o 30 mph front impact, 1993 Sentra, 2 - 50 percentile test dummies
- o 30 mph front impact, 1993 Century, 2 - 50 percentile test dummies

The results of the test program shows that the phenomenon of inertial unlatching can be described in terms of the physical parameters of acceleration amplitude, duration of the acceleration pulse, and belt tension. As belt tension increases, the threshold for opening a buckle also increases. As the pulse width decreases, the acceleration threshold for inertially opening the buckle increases.

These parameters are shown graphically in Figure 1. This figure shows the predicted line for inertially opening the buckle with a belt tension of 50 lb. The area above the line indicates the conditions under which it is theoretically possible to open the buckle release by inertial forces latch. Conditions below the line the latch would not cause the buckle to release . Data points taken from the bench testing, using drop weight, video cassette, and human hip impacts are plotted to show their relation to the predicted threshold for opening. Laboratory crash data points are shown to be well under the acceleration threshold for inertially unlatching of the buckle.

Conclusion: No buckle releases were observed during the crash testing. All of the laboratory test results indicate that while it is possible to create inertial forces that could cause a safety belt buckle to release, such conditions do not exist in real-world crash conditions.

## RECALLS:

A review was made of all motor vehicle safety recalls, from 1968 to the present, that reported a defect in safety belt buckles. The recalls were reviewed to determine if there was any relationship between the reported defect in the recall and the alleged defect of "inertial unlatching." A total of 20 recalls were identified reporting safety belt buckle defects. The defects included a broad range of reported problems, such as improper latching, false latching, failure to unlatch, failure to remain fastened under high tensile loads, and mechanical failure (cracking and disintegration) of certain parts as a result of aging. There have been no recalls reported to the agency that relate to the alleged problem of inertial release of a buckle due to impact to the back of the buckle housing. Appendix E shows a listing of all safety belt buckle recalls received by the agency.

### **TELEPHONE SURVEY:**

The agency conducted a telephone survey of callers whom reported seeing the "Street Stories" television show. The objective of the survey was to determine any effect that the show may have had on person's decision to use safety belt when riding in a motor vehicle. The following is a summary of the survey.

- o Follow up calls to 128 individuals who saw "Street Stories" and called Hotline
- o All persons used their safety belts all or most of the time
- o 102 persons (80%) continue to wear safety belts
- o 4 persons (3%) stopped wearing safety belts or use them less often
- o 22 persons (17%) fasten their safety belts more carefully, including:
  - o 2 persons that take extra precautions with child safety seats, e.g. padding under buckle
  - o 1 person that does not allow children to ride in vehicles with side release buckles
- o Conclusion -- some people report they do not buckle up as often compared with before the show

## FOREIGN STANDARDS -- AUSTRALIA:

The Australian Federal Office of Road Safety (AFORS) was contacted for information related to unwanted buckle release in seat belt assemblies of the subject design. Of particular interest were any regulations which may, either by intent or effect, discourage use of the subject buckles in Australia. AFORS commented that no such regulations existed. The agency requested any information from Australia's investigative files related to the subject buckle types. AFORS noted that review of the safety defect investigations found "no record of any alleged problems with this type of buckle in Australia."

While not containing any provisions specifically related to buckles of the subject design, current Australian Design Rules (ADR) and Australian Standards (AS) for seat belt assemblies include several requirements intended to limit the possibility of unwanted buckle release in general. These requirements involve tests for partial engagement, inadvertent release, dynamic performance and buckle-spring fatigue resistance. A brief discussion of each follows.

**Partial engagement.** Clause 9a of AS 2596-1983, "Seat Belt Assemblies for Motor Vehicles," states that "the buckle shall be of a quick-release type and shall not be capable of partial engagement." Partial engagement is defined in the Australian Standard as "any stable condition, other than complete engagement, in which the buckle components will withstand a

separating force of not less than 1 N applied by tensile forces in the strap components, without disengaging. The tensile forces may be readily applied by holding one part of the buckle so that the other part tends to fall out vertically under its own weight."

**Inadvertent release.** Clause 9b of AS 2596-1983 states that "the buckle shall not have a potential for inadvertent release by the vehicle occupants." A buckle assembly is considered free of such potential if, when tested in accordance with AS 2597.4, release is not caused. This test involves application of a flat planar surface against a latched buckle assembly such that the surface is normal to the line of action of the actuator.

**Dynamic performance.** The seat belt assembly is subjected to dynamic forces designs to cause a nominates deceleration of a dummy of specified characteristic. A dummy with mass of  $72 \pm 2$  kg ( $163 \pm 5$  lbs) is mounted on a test sled and restrained by the seat belt assembly to be tested. The seat belt assembly is configured in a manner consistent with its intended usage. From a nominal initial velocity of 13.6 m/s (29.0 mph) the apparatus achieves a deceleration of between  $235 \text{ m/s}^2$  ( $771 \text{ ft/s}^2$ ) and  $335 \text{ m/s}^2$  ( $1010 \text{ ft/s}^2$ ) within 30 ms. The deceleration must be substantially within the specified range for at least 20 ms, disregarding values outside the range that occur for periods of less than 1 ms. Upon completion of the test, the seat belt assembly is checked for separation of any components within themselves or from the anchorages and for proper release operation of the buckle.

**Buckle-spring fatigue resistance.** Clause 4.5.3 of ADR 4/01, "Seat Belts," states that "in the case where a spring is incorporated in the unlatching mechanism of a buckle, the load required to operate the spring shall not be reduced by more than 20% after the spring has been subjected to 50,000 operations each involving a movement not less than 95% of the design movement for buckle unlatching."

**SUMMARY:**

The petitioner alleges that certain designs of safety belt buckles are vulnerable to unlatching caused by inertial forces that may be applied to the buckle in a crash. To support this contention, the petitioner demonstrated the unlatching of side release buckles by hitting sample buckles on the back side with a sharp impact, typically with a video cassette box, a human hip, or human head. Also, the petitioner provided consumer complaints alleging the unlatching of buckles in motor vehicle accidents.

The agency conducted an extensive review of all available information to assess the real-world risk of inadvertent unlatching of buckles. It sent information request letters to 8 manufacturers, 5 safety belt manufacturers, and holders of 7 patents of end release-type buckles. The agency reviewed its accident data, consumer complaint file, and crash test data to assess this alleged problem. Furthermore, full scale vehicle crash tests and other laboratory tests were conducted specifically for this evaluation to determine the possible real-world risk associated with the alleged "inertial" unlatching.

The vehicles manufacturer's information demonstrates a very low complaint level of alleged releasing of buckles in motor vehicle accidents. The subject design buckle has been used in vehicles from all of the major manufacturers for many years. Since 1970, about 263 million vehicles have been equipped with side release type buckles. The manufacturers report either none or very few alleged unlatching complaints in that period of time. No manufacturer reported developing test programs to address real-world problem concerning the alleged defect. Several manufacturers point out that the level of acceleration or impact on a buckle during a motor vehicle crash is far below the level needed to release a buckle.

Several patents for end release buckles reference the need for a design to consider the inertial effects on the performance of a buckle. The patent holders provided two reasons for this. First, some designs are intended to be used with pyrotechnic belt pre-tensioner devices. These devices can impart impact loads to the buckle and these must be anticipated in the design with features to prevent inadvertent unlatching. Second, all designs of buckles, both end release, and side release, must operate safely without inadvertent release and since inertial forces are present in a vehicle crash, all designs are subject to engineering design criteria to prevent inadvertent release.

The agency analyzed its accident data for evidence of the alleged defect. The analyses compared injury and fatality levels between vehicles using side release buckles and vehicles using end release buckles. The analyses showed no significant differences between the two

buckle types that could indicate a real-world problem associated with the alleged defect. Specific accident files show no evidence to indicate "inertial" unlatching of buckles.

The agency reviewed all of its records of vehicle crash and sled test data for evidence of inertial unlatching. The agency has records on 2,067 tests involving 3,730 belted test dummies and 239 tests of dummies in child safety seats. Nine buckles unlatched in the vehicle test and 1 broke and 1 unlatched in child seat sled tests. Of the unlatched buckles, three were side release and seven were end release buckles. The agency has reviewed the written reports and films of these incidents and concluded that the test data provides no evidence of the alleged "inertial" unlatching phenomena.

The ODI consumer complaint data base contains some complaints of alleged unlatching. However, the level of complaints is very low in comparison to the population of vehicles with side release buckles. The complaints of alleged unlatching includes end release type buckles. In fact, the complaint rate for end release buckles compared to side release buckles is about the same (0.9 for end release compared to 0.7 for side release complaints per 100,000 vehicles). Most complaints report a front or rear impact, where as an inertial unlatching phenomenon for side release buckles would tend to be associated with side impacts.

**CONCLUSION:**

- o Information supplied by vehicle and buckle manufacturers indicate a very low complaint level of buckles unlatching in accidents. There is no evidence that those incidents are related to the alleged defect of "inertial" unlatching.
  
- o Information supplied by patent holders of certain end release buckles indicates that the potential of inertial release is a theoretical design consideration for all types of buckles in order to avoid unwanted buckle release. Further, the desire to use some buckles with pyrotechnic belt pre-tensioners requires special design considerations for inertial loads resulting from those devices.
  
- o Analysis of accident data indicates no evidence to suggest a defect with side release belt systems.
  
- o Review of over 2,000 agency crash tests involving 3,730 belted crash test dummies indicates no belt openings due to inertial unlatching.
  
- o Review of 239 agency crash tests involving 239 child dummies in child safety seats indicate one belt unlatching; not due to inertial unlatching.
  
- o Review of the ODI consumer Complaint Data Base indicates an extremely low complaint rate and low reporting of problems subsequent to media coverage.

- o Laboratory testing indicates that while belts can open in unrepresentative and unrealistic impacts to belt buckle, during representative, real-world impacts, the belts buckles do not release.
  
- o There are indications that the media allegations have potentially caused negative impacts on safety belt use.

**RECOMMENDATION:**

Deny the petition.



THE SECRETARY OF TRANSPORTATION  
WASHINGTON, D.C. 20590

December 8, 1992

Mr. Laurence A. Tisch  
President  
CBS, Inc.  
51 W. 52nd Street  
New York, New York 10019

Dear Mr. Tisch:

Under ordinary circumstances, I would not formally comment on the fairness of news coverage by CBS. But two recent "Street Stories" segments on safety belt buckles and the associated "CBS Evening News with Dan Rather" coverage of this issue present an extraordinary situation. I am concerned that the misstatements in those segments may lead some viewers to stop wearing their safety belts, thereby doubling their chances of death or serious injury in a crash. I believe that the risk to public safety posed by these statements is real, and the inaccurate information CBS gave the public should be corrected.

Serious charges were made about the buckles used in 90 percent of the cars sold in the United States since 1970. The allegations are unfounded, as we conclusively established in a lengthy investigation. The results were presented in a news conference on November 18th, yet CBS continued to insist that a safety problem exists with these buckles.

We have provided a detailed analysis of the issue and the problems we observed in the CBS coverage in a letter to Eric Ober from Marion Blakey, Administrator of the National Highway Traffic Safety Administration. In our view, CBS has an obligation to give its audience a fair presentation on matters of public safety. The "Street Stories" programs on safety belt buckles did not meet this obligation, nor did the related coverage on the "CBS Evening News with Dan Rather."

I urge you to give thoughtful consideration to the enclosed material. If you have any questions on any aspect of this matter, please contact me.

Sincerely,

A handwritten signature in cursive script that reads "Andy Card".

Andrew H. Card, Jr.

Enclosure



U.S. Department  
of Transportation

National Highway  
Traffic Safety  
Administration

Administrator

400 Seventh Street, S.W.  
Washington, D.C. 20590

DEC -- 7 1992

Mr. Eric Ober  
President  
CBS News  
524 W. 57th Street  
New York, NY 10019

Dear Mr. Ober:

As administrator of the National Highway Traffic Safety Administration (NHTSA), I cannot leave unchallenged the recent CBS coverage of allegations raised by the Institute for Injury Reduction (IIR) that the safety belts in most cars on the road today can unbuckle in crashes. In four separate news stories, "CBS Evening News" and "Street Stories" inaccurately and unjustifiably challenged the effectiveness of those belts.

NHTSA is the Nation's regulatory agency for automobile and traffic safety and for years has taken its motor vehicle safety enforcement activities very seriously. We receive many petitions for defect investigations that help us to identify problems that need to be remedied. But some petitions, such as the one from IIR raising allegations of belt unlatching, prove to have no basis. IIR is an organization funded by trial attorneys, and in this case, IIR wrongly attacked an item of safety equipment that reduces an individual's risk of dying in a crash by half. In more than two decades of service in all kinds of crashes these belt buckles have a proven record of saving lives.

Despite this record, NHTSA undertook an extremely thorough examination of the merits of the IIR petition because of the potential magnitude of the problem. NHTSA reviewed thousands of crash tests, conducted laboratory testing, analyzed real-world accident data, reviewed complaints to the agency's hotline, requested and reviewed information from vehicle and belt manufacturers, and even obtained information from other countries. We found absolutely no evidence that seat belt buckles are defective.

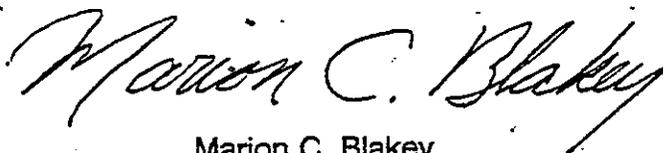
I am confident that we conducted an impartial, exhaustive review of the facts in this matter. We expected that the news media would cover the allegation and our response to it in a balanced, objective manner. Every news organization covering this story did so, except CBS News. Reporting by Dan Rather and Roberta Baskin proved factually inaccurate. In addition, their reporting undoubtedly misled millions of Americans who may now have a negative impression of safety belt benefits and

effectiveness. Some probably have been persuaded to stop buckling up. The integrity of the agency has been placed in question and our conclusions plainly have been misrepresented.

In the interest of public safety, I believe CBS should take action to rectify the incorrect impression that it has created. I have attached a chronology of events and an analysis of the errors in CBS News' coverage. I would appreciate your reviewing this information personally as I consider it to be of genuine importance to our country's ongoing effort to save lives on the highway.

If further information would be useful, we will be happy to provide it.

Sincerely,

A handwritten signature in cursive script that reads "Marion C. Blakey". The signature is written in dark ink and is positioned above the typed name.

Marion C. Blakey

Enclosure: Videotape of Nov. 18, 1992 NHTSA News Conference

Chronology and Fact Sheet  
Regarding CBS News Coverage  
Of Allegations of Safety Belt Unlatching

On September 10, 1992, the CBS News "Street Stories" program aired a segment which alleged that safety belt buckles could unlatch in a crash. The program showed numerous belt buckles coming unlatched after being struck on the backside of the buckle, typically by a hard, blunt object. This type of impact -- which is not typical of real-world crash forces on safety belt buckles -- causes a phenomenon called "inertial unlatching." Inertial unlatching has been reported for some 20 years, but is not associated with real-world crashes.

On September 11, 1992, the Institute for Injury Reduction (IIR) petitioned the National Highway Traffic Safety Administration (NHTSA) to conduct a defect investigation which could lead to a safety recall of side release safety belt buckles found in millions of cars. These belt buckles are called side-release because when the belt is connected, the push release button is on the side of the buckle, facing away from the occupant. The petition alleged that these buckles can unlatch in crashes because of an impact to the backside of the buckle. The petition also requested that the agency initiate rulemaking to preclude such designs in the future.

On September 11, 1992, the CBS Evening News replayed portions of the "Street Stories" program, and reporter Roberta Baskin indicated that belt unlatching due to inertial forces was a serious safety problem.

NHTSA conducted an exhaustive review of the issues contained in the IIR petition. The agency's assessment was based on a wide variety of information, including a review of thousands of crash tests, laboratory testing, analyses of real-world accident data, information from vehicle and belt manufacturers, data from holders of patents on safety belt buckle designs, experience from other countries, and complaints filed with our Auto Safety Hotline.

Each component of our analysis indicated there was absolutely no merit to the claims made on CBS and in the IIR petition. Accordingly, NHTSA denied the petition. During a news conference on November 18, 1992, announcing this denial, NHTSA Administrator Marion Blakey stated that there was no basis for the allegations and that these safety belts are safe. In addition, other senior agency officials provided detailed information on all aspects of the agency's analysis. Complete documentation of

NHTSA's review and analysis was provided to the media, and unlimited time was provided for questions. Roberta Baskin and a CBS News film crew were in attendance, and asked a series of questions.

The agency contacted CBS News before the news conference to advise it that NHTSA would be announcing its decision concerning the IIR petition on November 18, 1992. In a November 18, 1992 letter to Eric Ober, President, CBS News Division, the agency advised CBS of its concern about the potential impact on motorists when it was learned that Ms. Baskin would be airing a second "Street Stories" segment on this issue on November 19, 1992, suggesting that NHTSA had not conducted an adequate inquiry into the petitioner's allegations.

#### Errors and Misstatements on This Issue by CBS News

##### A. CBS Evening News Coverage of NHTSA's News Conference on November 18, 1992.

- o CBS News anchorman Dan Rather characterized NHTSA's denial of the IIR petition as follows: "Federal highway safety officials now admit that there is a potential problem with a type of automobile safety belt in millions of cars. So what are they going to do about it -- nothing." Mr. Rather then asked the rhetorical question about NHTSA, "Are they just buckling under to industry or should you feel secure buckling up?" This is after the news conference and the agency's press release stated that the results of NHTSA's analysis is that "... current safety belts are safe. Safety belts provide outstanding crash protection and the public should ignore irresponsible reports to the contrary."
- o Mr. Rather took unacceptable liberties with a statement made by the NHTSA Administrator at the news conference. Ms. Blakey stated, "Certainly in a crash environment it is conceivable that this could occur. But judging by all the data that we have before us, the odds are minuscule." Further, in response to repeated questions by Ms. Baskin regarding whether it was "possible" to get unlatching, Ms. Blakey indicated that such an event could occur, but "Judged against the responsibility that this agency is charged with -- to protect the public against unreasonable safety risks -- this doesn't even make it on the chart."
- o Such journalism is totally irresponsible. After having found absolutely no basis on which to conclude there is a safety problem with these belts, to have a major network news show lead the story with "Federal highway safety officials now admit that there is a potential problem ..." is more than misleading -- it is seriously and unjustifiably undermining public safety.
- o Mr. Rather also reported: "Today's press conference was called in reaction to a follow-up "Street Stories" report airing tomorrow night." This assessment was

not correct. NHTSA held the news conference because very serious allegations had been made that had raised questions in people's minds about the safety and usefulness of safety belts. Safety belts saved some 4,700 lives last year alone, and NHTSA is extremely aggressive in promoting safety belt usage. It was imperative that the agency advise the public as to the credibility of these allegations. NHTSA routinely holds news conferences when an issue has received widespread media coverage and can affect the safety of the public.

- o Ms. Baskin mis-characterized a number of other results. She stated that in 1970, the agency thought inertial unlatching was enough of a potential problem to propose a requirement for special buckle testing. In fact, the agency issued an Advance Notice of Proposed Rulemaking in 1969, in which it indicated it was considering amendments to its safety standards to specify dynamic performance requirements and test procedures for seat belt assemblies, to replace the existing static test procedures. Nowhere in this rulemaking notice did the agency state that it thought inertial unlatching was a problem. Ms. Baskin failed to note that NHTSA subsequently suspended this rulemaking in a Federal Register notice because "after consideration of the available information, it has been determined that sufficient justification for regulations of the nature proposed has not been shown at this time. Accordingly, no regulation on any of these subjects will be issued without additional notice and opportunity for comment." The most significant reason for terminating further work on dynamic testing of safety belts was a proposed requirement for automatic restraint systems in passenger cars. This proposal called for full-scale vehicle crash tests as a measure of assessing the entire vehicle's ability to provide occupant crash protection. The entire CBS News report left millions of viewers with the erroneous impression that the federal government identified inertial unlatching as a problem, proposed a rule to address this problem which was supported by the motor vehicle industry, and then never took action.

B. "Street Stories" Program on November 19, 1992.

- o CBS News aired a follow up report on "Street Stories" on November 19, 1992, titled "Accident Prone." It, too, was filled with a number of false and misleading statements.

1. Statements with respect to the investigation of the crash resulting in the death of Michelle Boyle, in a 1991 Oldsmobile Calais.

Ms. Baskin stated that NHTSA had sent investigators to investigate the crash. She then asked Mr. Boyle, the father of the deceased, what the NHTSA personnel said. Mr. Boyle responded that NHTSA staff told him that,

"Because of the mud splattering on the belt indicated the belt was in use at impact. [pause] That it was buckled."

Ms. Baskin then asked the rhetorical question, "How could the belt have gotten splattered with mud if it wasn't extended across Michelle's body at some point during the accident?"

Facts:

NHTSA ordered an independent investigation of the crash, and this was conducted by the Calspan Corporation's Transportation Sciences Center, Accident Research Group. The conclusion of their review of the vehicle, crash site, police report, and medical and coroner reports is that, "based on the lack of evidence [of belt use] on the automatic belt system, the ejection of the driver, and the lack of seat belt injuries [to the victim], we conclude that the belt was not worn prior to or during the crash." This conclusion was included in the report issued by NHTSA on November 18, 1992.

2. Statement by contractor of Ford Motor Company with respect to screwing safety belt buckle together during sled tests.

Ms. Baskin interviewed an unnamed individual who states that he participated in putting screws in safety belt buckles to ensure that they would not open in a laboratory test. Such a statement, without any mention of the purpose of such an action, gives the viewer the clear impression that Ford intentionally conducted safety tests with the buckle screwed together because of concerns over inertial unlatching.

Facts:

As reflected by a deposition of Mr. Richard Saul, Mr. Saul participated in testing of air bags using Ford's sled test facility while an employee of Eaton Corporation. During 1966 and 1967, a number of sled tests were conducted on passenger-side air bag designs with restrained dummies. The dummies were restrained using a center push button (side release) buckle. The position of the buckles was at the center of the abdomen where the release button could be contacted by the air bag, not to the side near a person's hip, where they are in on-the-road vehicles. Ford reports that Mr. Saul performed no more than 3 tests where the buckle was observed unlatched after testing. Of the estimated 13,000 belted occupant tests done by Ford, fewer than five had the buckle mechanically secured with a screw or bolt to avoid variability in air bag tests.

3. Statements concerning the patent documents that mention inertial unlatching.

Ms. Baskin stated that, "Several seat belt manufacturers have introduced new buckle designs, acknowledging in their patents that some buckles can open accidentally."

Facts:

In its review of the facts surrounding the petition, NHTSA contacted the holders of seven safety belt buckle patents. As noted at the NHTSA news conference on November 18, and in the materials disseminated that day, "Responses [to NHTSA] from safety belt buckle patent holders indicated that patents were sought to improve the general performance and ease of operation of buckles--not because of a safety problem associated with inertial unlatching." The patent holders indicated that their mention of "inertial unlatching" in patent documents was based on theoretical analysis, not real-world evidence of this phenomenon.

4. Statements made by Roberta Baskin alleging that Ford Motor Company has complaints of belt unlatching in crashes.

Ms. Baskin stated, "In the past, Ford insisted it didn't know of any cases of seat belts unlatching in crashes. Now it reports more than 60."

Facts:

As part of its review of information in response to the IIR petition, the agency contacted eight motor vehicle manufacturers. Each was asked to provide the agency with information on consumer complaints of safety belt unlatching incidents in real-world crashes. In the response we asked Ford to submit, Ford reported a total of 64 complaints of alleged unlatching from a variety of possible causes in all Ford vehicles manufactured since 1970. Eleven of these complaints involve end release buckles and 53 were side release buckles. Ford reported that since 1970 it had sold 4 million vehicles with end release buckles and 67 million with side release buckles. Ford reported that no consumer complaints indicated release caused by inertial unlatching. Ford's review of many complaints indicated that, based on inspection of the buckles and review of the complainants' injuries, there was no evidence to support the claim of unlatching. In some cases, Ford investigations indicated that the safety belts would not latch or were otherwise not functional. Other complaints to Ford involved vehicles which were the subject safety recalls for manufacturing defects in belt buckles.

NHTSA has been aggressive in identifying safety defects in safety belts and securing recalls. Over the past four years, as a result of NHTSA's effort, manufacturers have initiated ten safety recalls involving safety belts in 2.7 million vehicles. NHTSA's defect investigations have influenced over 87 percent of the vehicles involved in these recalls. In each, the defect involved a manufacturing deficiency in the safety belt, not a design flaw.

5. Statement made by "Street Stories" host Ed Bradley in his closing remarks indicating that end release buckles were a "safer" alternative to side release buckles.

Facts:

There is no evidence to suggest that end release buckles are immune to complaints of inadvertent unlatching, or are "safer." The NHTSA data base shows complaints for both types of buckles. Before the petition the agency's data base contained 11 end release complaints and 24 side release complaints. The complaint rate for end release buckles is 0.9 complaints per 100,000 vehicles and for side release, 0.7 complaints per 100,000 vehicles. Of the ten safety recalls for safety belt buckles since 1988, six were for vehicles with end release, three for vehicles with side release and one was a labeling recall effecting vehicles with both side and end release buckles. Further analysis of real-world accident data concluded that both side release buckles and end release buckles provided the same level of crash protection. There is no evidence on which to conclude one type of buckle design is safer than the other.

NEF12  
Quandt

DEC 11 1992

The Honorable Howard Metzenbaum  
United States Senate  
Washington, DC 20510

NEF-11dm

Dear Senator Metzenbaum:

Thank you for your letter dated November 5, 1992, on behalf of your constituent, Mr. Tom Marria. Mr. Marria contacted you regarding his concern over a recent television program regarding safety belt buckles that can release when struck with a sharp blow on the backside of the buckle. He indicates he has a 1985 Chevrolet Celebrity and a 1987 Chevrolet G20 Sportvan. Mr. Marria previously contacted the National Highway Traffic Safety Administration (NHTSA) through Senator John Glenn's office. We have enclosed a copy of our response to Mr. Marria's letter. Since our response to Mr. Marria, the agency has denied a petition to recall the safety belts and to establish performance requirements for safety belt buckles which would be included in a Federal motor vehicle safety standard.

NHTSA conducted an exhaustive review of the issues contained in the Institute for Injury Reduction's petition. Our assessment was based on a wide variety of information, including a review of thousands of crash tests, laboratory testing, analyses of real-world accident data, information from vehicle and safety belt manufacturers, data from holders of patents on safety belt buckle designs, experience from other countries, and complaints filed with our Auto Safety Hotline. Each component of our analysis indicated there was absolutely no merit to the allegation of defective safety belt buckle designs.

Accordingly, NHTSA denied this petition. During a press conference on November 18, 1992, announcing this denial, NHTSA Administrator Marion Blakey stated that, "current safety belts are safe. There is no need for a recall or new regulations. Safety belts provide outstanding crash protection, and the public should ignore irresponsible reports to the contrary." A copy of the Department of Transportation's press release on this subject is enclosed.

We hope that this information is helpful. If we can be of further assistance to you or your constituent, please call upon us. Mr. Marria may contact us through the Auto Safety Hotline at 1-800-424-9393.

Sincerely,

Original signed by  
William A Boehly

William A. Boehly  
Associate Administrator  
for Enforcement

3 Enclosures:  
Constituent's Correspondence  
Previous Correspondence  
News Release

NHTSA:NEF:ODI  
NEF-11:dm:DMazyck:65224:11/25/92:Final Typed:cmw:12/11/92  
NHTSA Control No. 9211230004  
DOT Control No. 923076  
ODI Control No. 44201  
cc:  
I; I10; I20  
NOA-01  
NOA-02; NOA-03  
NCC-01 Coord  
NEF-01; NEF-10; NEF-11, Subject/Chron/Mazyck/Optical Disk  
NEF-12 DP92-017 Dunsmoor/Quandt  
L:\congress\Marria.2

Post-It™ brand fax transmittal memo 7671		# of pages	1
To	Barney McCahill		
From	John Anderson		
Co.			
Dept.	Phone# 775-5040		
Fax #	Fax #		

# Agency rejecting seat belt charges

Det News  
11-18-92

By Bryan Gruley  
NEWS WASHINGTON BUREAU

WASHINGTON — Auto safety regulators today planned to officially reject charges that safety belts can unbuckle during crashes.

In a two-month review, the National Highway Traffic Safety Administration (NHTSA) found no evidence that so-called "inertial unlatching" occurs during auto crashes, sources said Tuesday.

Administrator Marion Blakey scheduled a news conference at which she is expected to criticize safety advocates and a CBS news program for publicizing alleged defects in seat belts.

Agency sources said the news conference was timed to come before Thursday night's airing of CBS' *Street Stories*, which will include a segment on belts unbuckling. NHTSA and automakers were sharply critical of a report on "inertial unlatching" that the program broadcast in September.

After that show, the Institute for Injury Reduction, a research group funded by plaintiffs' lawyers, asked NHTSA to recall the safety belts, citing lawsuits alleging that faulty belts contributed to deaths and injuries in car crashes.

The rejection of the petition "is entirely consistent with NHTSA's shirking of its safety duties under the Reagan-Bush administration's anti-regulation policies," said A. Benjamin Kelley, president of the Institute for Injury Reduction.

*Street Stories* producer Joan Martelli declined to comment. NHTSA can take up to 120 days to review a recall request, but took about 60 days fewer on the seat belt matter because Blakey is concerned people will be discouraged from wearing belts, sources said.

Among the materials NHTSA collected are several patents filed by seat-belt makers. The patents describe "inertial unlatching" as a problem with belts with a release button on the front face of the buckle.

But, in written replies to NHTSA queries, manufacturers said the problem is "theoretical" and has not occurred in crashes.

Safety Belt Performance

- o Safety belts are extremely effective in reducing the risk of serious injury and fatality. Studies done by safety researchers throughout the world have concluded that, when worn, belts reduce the risk of fatality by approximately 50% -- that is, belts cut the chances of being killed in half.
- o Safety belt use in this country has increased from 11% in 1982 to current levels of over 60%. This increased belt use has provided significant life savings. Since 1983, safety belts have saved more than 33,000 lives. In 1991 alone, seat belts saved some 4,700 lives.
- o Essentially every car in the U.S. is equipped with safety belts. All new cars have been required to be equipped with lap and shoulder belts in the front seat since model year 1968.

NHTSA Defect Investigations Concerning Safety Belts

- o NHTSA has a strong program to identify possible safety defects in motor vehicles and seek safety recalls when the facts warrant. This defect investigation program is part of the agency's effort to improve motor vehicle safety.
- o The agency has been aggressive in identifying safety defects in safety belts and securing recalls. Over the past four years, manufacturers have initiated 10 safety recalls involving safety belts in 2.7 million vehicles. NHTSA's defect investigations have influenced over 87% of these recalls. In each of these recalls, the defect involved a manufacturing problem, in which a component of the safety belt was not operating correctly.

Inertial Unlatching

- o The purpose of a safety belt buckle is to provide a means of latching and unlatching the two parts of a safety belt system. The buckle has a button that is pushed to unlatch the belt. The button has a spring mechanism beneath it that must be depressed in order for the belt to unlatch. Theoretically, if a spring-type mechanism, such as a safety belt buckle, is exposed to an abrupt acceleration, this acceleration can cause the button to ~~be~~ self-depress to the point that the belt becomes unlatched. This occurrence is a well understood engineering phenomenon, and is known as "inertial unlatching."
- o Whether the phenomenon has practical significance for automotive safety belts depends on whether the types of abrupt acceleration needed to unlatch a belt can occur in a vehicle crash. In a laboratory setting, a sharp blow to the opposite side of a buckle can cause an acceleration of such magnitude that it will cause the safety belt to unlatch. However, such a sharp blow is not characteristic of the motor vehicle crash environment.

### Past NHTSA Testing of Inertial Unlatching

- o NHTSA opened a defect investigation into inertial unlatching in 1977 after a single complaint that the seat belt mechanism in a 1975 Chevrolet Monza could inadvertently release if a sharp blow was applied to the back side of the buckle.
- o As part of its investigation into this issue, NHTSA conducted testing at its Vehicle Research and Test Center. The results of this testing indicated that a sharp blow to the backside of a safety belt buckle could indeed open the buckle. Absent real-world incidents, however, it was clear that an inherent defect in the design of seat belt buckles did not exist. It was also clear that the laboratory tests were not indicative of real-world conditions *through review.*
- o The agency published the results of these tests in a 1978 report titled "Survey of Seat Belt Latching Mechanisms Used on 1971-1978 Passenger Cars." While the agency found no defect in the Chevrolet Monza, or a need to conduct further investigation, the report recommended that tests be performed, simulating pelvic impact force on the back of the buckle in rollover and corner impact crashes. This type of testing has been done. The agency has conducted thousands of laboratory crash tests using dummies restrained by safety belts. Included in these tests are frontal, side, rear, rollover, and corner impact tests. In all of these tests, there is not one instance of inertial unlatching.

### The IIR Petition

- o On September 11, 1992, the Institute for Injury Reduction (IIR) petitioned NHTSA to conduct a defect investigation, leading to a recall, of safety belts which can become unlatched due to inertial unlatching. IIR alleged that crash forces applied to the buckle can actuate the release button, allowing the belt to become unlatched. Additionally, the IIR petition called for NHTSA to initiate rulemaking to preclude such designs in the future. IIR stated that the alleged defect appears to involve belts with the release button on the face of the buckle. When latched, the release buttons on such buckles are to the side of the occupant, hence they are characterized as "side release" buckles.
- o Associated with this petition was a national news story appearing on CBS's "Street Stories" show. On this show, side release buckles were portrayed as unsafe, in that they could become unlatched due to inertial unlatching. This show appeared on national TV on September 10, 1992 with a follow-up presentation on the CBS Evening News on September 11, 1992.

### NHTSA's Response to the IIR Petition

- o To address the allegations in this petition, NHTSA planned an extensive effort to obtain, analyze and review all available information and data on safety belt inertial unlatching. It was recognized that a thorough and exhaustive review would require extensive agency resources and, since such resources are fixed, other agency activities would necessarily be adversely affected.
- o NHTSA's comprehensive review of this petition encompassed a variety of approaches to address the issues associated with the alleged defect:
  - Detailed review of each and every laboratory crash test conducted by the agency to determine if inertial unlatching occurred in any of the thousands of tests.
  - Laboratory tests to define the characteristics that cause inertial unlatching and determine if these exist in the real-world crash environment.
  - Securing information from 20 manufacturers of motor vehicles and safety belts, as well as patent holders on safety belt buckles, to search for information concerning the alleged defect.
  - Analysis of real-world accident data to determine if there is any difference in the occupant protection provided by safety belts with side release buckles compared to belts with end release buckles, those in which the button is on the end of the buckle, towards the front of the vehicle.
  - Reviewing all information provided to NHTSA's Auto Safety Hotline, both before and after the "Street Stories" show to determine if any patterns exist among consumer complaints to suggest a possible defect with safety belt buckles.
  - Obtaining information from other countries concerning the alleged defect.

### NHTSA Findings

- o A comprehensive agency review of some 4,000 laboratory crash tests, including frontal, oblique, rear, rollover, and side crashes did not provide one instance of inertial unlatching. In 10 of these tests, belts did come unlatched due to other reasons, i.e., broken buckles, false latching. It was also noted that 7 of the 10 buckle unlatchings involved end release buckles.
- o Laboratory testing performed in response to this petition defined the engineering characteristic which cause inertial unlatching. Most important, this testing demonstrated that these characteristics are not present in real-world crashes.

- o Manufacturer data documented that inertial unlatching is not a safety problem. In the tens of thousands of crash tests conducted by motor vehicle and belt manufacturers, only General Motors reported what they believe may be a possible, but unverifiable case of inertial unlatching. Of the 30,000 tests GM has performed, they identified two such possible instances. No other reports were provided by either vehicle or belt manufacturers. Responses from safety belt buckle patent holders indicated that patents were sought to improve the general performance and ease of operation of buckles -- not because of a safety problem associated with inertial unlatching.
- o Analysis of real-world crash data demonstrated that there is no differences in the injury rates for occupants of vehicles equipped with side release compared to end release safety belt buckles. Thus, analysis of real-world data did not indicate the presence of a safety problem associated with inertial unlatching in side release buckles.
- o Review of consumer calls to the agency's Auto Safety Hotline did not suggest the presence of a safety problem. The complaint rate (the number of reports divided by the number of vehicles on the road) is essentially the same for vehicles with both side and end release buckles. Further, the complaint rate is extremely low compared to other safety problems reported to the agency. Additionally, the number of consumer calls to the Hotline subsequent to the "Street Stories" and CBS Evening News programs, the latter of which broadcast the toll-free Hotline telephone number, were no higher than the number of calls normally received. Generally, national TV publicity of a safety issue, in which the Hotline telephone number is presented, results in large increases in Hotline calls. The fact that such an increase did not occur in this instance suggests that the public does not consider this to be a safety concern.

#### Other Countries' Experience with Inertial Unlatching

- o The agency asked representatives of the Canadian Ministry of Transport and Australian Federal Office of Road Safety for any information they may have of investigations and reports concerning inertial unlatching of safety belt buckles.
- o The responses from Canada indicated that many investigations of alleged release of safety belt buckles had been conducted, but "in NO case was it concluded that the buckle released due to inertial forces."
- o The response from Australia noted that their review of the safety defect investigations found "no record of any alleged problems with this type of buckle in Australia."

NHTSA Conclusion

- o A comprehensive and exhaustive review of all available information led to the conclusion that there is no safety problem associated with inertial unlatching of safety belts in real-world crashes. This conclusion is based on laboratory crash tests, manufacturer submissions to the agency, analysis of real-world accident data, and assessment of consumer complaints filed with the agency. In each of these independent areas, the conclusion is strong and consistent --- inertial unlatching is a phenomenon that is not associated with real-world crashes.
- o Accordingly, the petition to conduct a defect investigation and to initiate rulemaking is denied.

# Safety Belt Unlatching

## Petition from The Institute for Injury Reduction

- o Initiate defect investigation leading to recall of certain safety belts
- o Initiate rulemaking leading to an amendment of Federal Motor Vehicle Safety Standard No. 208
- o Alleged "defect" appears to involve safety belt buckle designs with release on the front face of the buckle (side release)
- o Phenomenon involves concept of inertial unlatching
- o Public knowledge and interest stimulated by "Street Stories" program
- o Petition received on Sept 11, 1992
- o Grant or Deny by Jan 12, 1993

## Actions Taken To Address Alleged Defect

- o Wrote letters to holders of 7 end release safety belt buckle patents
  - o These patents imply a concern of inertial unlatching
  - o Chronology of industry knowledge and approach to "inertial actuation"
  - o Describe "inertial actuation" (failure mode analysis) as this relates to the patent and other buckle designs
  - o Respond to Ralph Hoar's allegations that the patent provides evidence of a problem in side release buckles
  - o Furnish technical papers, reports etc. discussing inertial unlatching or unwanted buckle release

## Actions Taken To Address Alleged Defect

- o Analyze real world accident data
  - o Review of specific NASS cases reporting belt/buckle failure
  - o Conclusion -- No evidence to indicate inertial impact on back of buckle causing buckle openings. Reports of belt/buckle failure attributed to extreme vehicle damage, buckle shattering, or no evidence that belt was worn.
  
- o Review of State Accident files and Fatal Accident Reporting System files
  - o Assess ejection, fatality and incapacitating injury rate between side release buckles and end release buckles
  - o Conclusion -- Analyses conclude there is no evidence in crash data to suggest that side release systems are less safe than end release systems

## Actions Taken To Address Alleged Defect

- o Comprehensive review of agency crash and sled tests involving full size belted occupants

Type of Test	No. of Tests	No. of Dummies	Latch Openings
Front 90 degree	1353	2491	8
Front Oblique	53	104	0
Rear	409	811	0
Roll Over	17	17	0
Side	235	307	0
Total	2067	3730	8

- o Latch openings
  - o 3 defective buckles -- recalled for safety defect after ODI investigation (end release)
  - o 4 opened on rebound, after dummy contact with release button (end release)
  - o 1 lap belt released on rebound (side release)
- o Conclusion -- no evidence of buckles opening due to inertial unlatching

## Actions Taken To Address Alleged Defect

- o Comprehensive review of agency sled tests using belted child seats

Type of Test	No. of Tests	Latch Openings
Front 90 degree	238	2
Front Oblique	1	0
Rear	0	0
Roll Over	0	0
Side	0	0
Total	239	2

- o Latch openings
  - o 1 broken buckle -- R&D test of child seat (side release)
  - o 1 released in R&D CRABI test (side release) -- air bag pushed child seat into seat cushion
- o Conclusion -- no evidence of buckles opening due to inertial unlatching

## Actions Taken To Address Alleged Defect

- o Contact callers to Hotline regarding safety belt unlatching
  - o Before "Street Stories"
    - o 35 accidents: 14 front, 6 rear, 10 side, 5 roll over
      - o side release: 8 front, 4 rear, 8 side, 4 roll over
      - o end release: 6 front, 2 rear, 2 side, 1 roll over
    - o 8 child seat reports: 5 side release, 3 end release
- o Accidents
  - o most are moderate to severe -- \$2,500 damage to totalled
- o Injuries
  - o 6 minor -- bumps and scratches: 5 side release, 1 end release
  - o 9 minimal -- cuts, concussions or sprains: 4 side release, 5 end release
  - o 10 serious -- fractures and breaks: 9 side release, 1 end release
  - o 6 report hospitalized -- broken arm, ruptured spleen, kidney laceration, fractured skull, broken leg, broken knee

## Actions Taken To Address Alleged Defect

- o Contact callers to Hotline regarding safety belt unlatching (cont.)
  
- o After "Street Stories"
  - o 19 accidents: 3 front, 6 rear, 8 side, 2 roll over
    - o side release: 2 front, 4 rear, 7 side, 1 roll over
    - o end release: 1 front, 2 rear, 1 side, 1 roll over
  - o 2 child seat reports: 1 side release, 1 end release
  
- o Accidents -- moderate to severe
  
- o Injuries
  - o 9 minor -- bumps and scratches: 8 side release, 1 end release
  - o 10 serious -- fractures, breaks, serious head injury: 6 side release, 4 end release
    - o 2 emergency room -- broken leg, shoulder
    - o 6 hospitalized -- broken neck, leg, shoulder, skull, internal injuries, coma
    - o 2 fatal

## Actions Taken To Address Alleged Defect

- o Contact callers to Hotline regarding safety belt unlatching (cont.)
- o Conclusion -- Complaints show no evidence of inertial impact release.
  - o No significant difference in complaint rate between side and end release buckles in alleged release complaints.
  - o Most complaints report a front or rear impact -- an inertial release phenomenon would tend to be associated with side impacts
  - o Injury level is spread from none to serious -- pattern appears to be random and function of accident severity,
  - o Complaints spread among many different makes, models and model years -- no indication of a specific vehicle trend

## Actions Taken To Address Alleged Defect

- o Full Scale Vehicle Crash Tests at VRTC
  - o 20 mph side impact (2 - 50%tile dummies)
  - o 30 mph side impact (1 - 50%tile dummy and 1 child seat w/ 3yr old dummy)
  - o 2 - 30 mph front impacts (2 - 50%tile dummies)
- o Conclusion -- no buckle release

## Actions Taken To Address Defect

- o Laboratory Experiments at VRTC
  - o show technical difference between "parlor trick" and real crash forces and accelerations and how these affect belt opening

[INSERT CHART HERE]

## Actions Taken To Address Defect

- o Laboratory Experiments at VRTC
  - o Conclusion -- crash accelerations on the buckle are substantially below levels needed to open buckle using "parlor trick" and bench testing, when the back side of the buckle is impacted

# Actions Taken to Address Alleged Defect

## Telephone Survey

- o Follow up calls to 128 individuals who saw "Street Stories" and called Hotline
- o All persons used their safety belts all or most of the time
- o 102 persons (80%) continue to wear safety belts
- o 4 persons (3%) stopped wearing safety belts or use them less often
- o 22 persons (17%) fasten their safety belts more carefully, including:
  - o 2 persons that take extra precautions with child safety seats, e.g. padding under buckle
  - o 1 person that does not allow children to ride in vehicles with side release buckles
- o Conclusion -- some people report they do not buckle up as often compared with before the show

# Safety Belt Unlatching

## Conclusions

- o Analysis of accident data indicates no evidence to suggest a defect with side release belt systems
- o Review of over 2,000 agency crash tests involving 3,730 belted crash test dummies indicates no belt openings due to inertial unlatching
- o Review of 239 agency crash tests involving 239 child dummies in child safety seats indicate one belt unlatching; not due to inertial unlatching
- o ODI Complaint Data Base does not indicate a problem - extremely low complaint rate and low reporting of problem subsequent to media coverage
- o Laboratory testing indicates while belts can open in unrepresentative and unrealistic impacts to belt buckle, representative impacts do not open buckle
- o Indication that allegation has negatively affected belt use

# **Safety Belt Unlatching**

## **Recommendation**

- o Deny IIR Defect Petition**

## Analysis of Defect Petition DP92-017

### R 1. Basis of the petition

- petitioner's description of alleged defect of "inertial actuation" ⇒ "APPEARS TO EFFECT ..."  
"OCCURS WHEN IMPACT ..."
- action requested of NHTSA
  - initiate defect investigation
  - initiate rulemaking
  - issue warning to public
  - give guidance to crash investigators

### AL 2. Background

- seat belt buckles
  - functional description
  - design considerations
    - strength
    - reliability
    - ease of use
    - comfort
    - durability - age factor (mentioned in petition Australian std.)
- increased belt usage and demand for safety
- types of buckles, side release and top release
- # of cars, belts, and # in use

- INADVERTENT RELEASE
- PARTIAL ENGAGEMENT
- INERTIAL FORCES
- CRUSH RESISTANCE
- PUSH BUTTON OPERATED

### JM 3. Complaints

- ODI complaints prior to publicity
  - discuss general allegation of complaints
  - belt alone or with child seat
  - complaints trend:
    - model
    - model year
    - side release vs end release *bar charts*
      - # of complaints
      - rates/100k
    - age of vehicle
    - impact location
    - size and weight (might not have enough data for this)
- ODI complaints post publicity (9/10)
  - compare with pre-publicity as analyzed above
- summary

#### 4. NCSA data

- review of cases where buckles are alleged to have been latched NASS
- FARS in cross-over cars (switch from side to end release)
  - Caravan
  - Taurus
- State Data ejection and serious injury comparison of side with end release
- summary

*JMA.*  
Recalls

- list and describe if any that relate to inertial release
- relation to any of complaints
- summary

*JD ✓ 5.*  
*JR*  
Manufacturer responses

- table of vehicle populations and complaints
- accidents and lawsuits summary
- testing
- design changes or modifications to address inertial unlatching
- summary of mfrs technical evaluation of inertial unlatching
- comments on trend toward to end release buckles
- special comments or findings from
  - GM
  - Ford
  - Chrysler
  - Toyota
  - Honda
  - Nissan
  - Volvo
  - VW
- summary

*JR ✓ 6.*  
Supplier responses

- table of complaints

- accidents and lawsuits summary
- testing
- design changes or modifications to address inertial unlatching
- special comments or findings from
  - TRW
  - General Safety Corp
  - Takata
  - Allied Signal, Bendix
- summary

7. Testing

- Review of past crash or sled testing
  - overview, type of tests, number of tests
    - full size dummy
    - frontal, side, rollover
    - Canadian side tests
    - child safety seats
- comments on belt failures
  - 301-DYS-79-015
    - 1979 IH Scout, 301 test
    - buckle opened after rebound
  - VRTC-87-0074 (Apr 92) Draft, child seat
    - 91 Town Car buckle
    - air bag pushed seat rearward
  - DOT HS 807 466 (Mar 89), child seat
    - GM buckle, FP 9100 forward facing

- buckle over metal frame failed in bending
- other test failures list here
- summary of testing and failures
- Testing to address unlatching issue
  - 1978 testing on Monza and other buckles
    - duplicate parlor trick using spring ram
  - 1992 testing
    - overview
    - crash test of C10 truck
    - belted occupant bump and grunt test
    - child seat shove and shake test
    - bench test to establish force-time curves
    - summary

#### 8. Modeling

- simulation of side impact
- determine force and pulse

#### JP 9. Foreign standards

- Australia
- Canada
- European

#### 10. Analysis

- Alleged unlatching in real-world, level of problem
  - ODI, Mfr, and NCSA data
- compliance and R&D test data

- bench tests results compared to crash and hands on testing
- answer to question: can unlatching occur and is it "inertial" or some other random and unknown cause(s)?
- summary

11. Conclusion

12. Recommendation