NEW CAR ASSESSMENT PROGRAM

Response to the NCAP FY 1992 Congressional Requirements

Report to the Congress
December 1993

Executive Summary

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The FY 1992 Senate and Conference Appropriations Reports required the National Highway Traffic Safety Administration (NHTSA) to:

- implement improved methods of informing consumers of the comparative levels of safety of passenger vehicles as measured in the New Car Assessment Program (NCAP),

- examine and study the results of previous model year NCAP results to determine the validity of these test data in predicting actual on-the-road injuries and fatalities, and

- address the efficacy of allowing manufacturers to choose between the "high tech" and "low tech" crash test dummies for the purpose of NCAP testing.

In February 1992, a plan and schedule were presented to the Committees that detailed how NHTSA would comply with these requirements. This report presents results of NHTSA studies that address the three requirements and completes the 1992 plan. In addition, the report also includes a review of NCAP historical performance and future goals for NCAP as required by the FY 1992 Conference Report.

This report provides:

- the results of an 18-month study to assess consumer and media needs in understanding and promoting the use of NCAP data. This included contracts for consumer focus groups and media studies, using $150,000 earmarked in the FY 1992 budget. These studies indicated that consumers and the media desire comparative safety information on vehicles, a simplified NCAP format to better understand and utilize the crash test results, and would like to see NCAP expanded to include other crash modes, such as side crashes and rollovers. Plans for implementing the findings of these studies are included in the report.

- studies of real-world crashes versus NCAP crash tests. These studies conclude that NCAP test conditions approximate real-world crash conditions covering a major segment of the frontal crash safety problem. NHTSA concludes that there is a significant correlation between NCAP results and real-world fatality risks for restrained drivers. In high speed frontal crashes, fatality risks to restrained drivers of cars that perform well in NCAP may be as much as 30 percent lower than fatality risks to restrained drivers of cars that do not perform well in NCAP.

- a study on the efficacy of allowing manufacturers to choose between the Hybrid III and the Hybrid II crash test dummy. NCAP data were utilized in this study along with an analysis of comments to Federal Register notices on the mandatory use of the Hybrid III crash test dummy in Federal Motor Vehicle Safety Standard (FMVSS) No. 208 and in NCAP. From data analysis and the review of the comments to the two notices, NHTSA has concluded that exclusive use of the Hybrid III in NCAP should begin with MY 1996 vehicles. This is two years earlier than required by the recent amendment to FMVSS No. 208. In addition, NHTSA will immediately, beginning with MY 1994 vehicles, use the Hybrid III exclusively for all seating positions in which the occupant is protected by an air bag. Since air bags are in the vast majority of new passenger cars and are rapidly being introduced into light trucks, and since many manufacturers prefer the Hybrid III, nearly all seating positions will be tested with the more advanced Hybrid III. NHTSA believes these changes fully comply with the Appropriations Committees' requests to expeditiously move toward exclusive use of the Hybrid III.

In the report, NHTSA proposes to achieve the following major NCAP goals:

- reach a larger group of the population with simplified data that will assist consumers in their vehicle purchases.

- expand the collection of safety information by utilizing the additional injury-measuring capabilities of the more advanced Hybrid III dummy.

- expand NCAP to provide comparative side impact information to consumers along with the frontal NCAP information.

- monitor rollover safety activities to determine the potential for providing consumers with comparative information on levels of protection in the rollover crash mode and on vehicle roll stability.

NHTSA also is considering holding a public meeting on NCAP. The public meeting could provide an open forum for consumer groups, media, foreign governments, national and international safety organizations, and motor vehicle manufacturers to discuss the above NCAP goals. Comments would be solicited on the material in this report and opportunities would be given for interested parties to suggest alternative or additional NCAP goals and activities. Such a meeting could be held in 1994.

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Section 1. Introduction

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1.1 Foreword

The FY 1992 Senate and Conference Appropriations Reports required the National Highway Traffic Safety Administration (NHTSA) to implement improved methods to inform consumers of the comparative levels of safety of passenger vehicles as measured in the New Car Assessment Program (NCAP), to examine and study the results of previous model year NCAP results to determine the validity of these test data in predicting actual on-the-road injuries and fatalities, and to address the efficacy of allowing manufacturers to choose between the "high tech" (i.e., Hybrid III test dummy) and "low tech" (i.e., Hybrid II test dummy) dummies for the purpose of NCAP testing. In February 1992, NHTSA presented a report to the Committees with a detailed plan and schedule, describing how NHTSA would comply with these requirements. Activities have been completed and the following report responds to the requirements of the FY 1992 Senate and Conference reports.

1.2 Brief History of the New Car Assessment Program

In 1978, NCAP was initiated with the primary purpose of partially fulfilling one of the requirements of Title II of the Motor

Vehicle Information and Cost Savings Act of 1972. The purpose of this requirement was to provide consumers with a measure of relative crashworthiness of passenger motor vehicles. NHTSA concluded that by using existing technical approaches, safety information on the relative crashworthiness that vehicles provide in frontal crashes could be developed. This provided consumers with important information to aid them in their vehicle purchase decisions. The ultimate goal of NCAP was to improve occupant safety by providing market incentives for vehicle manufacturers to voluntarily design better crashworthiness into their vehicles, rather than by regulatory directives.

In this program, vehicles are subjected to a frontal crash test. The vehicles are towed head-on into a fixed, rigid barrier at 35 mph. Each vehicle carries two instrumented anthropomorphic test devices (dummies) that simulate 50th percentile adult males. These dummies are located in the front driver and front-right passenger seats and are restrained by the vehicle's safety belts and air bags, if available. During the crash, measurements are taken from each dummy's head, chest, and upper legs. These measurements are used to indicate the likelihood of serious injury and, thereby, the relative crashworthiness of the vehicle in a severe frontal impact.

The testing protocol used by NCAP is based on years of development work conducted by NHTSA, the automobile industry, and others to create the test devices and test procedures used in determining compliance with Federal Motor Vehicle Safety Standard (FMVSS) No. 208, "Occupant Crash Protection." This standard requires that certain injury criteria, as measured by the dummies, not be exceeded in a 30-mph frontal crash test. The injury criteria apply to the head (as measured by a composite of acceleration values known as the Head Injury Criterion or HIC), chest (as measured by a chest deceleration value known as chest G), and upper legs (as measured by compressive forces on each of the femur bones). These criteria are used to assess the performance of the vehicles tested in the NCAP.

The NCAP crash tests are conducted at 35 mph in order to provide a level of impact severity sufficiently higher than the FMVSS No. 208 requirement at 30 mph so that differences in frontal crashworthiness performance among vehicles can be more readily observed. Since kinetic energy is proportional to the square of the velocity, there is 36 percent more kinetic energy in a 35-mph crash than one at 30 mph. Another measure of severity in a frontal, fixed barrier test is the total instantaneous change in velocity of the vehicle (known as delta V), including the rebound from the barrier. In the 35-mph NCAP test, the average delta V is 40 mph, including the rebound velocity from the barrier. In a 30-mph test, the average delta V is 33 mph.

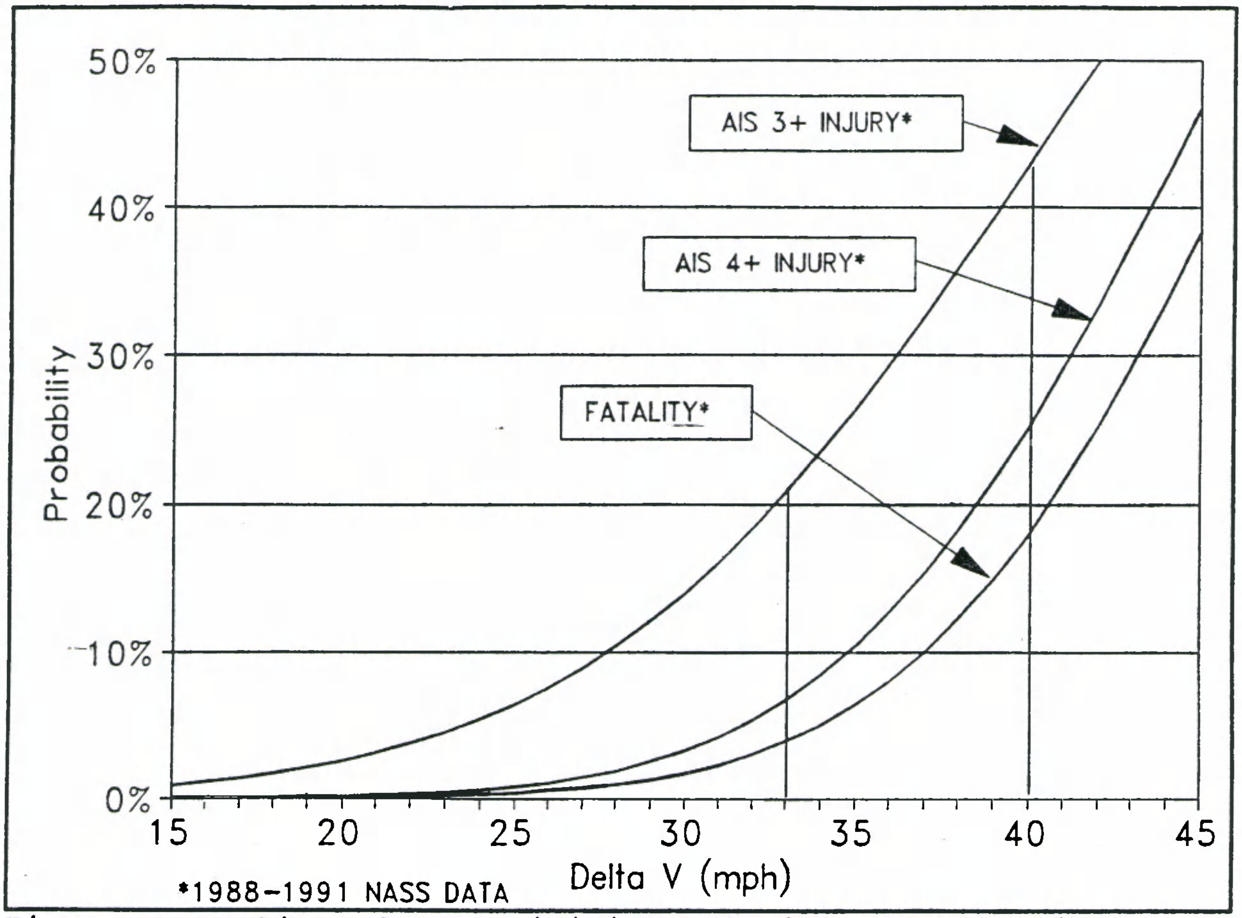

Figure 1. Estimated Probabilities of Injury and Fatality for Restrained Drivers in Frontal Collisions.

From an analysis of the National Accident Sampling System's (NASS) files[1], the relationships of delta V to injury and fatalities have been developed for passenger car drivers restrained by available belt systems (no air bag equipped vehicles are included). These data are shown in Figures 1 and 2.

[1]The NASS files present detailed characteristics of traffic crashes in the United States. NASS is a sample of police-reported passenger vehicle towaway crashes that yields national estimates. These estimates are associated with both sampling and nonsampling errors.

Curves are given for Abbreviated Injury Scale (AIS)[2] 3 and greater injuries, AIS 4 and greater injuries, and fatalities. AIS 3 injuries are serious but often not life threatening with emergency care. AIS 4 and greater injuries are severe and life threatening. AIS 4 and greater injuries to the head may include severe skull fractures and/or brain injury. AIS 4 and greater injuries to the thorax may include severe damage to the lungs, torn aortas, or massive collapse of the rib structure.

The NASS data indicate that the fatality and injury rates for restrained, front-seat drivers are several times greater in a crash with a 40-mph delta V than in a crash with only a 33-mph delta V (See Figure 1). The NASS files also show that approximately 50 percent of the life-threatening injuries and nearly 80 percent of the fatalities of restrained drivers in frontal collisions occur in crashes with a delta V greater than 33 mph (See Figure 2). As in the real-world crashes, the injury data obtained in the 35-mph crash tests show a much greater injury potential and a much greater spread among the safety performance measures of various vehicles than observed in the 30-mph crash tests.

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[2]The AIS is used to provide a simple numerical method for ranking and comparing injuries by severity. The AIS classifies individual injuries by body region on a 6-point ordinal severity scale ranging from AIS 1 (minor) to AIS 6 (fatal). The AIS scale is a consensus-derived, anatomically based system, developed under the sponsorship of the Association for the Advancement of Automotive Medicine.

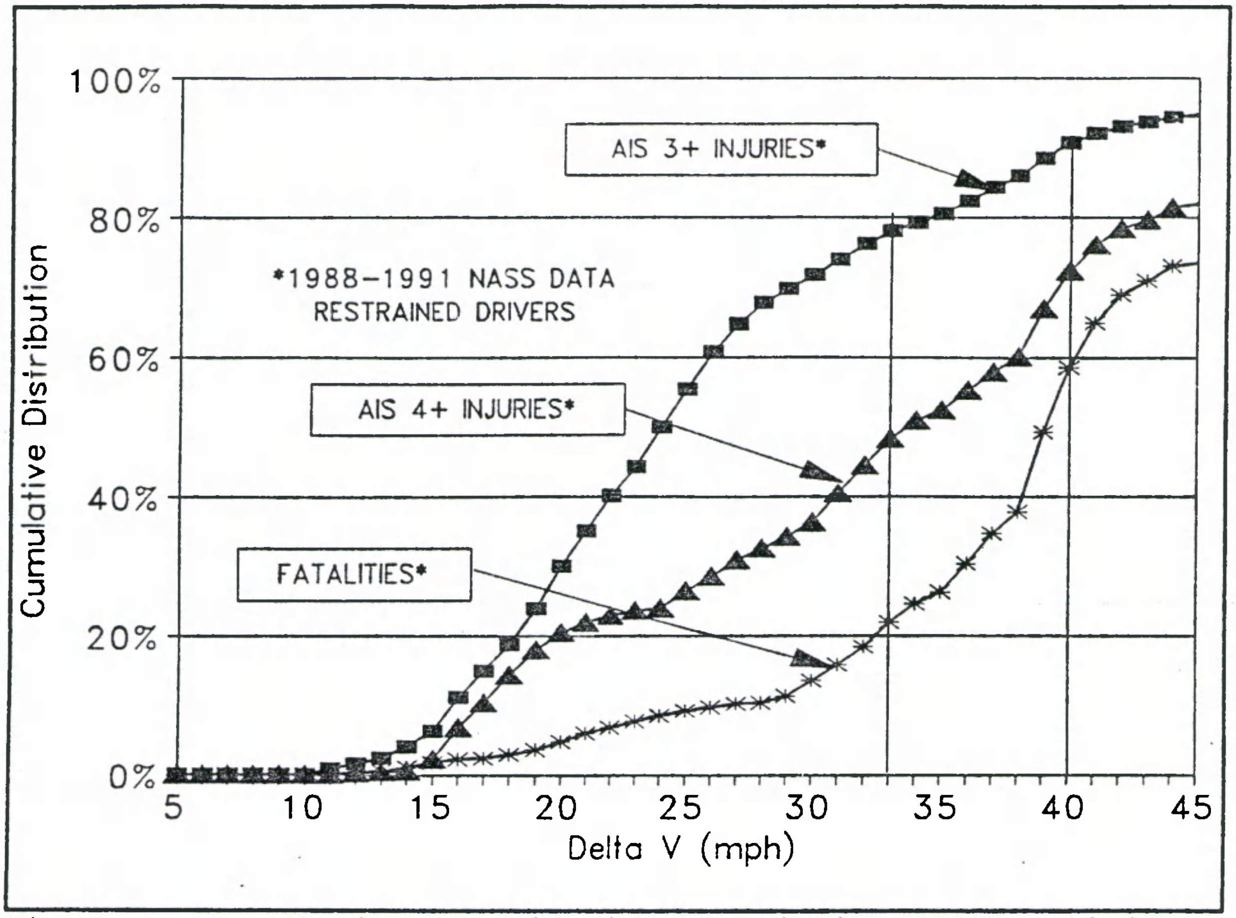

Figure 2. Cumulative Distribution of Injuries and Fatalities for Restrained Drivers in Frontal Crashes.

The first NCAP press release was issued on October 16, 1979. Since that time, more than 440 different passenger cars, light trucks, vans, and sport utility vehicles have been tested. Presently, the tested makes and models of passenger cars represent more than 50 million of the passenger cars on the road today. Notable improvements in occupant safety as measured by the dummy responses have occurred during the history of the program. A summary of these improvements is given in Section 1.4. Based on the study of the correlation of NCAP test results with actual fatality risk which was requested by the Committees

and detailed in Section 3, there have been significant reductions in the fatality risks for restrained drivers of passenger cars involved in severe frontal crashes.

1.3 Review of NHTSA's Plan as Proposed in the February 1992 Report

In the FY 1992 Senate and Conference Appropriations Reports, NHTSA was required to utilize a variety of new methods in presenting NCAP data in order to make the data more easily understandable by consumers and more useful as a market incentive. The Committees proposed that these methods may include publications of lists of vehicle models performing best and worst on different injury criteria, lists of vehicle models with the highest and the lowest HIC, lists of vehicle models in rank order of their performance on NCAP tests, and the historical performance of different automobile manufacturers on NCAP tests. Congress included $150,000 in the FY 1992 budget to be used in the development and promotion of these new marketing techniques.

NHTSA proposed to:

- develop a report of the historical performance of the different automobile manufacturers in NCAP,

- analyze the NCAP data base and determine an appropriate format for presenting the various suggestions for new lists,

- evaluate the potential impact of these presentation methods on the car-buying public and evaluate the vehicle safety needs and choices of the automobile consumers through the use of consumer focus groups,

- enlist the help of media experts to determine improvements in NCAP data presentations.

The report of the historical performance of the different automobile manufacturers in NCAP was completed and delivered to the Committees and then made available to the public in September 1993. A summary of this historical performance report is given in Section 1.4. A copy of the News Release disseminating the report is included as Appendix A.

A simplified NCAP data presentation format has been developed and focus groups have been conducted to evaluate consumer reactions. Details of the focus group studies are given in Section 2 along with the results of the media survey.

In addition to the requirements on consumer information, the Committees also requested a study to analyze the results of NCAP data from previous model years to determine the validity of these

tests in predicting actual on-the-road risk of injuries and fatalities over the lifetime of the models. In an attempt to fulfill the Committees' requirements for this study, NHTSA proposed to:

- continue to examine data contained in NASS, Fatal Accident Reporting System (FARS), and individual state accident files, and

- analyze "hard-copy" (i.e., written) reports of crashes to evaluate and compare on a one-to-one basis the performance of specific models which have been tested in NCAP and also have been involved in high-severity frontal impacts on the highway.

A summary of these studies and the conclusions are presented in Section 3 of this report.

The Committees also required NHTSA to address the efficacy of allowing automobile manufacturers to choose between the "high-tech" (i.e., Hybrid III) and "low-tech" (i.e., Hybrid II) crash-test dummies for the purpose of NCAP testing. NHTSA proposed to:

- analyze the NCAP test data to evaluate and explain the differences between the two dummies and the effect that these differences may have had on the NCAP results, and

- use the analysis of comments to a Notice of Proposed Rulemaking (NPRM) which will require mandatory use of the Hybrid III dummy in FMVSS No. 208 testing in the mid to late 1990's.

These activities have been completed and are presented in Section 4 along with the schedule to phase out the use of the Hybrid II dummy.

1.4 An Update of NCAP Results and a Review of the Historical Performance of Different Auto Manufacturers in NCAP

In the February 1992 report, trends of improved vehicle safety performance as measured by NCAP were provided. Since that report, NCAP tests have been completed on MY 1992 and 1993 vehicles. These two additional years have been included in the trend analysis and are shown in Figure 3. These trends, based on the dummy HIC and chest G responses are shown for all tests of passenger cars that have been conducted through MY 1993. The average values for the dummy response parameters are given for each model year. Also, the averages for the fleet[3] of NCAP-tested passenger cars, as determined from vehicle registrations, are shown for each year. (Note: The file has not yet been

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[3]After the first year of NCAP testing, MY 1979, this fleet included approximately two million of the passenger cars on the road. At the conclusion of the MY 1992 NCAP testing, this fleet constituted over 52 million of the registered passenger cars.

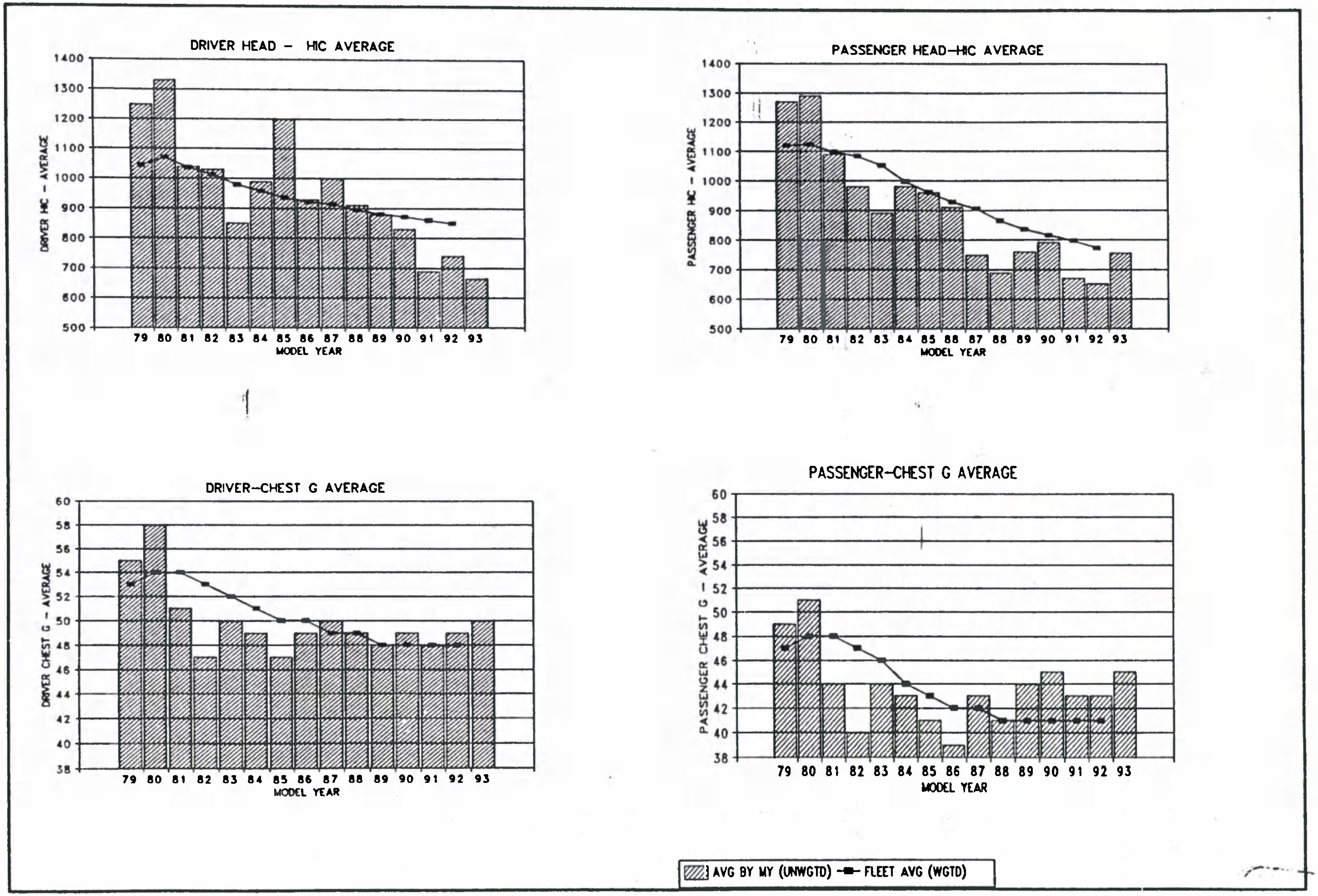

Figure 3. NCAP Dummy Response Trends for Passenger Cars

updated with vehicle registrations for MY 1993. Therefore, weighted values are only available through MY 1992.) As noted in the previous report, significant downward trends are shown for each of the injury parameters.

The Committees had requested in the 1992 Appropriations' report that the historical performance of different motor vehicle manufacturers in NCAP be developed and presented to consumers. NHTSA stated in the February 1992 report that, "A presentation of the historical performance of the different automobile manufacturers will be developed and presented to the focus groups as a consumer information document. This document will, as appropriate, highlight technological developments attributed to each manufacturer." NHTSA completed this document, transmitted it to the Committees, and then released it to the public in September 1993.

In Tables 1 and 2, summary information from this report on the different motor vehicle manufacturers is given. These data include: the number of vehicles which have been tested, the percentage of vehicles which have met FMVSS No. 208 requirements (HIC's not exceeding 1,000, chest G's not exceeding 60, and femur loads not exceeding 2,250) in the higher-speed NCAP tests, and overall average values for the driver HIC, passenger HIC, driver chest G, and passenger chest G. For passenger cars, where adequate data exist, this information also is given for two time

TABLE 1. NCAP - SUMMARY DATA ON PASSENGER CARS

MANUFACTURER	NO. OF CARS TESTED		% MEETING FMVSS NO. 208 CRITERIA			DRIVER HIC AVERAGE			PASSENGER HIC AVERAGE			DRIVER CHEST G AVERAGE			PASSENGER CHEST G AVERAGE		
	MODEL YEARS		MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS		
	ALL	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-88	87-93	ALL	79-86	87-93
GM	71	33	59	61	58	858	897	812	806	802	811	46	44	48	40	39	42
FORD	51	22	48	19	89	920	1090	693	796	1018	500	52	55	47	44	47	41
CHRYSLER	44	20	48	38	61	969	1111	799	974	1069	853	50	51	48	44	43	45
TOYOTA	29	13	62	62	62	883	910	849	753	853	631	50	50	51	47	48	44
NISSAN	25	15	40	20	53	982	1142	874	939	1301	697	53	56	51	46	50	43
HONDA	28	17	69	50	81	909	1176	736	795	1016	652	49	49	49	41	38	43
VOLKSWAGEN	17	8	19	10	33	1136	1250	945	958	911	1035	53	54	52	45	44	45
MAZDA	12	7	58	0	100	861	1065	750	1012	1445	703	56	60	51	48	49	48
MITSUBISHI	10	7	78	67	83	891	879	897	830	1168	685	54	62	50	44	45	44
PEUGEOT/RENAU	13	4	0	0	0	1906	1957	1793	1868	2011	1577	69	58	60	49	47	52
VOLVO	7	2	86	80	100	742	879	400	700	724	640	41	42	40	39	39	40
HYUNDAI	8	7	25	0	29	888	1000	871	971	2662	729	56	73	53	45	55	44
ISUZU	5	2	0	0	0	1570	1821	1194	1523	1711	1240	47	42	54	48	47	48
SUBARU	8	4	38	25	50	1055	1230	880	988	1293	682	53	54	51	46	49	43
MERCEDES	3	1	33	0	100	984	1076	800	979	1052	833	59	58	60	49	44	58
SAAB	5	3	40	0	67	658	754	594	1029	1304	846	48	55	43	38	40	37
BMW	3	2	33	0	50	1093	1539	870	622	547	698	49	42	52	40	39	40
TOTAL	339	165	50	37	63	967	1101	826	905	1055	746	50	51	49	44	44	44

TABLE 2. NCAP - SUMMARY DATA ON LIGHT TRUCKS, VANS & SPORT UTILITY VEHICLES (LTVS)

MANUFACTURER	NO. OF LTVS TESTED	% MEETING FMVSS NO. 208	DRIVER HIC AVERAGE	PASSENGER HIC AVERAGE	DRIVER CHEST G AVERAGE	PASSENGER CHEST G AVERAGE
		MODEL YEARS	MODEL YEARS	MODEL YEARS	MODEL YEARS	MODEL YEARS
		ALL	ALL	ALL	ALL	ALL
GM	21	29	1274	1215	60	49
FORD	17	44	1124	901	52	47
CHRYSLER	18	44	857	1005	51	45
TOYOTA	12	8	1250	828	55	50
NISSAN	8	38	1080	810	54	46
VOLKSWAGEN	3	0	1507	874	56	49
MAZDA	3	33	1002	857	55	48
MITSUBISHI	6	50	1203	978	52	54
ISUZU	10	10	1282	1207	61	59
SUZUKI	3	33	1214	1548	62	53
TOTAL	101	31	1150	1020	55	49

periods, MY 1979 through MY 1986 and MY 1987 through MY 1993. The phase-in of the automatic occupant protection safety requirements of FMVSS No. 208 began in MY 1987 with a substantial increase in the use of air bags as supplemental restraints, which improved the safety performance of passenger cars.

Significant reductions in average driver HIC and passenger HIC values have occurred in MY 1987 through 1993 passenger cars when compared to MY 1979 through 1986 passenger cars. The average driver HIC values along with these reductions for the 6 major manufacturers are graphically shown in Figure 4.

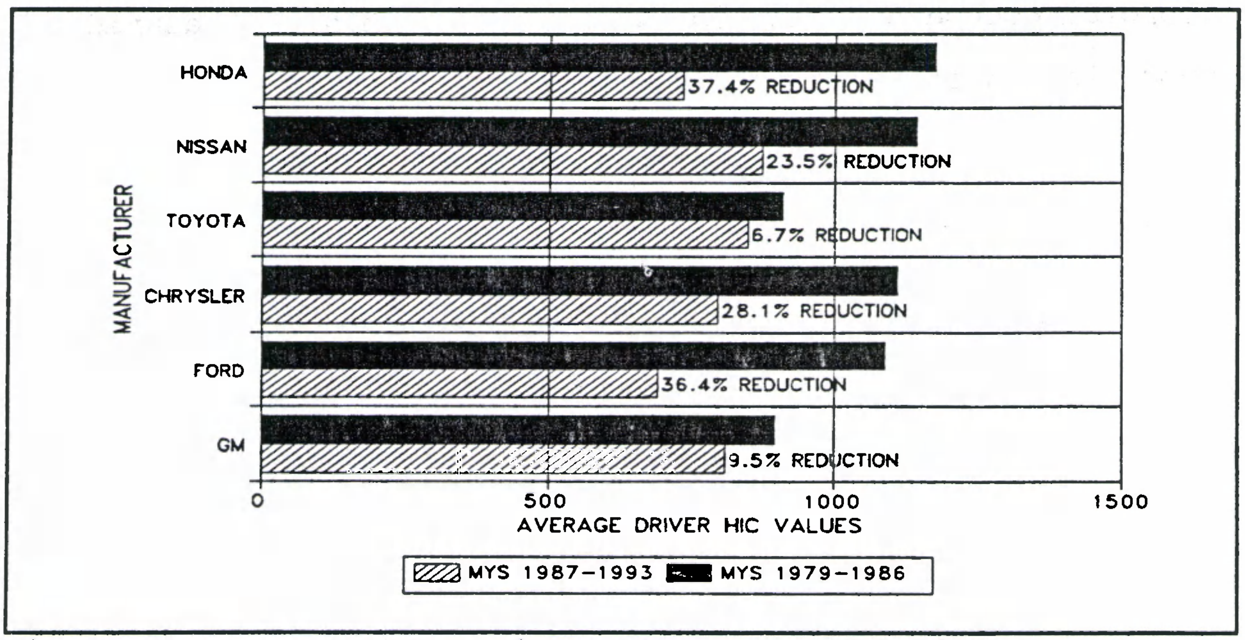

Figure 4. Average NCAP Driver HIC Values with the Percentage Reduction when Comparing MY 1987-1993 Passenger Cars to MY 1979-1986 Passenger Cars.

A much higher percentage of passenger cars are now meeting the requirements of FMVSS No. 208 at the higher NCAP crash speed.

Almost 80 percent of the passenger cars tested in NCAP during 1993 met the FMVSS No. 208 requirements. These historical records and the trends shown in Figure 3, indicate, as stated in the February 1992 report to Congress:

- that the vehicle manufacturers have the knowledge and capability to design passenger cars that provide exceptional safety in the severe 35-mph crash if all restraint systems are used, and

- that with the phase-in requirements of passive restraints beginning with MY 1987, the vehicle manufacturers significantly improved occupant protection in 35 mph crashes as measured by the dummy responses.

Section 2A. Focus Group Study

Section 2A. Focus Group Study and Media Survey

2A.1 Background and Objective

2A.1.1 Background

As mentioned in Section 1, NHTSA utilized $150,000 of the FY 1992 budget to evaluate new marketing techniques that would increase public awareness of NCAP crash test information and ensure that the information presented to the consumer is useful and easy to understand. This evaluation was conducted by using consumer focus groups.

To reiterate, NCAP tests are conducted using all occupant protection equipment provided with the vehicles so that test results demonstrate the relative crash protection provided to front seat occupants. Instruments located on each dummy's head, chest, and upper legs generate measurements that determine the likelihood of serious injury in a frontal collision. Only one vehicle of each make or model is tested. Vehicle models are selected from those that are new, potentially popular, or have been redesigned with new or improved safety equipment such as an air bag. Expensive luxury models are not tested as frequently as more popular models because information about these models is not

requested by many consumers. Domestic and foreign manufacturers are equally represented in the vehicles selected. The cars are purchased from existing dealer inventory, replicating the selection process in which the average consumer purchases a car.

NCAP's test results are grouped for comparisons between vehicles of similar size and weight. The NCAP test results compare a vehicle's level of protection with that of other like vehicles.

Unfortunately, this testing concept and NHTSA's reported results have been difficult for some consumers to understand. In the past NHTSA has reported the test results in a numerical format under the categories of HIC, chest G, and femur loads. Other organizations, such as Consumers Union, have taken the NHTSA results and presented them in a modified format which they believe would be easier for consumers to comprehend. Consumers have used this type of adaptation, but were not sure of the original source of the information even though acknowledgment was given to NHTSA.

NHTSA, as required by the Senate and Conference Reports, has investigated a variety of new methods for presenting NCAP data to make it more immediately informative to the car-buying public. NHTSA is proposing to adopt a variety of promotional efforts to advertise the availability of NCAP crash test results and to

better inform the public of its availability through the Auto Safety Hotline.

2A.1.2 Objectives

In recent years, focus group research projects have provided useful qualitative insights and programmatic direction on a variety of topics that could not be generated with large-scale quantitative surveys or other data-collection techniques unsuited to exploratory behavioral research. Focus groups have provided a practical way to elicit needed information about individuals' perceptions and buying habits.

The NHTSA focus group study had as its objectives to:

- assess vehicle-buyer perceptions, needs, and desires concerning the delivery and presentation of motor vehicle safety-performance data,

- identify the potential uses of NCAP information in vehicle selection, and

- gather preliminary information needed to plan an effective promotional campaign.

This includes the existing frontal-crash test information and assessment of the public's desire for other crash test information, e.g., side-impact performance.

2A.2 Methodology

2A.2.1 Overview

A "focus group" is an informal small-group discussion, led by a trained moderator, designed to elicit feelings and attitudes about a specific topic. Groups usually involve eight to ten people and last up to two hours.

In the spring of 1993, fifteen focus groups--seven of men and eight of women--were conducted in three cities; seven in Washington, DC, four in Dallas, and four in San Francisco. All of the participants had either recently purchased a new car or planned to do so in the near future. The discussion issues were designed to determine how participants regarded the importance of safety in general and of specific safety features in selecting a car; what types of safety information they wanted; and where they would like that information made available.

At the beginning of the sessions, participants discussed how they went about choosing a car, what features they looked for in a new

car, and the importance of safety features and safety information in making a selection. Next, participants read and gave their reactions to two sets of NCAP crash test data presentations. The last part of the session was devoted to reviewing two potential radio public service announcements and two print public service announcements promoting the availability of NCAP safety information.

2A.2.2 Participant Selection

Buyers of New Cars - All groups were composed of drivers who had either bought or leased a new car within the past year or planned to do so within the coming year. Whether this action was imminent or in the recent past, the new-car selection process was of considerable significance to all participants.

Hotline Callers - Most of the groups included at least one or two people who had previously called the NHTSA's Auto Safety Hotline and requested NCAP data.

Gender - Gender-specific groups--seven groups of men and eight groups of women--were used in order to identify any differences in the ways in which men and women in the groups viewed the importance of safety information, or assessed the information in the NCAP test materials. This also permitted identification of gender differences in responses to the advertisements.

Age - Age is also an important variable, but an examination of possible differences in responses by age was not within the scope of this project. People under 25 or over 55 years of age were not included in the groups.

People under 25 were excluded because few people in that age group can afford new cars. People over 55 were excluded to permit comparisons of parents of young children and non-parents of similar ages, since one purpose of the study was to determine whether parents of young children or those just starting to drive go about choosing a car differently from others.

Parental Status - Parents of young children were included to determine if they are more safety-conscious than people buying a new car for themselves. The participant screening process ensured that about half the participants had children under 18 years of age living at home.

Education - Participants represented a range of educational attainment levels. All participants had graduated from high school and most had at least some college or were college graduates. A few had advanced degrees.

Mileage - An effort was made to recruit high-mileage drivers. Because they spend more time in their cars it was assumed that they are more attuned to individual characteristics of the

automobiles they drive. High mileage drivers may be more concerned with certain automobile features. A few low-mileage drivers were included, but most participants drove more than the average number of miles. Men in the groups drove an average 19,500 miles per year, compared to a national average of 16,497 miles; women participants drove an average of 15,200 miles per year, compared to a national average of 9,438. The national average is based on the 1990 National Personal Transportation Survey.

2A.2.3 Participant Recruitment

Participants were recruited through a series of advertisements in local newspapers in the Washington, DC, Dallas, and San Francisco metropolitan areas. Callers who responded to these ads were asked questions included in an NCAP focus group screener.

Hotline callers were recruited by telephone. NHTSA provided lists of people who had previously requested NCAP data through the Auto Safety Hotline from each city. Potential respondents were told that this was a Department of Transportation study, given a brief description of a focus group, and an explanation of the scope of the study.

This procedure was followed to establish the credentials of the recruiters and to encourage Hotline callers to participate.

Interested Hotline callers were asked the questions in the focus group screener. A total of 22 Hotline callers participated in the study.

2A.2.4 Site Selection

In order to ascertain possible geographic differences in attitudes and perceptions relating to automobiles and automobile safety, groups were conducted in three geographic areas of the country: the East, the Southwest, and the West. Washington, DC, Dallas, and San Francisco were selected.

2A.2.5 Moderator's Guide

Each of the groups was led by an experienced moderator. A Moderator's Guide served as an outline for the group discussions. It included four sections:

- introduction, including factors considered when buying a car,

- discussion about a draft NCAP Crashworthiness Chart (NCAP Chart - see Figure 5)

- discussion on the MY 1993 NCAP news release data sheets (NCAP data sheets - see Appendix B), and

- discussion concerning the draft NCAP radio and print advertisements (see Appendix B).

The sessions opened with participants stating their names and the approximate number of miles they drove each year. The moderator then initiated a discussion of the importance of safety in their decision to buy a new car. After the participants became familiar with the NCAP data they were asked to identify effective ways of creating public awareness of the Auto Safety Hotline and the existence of NCAP data.

Participants discussed their opinions of the draft NCAP Chart and its accompanying cover page. A sample of this chart is shown in Figure 5. The discussion was designed to assess the clarity and usefulness of the information on the chart, as well as participants' reactions to the chart format.

NCAP data sheets were discussed next. Respondents discussed the clarity and usefulness of the data sheets both independently and as a supplement to the crash test chart. They also suggested ways to make this information easily available to the public.

Hotline callers discussed their experience with the Hotline in obtaining NCAP information and the usefulness of the information they received.

US Department of Transportation

NEW CAR CRASHWORTHINESS

HOW TO USE THIS CHART

Crash tests measure three principal forces involved in driver and passenger injury: sudden deceleration, impact, and load. To simplify the results on the chart, the measurement of forces against the head and chest were plotted against a curve that measures the likelihood for serious injury. Each car's score indicates how well the car protects its occupants against injury in a 35 mph frontal crash test.

Cars should be evaluated against other cars within their own weight class. If a light car collides head-on with a heavier car at 35 mph, the occupants in the lighter car will experience a greater likelihood of injury than the results of this test indicate.

1-4 High numbers indicate greater potential for serious injury and less protection. For instance, if a car scores 3 on the chart in either the driver or passenger category, there is up to a 50% chance of serious injury. A serious injury is considered to be one requiring immediate hospitalization and may be life-threatening.

1 - 10% or less chance of serious injury
2 - 10% to 25% chance of serious injury
3 - 25% to 50% chance of serious injury
4 - 50% or greater chance of serious injury

o Normally the chance of head injury resulting from sudden deceleration without impact will not be as high as the chance of head injury resulting from impact. However, sometimes the score for sudden head deceleration without impact is the highest score recorded during that crash test. To indicate these non-impact occurrences, the score is denoted by an open circle. Please see Head Injury on the New Car Assessment Program Results for more details.

* There are several types of seat belts being offered in new cars. Shoulder belts that are adjustable are often more efficient and comfortable.

1993 LIGHT PASSENGER CARS (2000–2499 lbs.)

VEHICLE	TYPE	POSITION	LEVEL OF PROTECTION (The lower the number, the better the protection) 1	2	3	4	FEATURES: AIR-BAGS	ADJUST-ABLE BELTS*	ANTI-LOCK BRAKES
Geo Storm	2-Dr. HB	Driver	•				•		
		Passenger		o					
Ford Escort	2-Dr.	Driver	•						
		Passenger	•						
Hyundai Excel	4-Dr. Sedan	Driver		•					
		Passenger	•						
Toyota Corolla	4-Dr. Sedan	Driver		•			•	•	OPT
		Passenger	•					•	
Isuzu Stylus	4-Dr. Sedan	Driver		•			•		
		Passenger	•						
Nissan Sentra	4-Dr. Sedan	Driver	•						OPT
		Passenger	•						
Acura Integra	4-Dr. Sedan	Driver	•						OPT
		Passenger	•						
Hyundai Excel	2-Dr. HB	Driver	•						
		Passenger	•						
Saturn SL2	4-Dr. Sedan	Driver		•			•		OPT
		Passenger		o					
Mazda Protege	4-Dr. Sedan	Driver		•					
		Passenger		•					
Toyota Celica	2-Dr.	Driver		•			•		OPT
		Passenger	•						
Hyundai Scoupe	2-Dr.	Driver		•					
		Passenger	•						
Mazda Miata	2-Dr. Conv.	Driver		•			•		OPT
		Passenger	•						

Figure 5. NCAP Crashworthiness Chart

The remainder of the session was spent assessing the effectiveness of two radio public service announcements and two print public service announcements designed to inform the public about the existence and availability of NCAP crash test data. Participants discussed a series of issues about each public service announcement--things they liked, or disliked, whether they thought the public service announcement was effective, and ways of improving it.

2A.2.6 Test Materials

The New Car Assessment Program Cover Page - Participants were given a brief description of the NCAP crash tests and the New Car Assessment Program. Three key points were covered in this section:

- the test consists of a 35 mph head-on crash into a fixed barrier,

- the crash simulates a head-on crash between two vehicles of the same weight, each travelling at 35 mph, and

- vehicle occupants are wearing seat belts.

A description of the draft NCAP Chart was also provided.

The Draft NCAP Chart - The chart used during the focus groups was derived from the HIC and chest Gs obtained in the crash tests. The purpose of the chart was to provide consumers with a quick, simplified, single point of comparison to evaluate the new cars listed.

A scale[4] was selected that related the probability of sustaining an injury to how well a car protected its occupants from receiving such an injury. This scale was called the Level of Protection Scale on the chart and the four points on that scale were equivalent to the increasing chances of severe injury. It was noted on the chart that the lower the number, the better the protection. Cars with a 10 percent or lower probability of severe injury were assigned a #1 level of protection; cars with a 11 to 25 percent probability of severe injury, a #2 level of protection; cars with 26 to 50 percent probability of severe injury, a #3 level of protection, and cars with a 51 percent or greater probability of severe injury received a #4 level of protection.

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[4]This scale is based on injury assessment curves, as given in the Society of Automotive Engineering (SAE) Paper No. 851246, "The Position of the United States Delegation to the ISO Working Group 6 on the Use of HIC in the Automotive Environment," P. Prasad and D. Viano and in the SAE Paper No. 902338, "Assessing the Safety of Occupant Restraint Systems," D. Viano and S. Arepally, and relates HIC and chest G scores to the probability of life-threatening, AIS 4 and greater, injury. (See Section 1 for a discussion of AIS levels.)

Non-impact HIC[5] - Of the two scores for each test car, HIC and chest G, the higher of the two was used to determine the car's rating on the chart's Level of Protection rating. The scores were not added or combined.

When a non-impact HIC score was the higher of the two scores, the chart indicated non-impact HIC with an open circle in the Level of Protection rating. In general, during a vehicle crash, the risk of injury is reduced if contact between the occupant head and interior surfaces is prevented. If a car had a non-impact HIC rating, but the chest G score was higher, and therefore responsible for the car's rating on the Level of Protection scale, the non-impact HIC was not noted.

As a service to the reader, available safety options were included on the chart to identify cars with optional safety features. A note about the availability of different types of seat belts was also provided.

The NCAP Data Sheets - The data sheets contained the crash test scores, as provided in the MY 1993 NCAP news releases. These sheets presented the HIC and chest G scores in tabular form and the HIC scores as a bar graph to illustrate relative likelihood of head injury.

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[5]A non-impact HIC score indicates the dummy's head did not strike any interior surfaces of the vehicle in the crash test.

NCAP Potential Promotional Materials - Two radio public service announcements and two print public service announcements were supplied by NHTSA for testing in focus groups. Their basic message was, "Call NHTSA for free auto safety information."

2A.3 Findings

2A.3.1 General

Desired Features - The moderator opened each discussion with what participants looked for when choosing a new car once they had decided on price and type of car (e.g., a four-door sedan). A number of things were mentioned, the most common being reliability; economic factors such as fuel economy, repair costs, and resale value; and safety. Comfort, interior space, ease of handling, and style were also mentioned.

Safety Features Sought - Safety or specific safety features were regarded as important by all groups, with women somewhat more likely than men to cite safety as one of the features they sought.

Few respondents mentioned crash test results--largely because few knew at the beginning of the focus groups that such information was available. When asked what safety characteristics they want

information about, both men and women mentioned anti-lock brakes the most, followed closely by air bags. At the end of the sessions, however, when participants were asked to rank nine automobile characteristics in order of importance in choosing a car, crash test results ranked number one in importance for women and number three for men, somewhat ahead of anti-lock brakes.

Women with children mentioned that they would look for specific safety features such as child safety locks and child safety seats when buying a car. They also mentioned wanting large, heavy cars for protection in a crash. Some of the men said that while safety was less important than certain other features in cars they drove themselves, it was the most important in cars for their wives and children.

A few participants commented that since all cars had to meet certain safety standards, buyers could take safety for granted and, therefore, could pay more attention to other features such as styling or comfort.

Sources of new car information - Most participants said they talked to other people about cars they were considering. Many said they also did further research. Auto magazines were a popular source of information. Some respondents said they purchased auto magazines only when planning to buy a new car. Other sources mentioned included the library, AAA, *The Car Book,*

The Car Buyer's Guide, newspapers, and popular magazines. A few respondents mentioned that before they buy a car they rent the make and model they are interested in to see if they like it. *Consumer Reports,* insurance agents, and auto magazines were the most popular sources of information.

Availability of information - Most agreed that safety information produced by Federal agencies should be available at automobile dealerships. They felt that automobile dealers should be required by law to furnish such information to prospective customers. It should be noted that respondents were quick to point out that they would mistrust dealers as the source for this kind of information, but they would believe the data to be true if it was made clear it had been provided by a government agency.

Participants also suggested placing a safety rating number on new car stickers, in auto brochures, in owners' manuals, and in auto advertisements. Someone suggested that if no single standard rating could be developed, new-car stickers might carry an 800 number that prospective customers could call for safety information. Insurance companies were also suggested by all the groups as a channel for distributing Federal safety information. Some suggested that the information could be mailed along with premium notices.

Other recommendations for placement of information included; libraries, departments of motor vehicles, post offices, institutions which make car loans (such as banks and credit unions), AAA offices, new car shows, and other public places such as supermarkets, shopping malls, and doctors' offices.

Suggested print outlets included *Consumer Reports*, April issue (dealing entirely with new cars), car safety handbooks, the *Bluebook*, auto magazines, *The Car Book*, and newspapers and popular magazines.

Safety Information Sought - Most participants seriously considered the comparative safety and safety features afforded by different makes and models of cars. They were interested in specific safety features--anti-lock brakes, air bags, safety locks--offered on the different models. They wanted to know about crash rates for different models and about the protection afforded drivers and passengers in a crash. Parents of young children were especially concerned about the safety of back-seat passengers. Some said they checked on recalls of previous years' models.

Weight of the vehicle, strength of construction, and stopping distance after braking were other things participants said they wanted to know.

2A.3.2 Reactions To NCAP Information

NCAP Chart Materials - The chart evoked mixed reactions from the groups. They had no trouble understanding what the chart was about, and they regarded the information as valuable. Women were somewhat more likely than men to say that the information was important and useful. By and large, they liked the chart format, and agreed that the "Levels of Protection" were clear, easy to understand, and easy to use. However, the symbols and the explanatory notes were generally regarded as unclear, too technical, and confusing.

In a discussion of the chart, most respondents said that it gave information about the protection afforded the occupants in a head-on crash by various cars in a given weight class.

The meaning of the symbols was less clear. While participants had no difficulty understanding "Levels of Protection," almost no one understood the significance of the two symbols (a full circle and an open circle) that denoted head injury with and without impact, respectively. Most participants believed that a head injury was not possible unless there was an impact, therefore, "head injury without impact" was confusing. One respondent called the idea "preposterous." Though the groups spent

considerable time trying to work out an explanation for the symbols, in most cases they did not interpret them correctly.

Participants found the information useful, but they felt that this information alone was not an adequate indication of the safety of a car. As several respondents pointed out, the results of this test do not apply to other kinds of collisions. Many respondents said they would use the information to eliminate various cars from consideration, but would not purchase a car merely because it scored well on this particular test.

Although they regarded the level of protection score as an incomplete measure of auto safety, participants felt it was important information. Participants felt that a long, complicated explanation was unnecessary--all they needed to know was the Level of Protection.

In discussing what else they would like to know about the crash tests, some participants asked if the passenger category included back-seat passengers. Others participants wondered if every make and model of car sold in the U.S. is tested by NCAP, or only a sample; and others asked whether each model is tested several times or only once.

Additional Information - While respondents found the information in the chart important and useful, most regarded it as only a

beginning. Most participants felt that although the chart was helpful, it was not a true measure of protection on the highway.

They agreed that head-on collisions are rare in real life, and that a car's performance on the NCAP test tells nothing about how it will fare in other kinds of collisions. Most groups clearly called for information about side-impact and rear-end collisions, which they regarded as the most common. Some also wanted data on corner-to-corner collisions and rollovers.

A few wanted to know about back-seat passenger safety in all kinds of collisions, and they asked what kinds of factors (such as differences in design or construction) made some cars safer than others.

Group members were very concerned about driver and passenger safety in crashes at highway speeds, and between cars of different weights and of different makes and models. They asked if the Federal Government could use existing highway accident statistics to provide information about the relative safety of various makes and models in real-life accidents--preferably in a simple, non-technical form.

There was considerable enthusiasm for the idea of compiling all safety data (highway crash statistics as well as crash test results) into a single, standardized rating system which would

apply to all vehicles, and which could be read and comprehended at a glance by the consumer.

NCAP Data Sheets - The groups discussed the numerical data sheets. Most respondents disliked the data sheets. They found them overwhelming--too confusing, too technical, and too hard to read. Many participants said frankly that they would throw out the tabulated data without even attempting to read it. They found the explanatory note confusing and they had to flip back and forth repeatedly between this note and the data sheets.

Again, participants were confused by the numbers in parentheses (non-impact HIC) on both tabular data sheets and the bar graphs because most did not understand that there could be a head injury without impact.

At first glance, participants liked the bar graph format better than the tabular data. At closer inspection, they became more confused. They did not agree on whether the graph contained the same information as the tabular data; they did not understand the numbers in parentheses; and the footnote, "35 mph barrier crash tests represent a 70 mph closing speed," left most of them at a loss.

Participants were confused by the "Unlikely" and "Possible" headings on the bar chart, and in many cases misunderstood them.

Group members generally agreed that none of the information on the data sheets changed their understanding of the test results presented in the draft NCAP chart.

Most participants said they would not read the data sheets if they also had the chart, which they felt was much easier to understand. They said that the data sheets added nothing to their understanding of the chart.

2A.3.3 Reactions to NCAP Promotional Materials

Participants regarded the message from the promotional materials--that auto safety information is available free from the Federal Government--as important and valuable, something that they and other consumers would want to know about and be informed about. Their comments and criticisms dealt with the effectiveness of the materials in conveying this message, not with the message itself.

They expressed resistance to most product advertising and noted that they would be much more accepting of government-sponsored messages; thus, they emphasized that a reader or listener should be made aware at the outset that the safety information and the public service announcement itself comes from a Federal agency.

There was consensus that three elements should be included in every public service announcement concerning the NCAP program:

- a clear identification of the Federal Government as the source of the public service announcement,

- a prominent statement that the information is free, and

- a conspicuous and easy-to-remember 800 number.

Participants also said they would more likely read or listen to an ad when it was clear something was being offered for free. They suggested that the word "free" be featured prominently in any public service announcement regarding the availability of NCAP's crash test data.

Participants said they do the majority of their radio listening in their cars, and assumed most other people do too. Because it is so difficult to write down a phone number while driving, participants insisted that providing an easy-to-remember, catchy phone number in the radio public service announcements was very important. They also said it would be helpful to display the easy-to-remember 800 number in a conspicuous place on the print public service announcements.

Patterns of response to the materials were fairly consistent across all the groups. All groups strongly suggested emphasizing the fact that the information is free, and again stressed the importance of an easy-to-remember phone number.

2A.4 Conclusions and Recommendations from the Focus Group Study

While women seemed to place somewhat more emphasis on auto safety than men, safety was of major importance for both men and women, both for themselves and for their families. Participants said they spent considerable time and effort in obtaining information about the safety characteristics of cars they were considering for purchase.

Many respondents said they would like a standard rating system that would apply to all new cars sold in this country, based on a combination of standardized crash tests and highway accident data. There was considerable support for requiring that this rating be displayed on all new car stickers.

Recommendations relating to the NCAP tests, presentation of the test results, distribution and placement of this information for use by consumers, and advertising to increase public awareness of the program are listed below and discussed in the study report.

- Continue and expand the NCAP program. Consider conducting additional kinds of crash tests, and include measures of potential injuries to rear-seat passengers.

- Present information on crash tests in a form that is non-technical and as short and simple as possible.

- Prepare a cover page for the NCAP Chart which describes the testing program.

- Retain the NCAP Chart with some changes.

- Send tabulated data (HIC and chest G scores) to anyone who requests information to supplement the "level of protection" ratings in the NCAP Chart.

- Provide NCAP data at a variety of locations frequented by new-car buyers.

- Furnish NCAP data to publishers of magazines and newspapers; those publications commonly consulted by new car buyers cited by participants included: *Consumer Reports*, car magazines, newspapers, and general-interest magazines.

- Maintain up-to-date information concerning consumers' preferred sources of information on the crashworthiness of new cars.

- Develop a partnership program with auto-safety advocates to promote wider use of NCAP test results.

- Explore possible enhancements of NCAP coverage by the press.

- Identify the Federal Government clearly and conspicuously as the source of the information and the public service advertising.

- Emphasize that the safety information provided by NCAP is free.

- Choose an 800 number that is easy to remember, and display it prominently in any promotional materials.

Section 2B. Media Survey

Section 2B. Media Survey

2B.1 Background

Over the past few years, NCAP has lost some of its appeal to the general press. NHTSA has made improvements to the NCAP press release, highlighting impact and non-impact HIC as well as differentiating between dummy contact with and without an air bag. The press releases also contain more explanation concerning interpretation of the test results. However, the media did not respond in a positive manner by giving NCAP more coverage. NHTSA expanded the video tape coverage of the test vehicles. But this did not increase the request level from the television media.

This situation was highlighted within NHTSA as one of the problems that required attention when the FY 1992 Senate and Conference Appropriations Reports required NHTSA to utilize a variety of new methods in making the NCAP information more useful as a market incentive. In its February 1992 NCAP report to the Committees, NHTSA stated that it would initially conduct a survey of the automobile and general media in the Washington, DC, area. The objective of the survey was to determine what improvements can be made to the NCAP information that will motivate the media to promote it. NHTSA recognizes the limitations of this survey,

but it is the beginning of an ongoing response to the needs of the media.

2B.2 Is NCAP Still Newsworthy?

NHTSA's Office of Public and Consumer Affairs conducted a questionnaire guided interview of six of the key reporters that routinely cover automotive safety issues for the National Press Corps based in Washington, DC. The six reporters were selected because, collectively, their work has national exposure. They represent the national wire services, daily newspapers in Detroit, New York City, and Washington, DC, and automotive industry trade publications. Also, these individuals are knowledgeable about the detailed aspects of the NCAP.

The verbal comments from the reporters were collected using an 11 question survey. The survey questions are listed below:

1. How would you rate the newsworthiness of a release of new NCAP results?

2. Do you think the perceived newsworthiness of NCAP results has declined from past years?

3. Do you believe that the NCAP results are taken by your readers/listeners/viewers to be a useful index of an automobile's safety?

4. In your view, do the limitations of the NCAP test procedure as described in the NCAP press release discourage readers from taking the test seriously? (e.g., full frontal crash only; no applicability across weight categories; no demonstrated linkage to real world experience.)

5. Are the purpose and limitations of the NCAP test presented clearly in the current press release text?

6. Are the charts understandable and helpful?

7. There is now little variation between vehicles tested, with most test results coming in well below the thresholds NHTSA identifies as significant -- 1,000 HIC and 60 Gs of chest deceleration. Does this lack of variation make it more difficult for you to produce news stories with an interesting lead?

8. What changes could be made in the presentation of the NCAP data to make the release of each new report a more newsworthy event?

9. NHTSA makes no interpretation of the NCAP test results beyond presenting them in tables and graphs. Should NHTSA go further in highlighting aspects of the tests or in explaining why a test produced a certain result?

10. Should NHTSA explore other forms of NCAP testing, such as side impact or rear impact tests? Would this create significant new public interest?

11. Fatality rates for small cars per number of cars registered are much higher than for large cars. Is NHTSA doing a disservice to people interested in buying a safe car by minimizing the relative danger of smaller vehicles in the current NCAP presentation?

2B.3 Survey Findings and Recommendations

Opinions on the program varied widely. One reporter characterizes the program as a source of misinformation, while another reporter believes that consumers can never get enough information on automobile safety and the NCAP results are used to respond to the many readers who contact him by phone.

In general, the reporters who continuously cover NHTSA and NCAP seem to be quite familiar with the scope and limitations of the program. They have worked out methods of adapting the story to

their own media. But, they are divided on the usefulness of the program. They are looking for more unity, context, and interpretation of the numbers. They want more clarification. They need information that is clear and understandable.

One common theme was that they understand why NHTSA releases the test results in small batches, but it creates some problems for them in comparing, interpreting individual results, and presenting newsworthy information. A wire service reporter said that often she will not write a story on a specific NCAP release, preferring instead to combine it with another release. She does this because she usually presents the story on which car did best and which did worse. She does not think it is fair to make the comparisons in small batches. If she calls attention to the worst car in a batch, she is concerned that everyone in the next batch may be worse than the one she picked on. However, she says she would not want us to hold back on releases of new test results.

A reporter for a trade paper also commented on the small number of vehicles in each press release. But he agreed that the releases should not be withheld or lumped together in larger groups. His readers in the industry require that the numerical test results be immediately reported because they want to see the results as soon as possible for the vehicles they build and those of their competitors. He said his audience is expert enough to

understand all the caveats relating to the program. They are interested in seeing the numbers to gauge their effect on the safety conscious consumers and to make comparisons with other manufacturers' vehicles.

He notes that NHTSA groups pickup trucks, vans, etc., in each release and he thinks it is a good idea because it enables comparisons and enhances understanding.

One reporter suggested that NHTSA make two releases, one for the media and another for the general public in a simplified form. However, he does not pay any attention to the femur loads and chest Gs. He also suggests there should be material made available on trends in the numbers, showing how a given manufacturer had improved a particular model over the years.

On the question of additional interpretation, all reporters agreed it could be useful. There is still a genuine problem that the HIC number is a difficult concept to explain. They understand the need for three pages of extensive explanation and caveats, but it does not make their job easier. They receive complaints from manufacturers constantly about oversimplification or unfairness. The wire service reporter looks for outside interpretation of the figures from various experts to put the results in context.

One reporter suggested that NHTSA hold a press conference to discuss all of the tests and provide some analysis of trends. This could be scheduled for the end of the program each year or planned for releasing the final test results each year. He referred to the news conference held by Jack Gillis, author of *The Car Book*, as an example that the NCAP program can be general interest news as well as a source of controversial automobile safety issues. When asked, most reporters concurred on the value of a news conference summarizing the year's events.

Most of the reporters expressed some curiosity about side impact NCAP or rear impact tests. While they disagreed on whether this would significantly heighten public interest, they did agree that additional test modes would broaden the appeal and desire for the test results.

Nearly all the reporters discount the idea that the variation between vehicles is too low and, therefore, insignificant. They want to report on the differences that exist.

Section 2C. Review and Proposed Implementation of Focus Group and Media Recommendations

Section 2C. Review and Proposed Implementation of Focus Group and Media Recommendations

2C.1 Review of Recommendations

NHTSA has reviewed the recommendations from the focus group participants and the media. The review was conducted to determine which recommendations from both entities would produce the largest increase in consumer usage of the test results while requiring low initial funding. Also, NHTSA sought recommendations that would improve consumer and media interest in the program.

One often-heard recommendation was to make the presentation of the test results simple and easy to understand:

Consumers - *Present information on crash tests in a form that is non-technical and as short and simple as possible.*

Media - *Need information that is clear and understandable.*

This recommendation became the primary goal because it also met NHTSA's main objective - *Something that would produce the largest*

increase in consumer usage of the test results while requiring the least initial funding.

When participants in the focus groups were asked which sources they sought for new car information, the majority responded by listing various publications; i.e., books, magazines, and newspapers. Some stated that they talked to other people about the cars they were considering. But *Consumer Reports* and auto magazines were their most popular sources of information. This confirmed NHTSA's contention that the print media is an important avenue to disseminate NCAP test results. Thus, more emphasis should be directed toward promotional products that can be easily utilized in various types of publications.

Reporters who were surveyed concurred in the recommendation that a news conference should be held at the end of each year's NCAP. This would fulfill many of their needs for access to more information.

The focus group participants felt that head-on collisions are rare in real life, and that a car's performance on the NCAP test tells nothing about how it will fare in other kinds of collisions. Most groups clearly called for information about side-impact and rear-end collisions, which they regarded as the most common. Some also wanted data on corner-to-corner collisions and rollovers.

The participants and the reporters strongly recommended that NCAP should include other modes of crash testing:

Consumers - *Consider conducting additional kinds of crash tests, and include measures of potential injury to rear seat passengers.*

Media - *Additional test modes would broaden the appeal and desire for the test results.*

This recommendation requires a major increase in the program's budget. NHTSA has developed a side impact test procedure and is prepared to begin the program when funds are appropriated. Approximately $40 thousand will be required to purchase a vehicle and to conduct each side impact test.

2C.2 Implementation of the Recommendations

In the FY 1994 budget, NHTSA requested and received $250 thousand to implement new NCAP promotional methods and dissemination efforts recommended by the focus groups and the media survey. Based on NHTSA's review of the recommendations, the following efforts have been selected. The breakdown below gives details of these efforts and the anticipated expenditures.

• A consumer brochure will be developed in a computerized format that will permit easy updating. This format will also be adaptable to print media requirements. The brochure will utilize an easy to read and simple presentation technique. It will contain a description of NCAP and the comparative results from the vehicle tests. It will clearly state that these data were developed by the Federal Government and additional information may be obtained by calling a toll free hotline number. This initial development of the brochure will require a one time expenditure of $50 thousand.

• The NCAP brochure will be reproduced for dissemination at strategic consumer locations. In addition to making it adaptable for media publication, NHTSA is deliberating the feasibility of distributing it through existing networks to local and state organizations (Public Health Departments, Departments of Motor Vehicles, Law Enforcement Organizations, etc.), to insurance companies and associations, to consumer groups, and at public events (automobile shows, etc.). Annual cost for this printing and distribution effort will be $110 thousand.

• NCAP promotional efforts will be expanded. The draft public service radio and print media announcements, developed in FY 1993, will be revised based on the focus group comments. Simple public service video press releases will be developed from NCAP test films. These promotional materials will be furnished to

media commonly consulted by new car buyers, as cited by focus group participants, including: *Consumer Reports*, car magazines, newspapers, and other automobile publications. Annual costs for these promotional efforts will be $90 thousand.

- The NCAP news releases will be continued as in past years. However, these releases will use a simplified format based on recommendations by the focus group participants[6]. A copy of the first FY 1994 NCAP news release with the simplified format is included as Appendix C. An automated fax system will be investigated to allow improved response to consumer requests for the simplified data as well as the detailed test results.

- NHTSA also is considering the recommendation that a news conference be held at the end of each year's NCAP. This would fulfill many of the media's needs for access to more information.

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[6]After NHTSA review, some changes have been made to the simplified format that was used in the focus groups. These changes further simplify the data presentation and are based on the combined effects of HIC and chest Gs. In the press releases, NCAP results are reported in a one to five star classification system, with five stars indicating the best crash protection. In addition, NHTSA is considering holding a public meeting to allow further review of this simplified format as well as NCAP future activities. More information on this public meeting is given in Section 5.6.

Section 3. Real-World Correlation with NCAP Test Results

Section 3. Real-World Correlation with NCAP Test Results

3.1 NHTSA's Approach in Comparing NCAP Results to Actual On-the-Road Injury and Fatality Risks

In response to the Committees' request to compare the results of NCAP data from previous model years to determine the validity of these tests in estimating the risks of actual on-the-road injuries and fatalities over the lifetime of the models, NHTSA has continued to examine data contained in individual state files, NASS, and the Fatal Accident Reporting System (FARS). In addition, studies have been conducted of hard-copy accident files to evaluate and compare on a one-to-one basis the performance of specific models which have been tested in NCAP and also have been involved in severe real-world frontal crashes.

3.2 The Use of State Files in Real-World/NCAP Studies

Individual states maintain police-reported accident data files. These files provide the largest existing number of real-world crash events of any file. These files have been examined relative to the study of NCAP correlation to real-world crashes. NHTSA has concluded that, presently, these files have two major shortcomings that have limited their use in this study. First,

injury coding is based only on the police officer's judgment at the scene of the accident and is often not a reliable estimate of the actual severity level of an injury or its threat to life. Secondly, the recorded use of safety belts by the occupants is subject to significant bias since, in most crashes, it is based on a statement by the crash victim and may not be supported by physical evidence. Even with these shortcomings, NHTSA will continue to examine the possible use of these data because their large sample sizes make them useful for statistical analyses.

3.3 The Use of NASS in Real-World/NCAP Studies

NASS contains extensive information on selected real-world crashes. However, the amount of crash information on individual makes and models remains inadequate for studying correlations to NCAP results. The major importance of NASS is the nationally representative detailed information on types and causes of injury, crash speeds, and crash configurations. These detailed data are used to establish and support vehicle and highway safety priorities.

The detailed data in the NASS file were examined to determine how the NCAP test conditions relate to real-world crashes. Two of the more important crash parameters for frontal crashes are the change in velocity (delta V) which occurs during the impact and the impact configuration. As previously noted, the NCAP tests

result in delta Vs of approximately 40 mph and the NCAP crash configuration is a full-frontal barrier impact.

Crash Severity--In Figure 2, Section 1, the distributions of injury and fatality versus delta V as found in the NASS file for restrained drivers in frontal towaway crashes are given. These data indicate that almost 60 percent of the fatalities and approximately 90 percent of the serious injuries for restrained drivers occur below the NCAP delta V of 40 mph. Assuming that NCAP results reflect the relative potential safety that a vehicle provides for belted occupants within 5 mph of the NCAP delta V (i.e., the NCAP data are applicable from 35- to 45-mph delta V), nearly 50 percent of the fatalities occur within this range.

Crash Type--The NCAP test configuration is based on FMVSS No. 208. This configuration is a full-frontal crash into a fixed-rigid barrier. This is approximately the same as two similar vehicles colliding head-on. Such collisions result in extensive damage across the full front of the vehicle and expose the occupants to high forces which must be effectively controlled by the restraint systems and the gradual deformation of the vehicle structure in order to prevent serious or fatal injury.

In Figures 6 and 7, NASS data provide insight into the relationship of real-world crash configurations to this laboratory test condition.

In Figure 6, it is seen that more than 70 percent of the real-world frontal crashes which result in AIS 3 or greater injuries have a direction of force of 12 o'clock or head-on. In Figure 7, it is shown that 54 percent of the frontal crashes have induced or direct damage across the full front of the vehicle and another 27 percent have induced or direct damage which extends two-thirds of the way across the front of the vehicle.

These NASS data indicate that the FMVSS No. 208 and NCAP test configurations reflect closely the real-world frontal crash configurations which result in the largest number of serious injuries and fatalities.

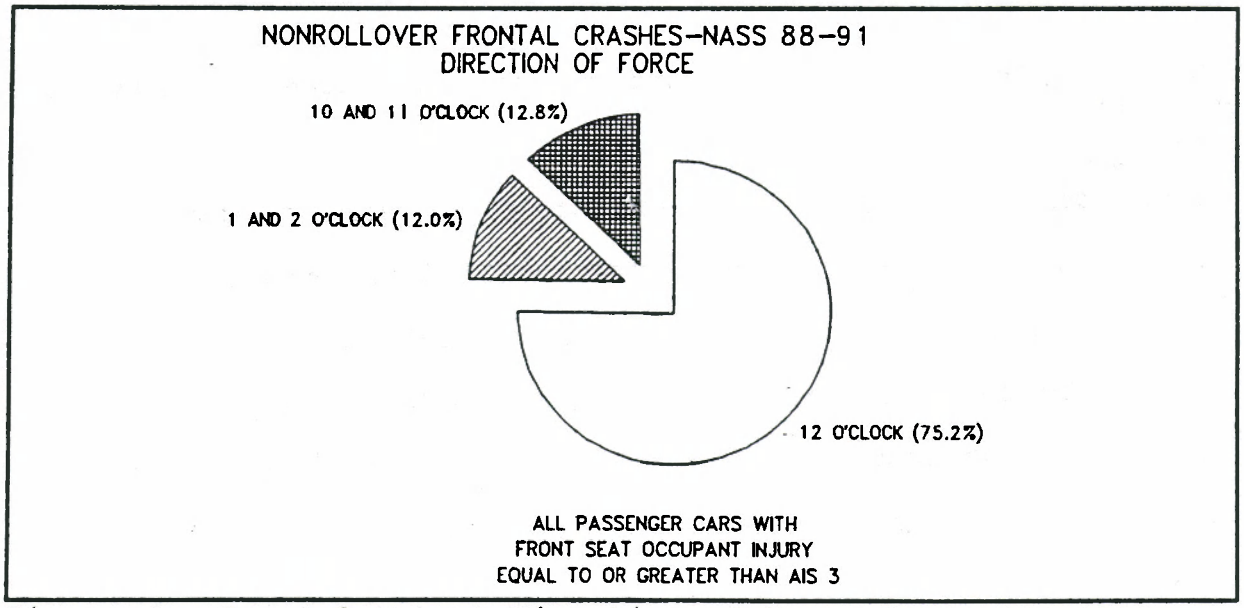

Figure 6. Frontal Impact Direction of Force from 1988-1991 NASS - Retrained and Unrestrained Front Seat Occupants

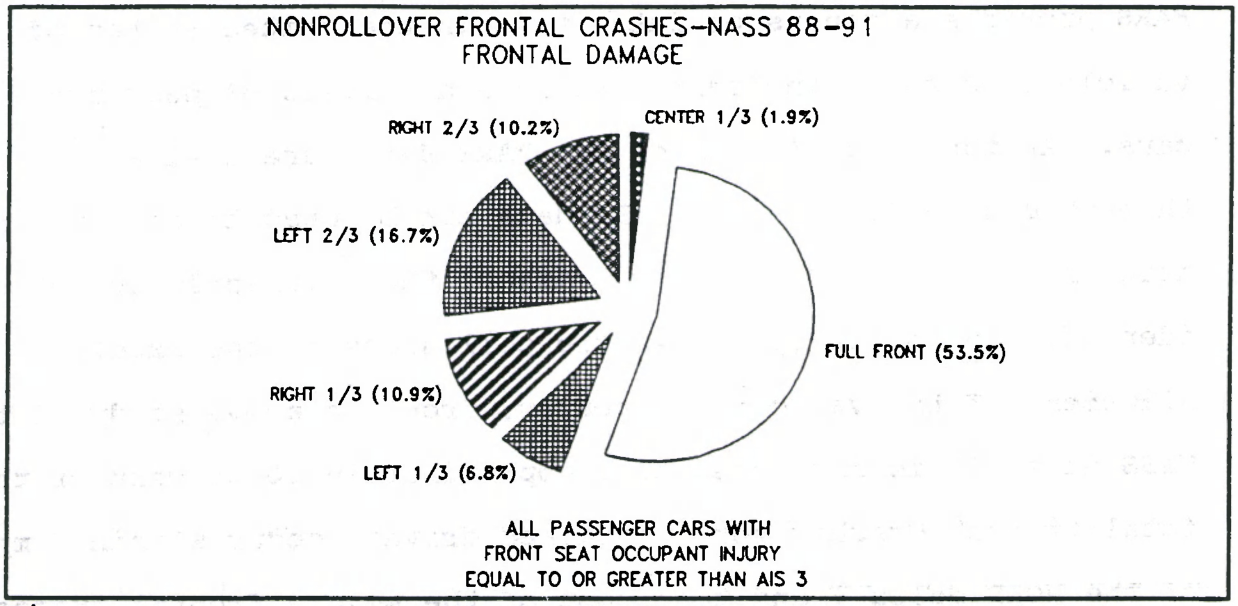

Figure 7. Frontal Impact Damage Pattern from 1988-1991 NASS - Restrained and Unrestrained Front Seat Occupants

3.4 The Use of FARS in Real-World/NCAP Studies

As noted, NASS data are very beneficial in determining the distribution of parameters such as the injury levels, delta Vs and crash configuration in the overall national crash patterns. However, the amount of data on specific vehicle makes and models is insufficient to evaluate the effectiveness of NCAP results in estimating actual on-the-road risk of injuries and fatalities. NHTSA has concluded that the accident data file in which this effectiveness can be reliably studied is FARS and, since FARS is a fatal accident file, this effectiveness can only be studied from the perspective of fatality reduction.

FARS provides a census of fatalities in the United States of vehicle occupants, including restrained drivers of passenger cars. At the time of this study, FARS data were available through mid-1992. Whereas FARS data can be used to distinguish head-on collisions from other crashes, they currently do not identify the impact speeds in the collisions or the exact alignment of the vehicles. However, from the above study of the NASS data, it is estimated that approximately 50 percent of the fatal frontal crashes for restrained drivers occur within 5 mph of the NCAP delta V and that most of the severe frontal crashes involve damage across a large portion of the front of the vehicle (as occurs in NCAP tests). However, there are many major differences between the NCAP controlled laboratory crash tests and real-world, head-on crashes. These include:

- differences between the physical characteristics of the human driver population and the anthropomorphic dummy (the dummy represents a 50th percentile male),

- injury and fatality risk variations due to age and sex, and

- location of the fatal lesions (injury parameters are measured only in the head, chest, and femurs of the dummies in NCAP).

Although the controlled test approximates a sizable portion of the fatal frontal crashes relative to crash severity, there

remains some 50 percent of the real-world events which are more than 5 mph greater than or less than the NCAP delta V. As a consequence, it is inappropriate to expect perfect correlation between NCAP test results and actual fatality risks from the FARS files. However, if there is significant correlation between the two, it suggests that the NCAP scores reflect, to some extent, actual crashworthiness in a range of crashes that goes beyond the specific crash conditions simulated in NCAP tests.

NHTSA's major occupant protection crash standard (FMVSS No. 208) is based on the premise that vehicles which have dummy HICs, chest G values, and femur loads below 1,000, 60, and 2,250 respectively, in 30-mph barrier crash tests will provide improved occupant protection in the real world as compared to vehicles that do not meet these criteria. This premise is accepted by the safety community and motor vehicle manufacturers. From this premise, it may be inferred that low dummy responses in NCAP tests at 35 mph should reflect better than average safety in real-world crashes, regardless of the inherent differences between real-world crashes and NCAP tests. NHTSA has concluded that FARS provides adequate data to determine whether this premise of improved safety with lower dummy responses is valid in the spectrum of real-world frontal crash events.

3.4.1 FARS Analysis: Car-to-Car Frontal Head-on Collisions

An extensive statistical study of FARS has been completed and will be published as a NHTSA technical report and presented at a safety conference[7] in 1994. This study focuses on head-on collisions between two passenger cars (Insufficient NCAP and FARS data are available to include light trucks, vans, and sport utility vehicles in this study). The goal of the analysis is to determine whether cars with high injury scores in NCAP tests had more fatalities than would be expected, given the weights of the cars, and the age and sex of the occupants involved in the crashes. A summary of findings of this statistical study is given in the following paragraphs.

The large diversity of fatality rates in accident data often reflects more on the types of people who drive the cars and how they drive them than the actual crashworthiness of the cars. For example, "high-performance" cars, popular with young male drivers, have an exceptionally high frequency of fatal crashes - because they are driven in an unsafe manner - even though they may be just as "crashworthy" (i.e., provide equal occupant

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[7]The report is scheduled to be presented at the 14th International Technical Conference on Experimental Vehicles. This conference, co-sponsored by NHTSA and the host country, brings together the international safety community and world automobile manufacturers approximately every other year to share advancements in technical information and improvements in occupant safety.

protection in a given crash) as other models. The FARS statistical analysis objective was to attempt to isolate the actual crashworthiness differences between cars, removing differences attributable to the way the cars are driven, the ages of the occupants, etc., and then to determine if these crashworthiness differences on the highway correlate with NCAP performance as measured in controlled laboratory tests.

Since NCAP is a frontal-impact test, involving dummies protected by safety belts, this FARS study is limited to frontal crashes involving belted occupants. Only the FARS data for head-on collisions between two passenger cars, each with a belted driver, that resulted in a fatality to one or to both of the drivers, are used. A head-on collision is a special type of highway crash that is ideally suited for studying crashworthiness differences between two cars. Both cars are in essentially the same frontal collision. Whether one of them had a "safe" driver and the other an "unsafe" driver is of little relevance at the moment they collide head on. Which drivers die and which survive will depend primarily on the relative crashworthiness of the two cars, their relative weights, and the ages and sexes (vulnerability to injury) of the two drivers.

Head-on collisions between two passenger cars, with both drivers belted, were identified in the FARS file, through mid-1992. By using the Vehicle Identification Numbers and available vehicle

characteristics information, accurate curb weights of the cars were determined. Applicable NCAP results were then assigned to each relevant passenger car make and model in FARS. A file of 370 head-on crashes was created in which vehicle curb weights, drivers' ages and sexes, and NCAP results are known for each of the 740 passenger cars[8], and both drivers were belted. A total of 427 drivers were fatally injured out of the 740 drivers included in these crashes.

In each of these 370 crashes, at least one of the drivers received fatal injuries. And, in 57 cases, both drivers were killed. As stated, which of the drivers die and which survive will depend primarily on the relative crashworthiness of the two cars, their relative weights, and the ages and sexes (vulnerability to injury) of the two drivers.

In the FARS file, if car 1 and car 2 weigh exactly the same, and both drivers are the same age and sex, the likelihood of a driver fatality in a head-on collision would be expected to be equal in car 1 and car 2. More generally, if car 1 and car 2 have different weights, and their drivers are not necessarily the same

[8]A major reduction in NCAP driver HIC values has occurred with the introduction of air bags. NHTSA expects that this significant improvement in occupant protection, due to air bags, will result in reduced risks in fatalities and injuries. However, only 3 percent of the 740 passenger cars in this study were equipped with air bags. Therefore, the positive effects of air bag protection are essentially not reflected in this analysis.

age, it is still possible to predict the expected fatality risk for each driver in a head-on collision between these two cars. Factors which establish the relationship between fatality risk and vehicle weight[9], and the drivers' ages and sexes were determined from the accident data.

Given a set of collisions, from this FARS file of 370 head-on crashes, in which car 1 always has lower NCAP scores (see definitions in Table 3) than car 2, the actual fatalities are tallied for the car 1s and the car 2s. The unadjusted actual fatality reduction for cars with the lower NCAP scores is the difference in these actual fatalities. The expected fatalities, based on the adjustments for car weight, age, and sex, are also summed up for the car 1s and the car 2s. The adjusted actual fatality reduction is the difference in actual fatalities relative to the difference in expected fatalities. In the analyses, both the unadjusted and adjusted actual fatality reductions are given to allow a comparison of the effects of these adjustments. Levels of statistical significance are derived for the adjusted fatalities relative to the unadjusted actual fatalities.

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[9]Adjustments for vehicle weights in car-to-car collisions, essentially, are adjustments to reflect the higher delta V that is experienced by the lighter weight car. For example, in a frontal head-on collision between a 2,000 pound car and a 4,000 pound car, the delta V for the lighter car will be twice that of the heavier car.

In Table 3, results of four statistical studies, Cases A, B, C, and D, are given, each of which uses two NCAP parameters, HIC and chest Gs, to distinguish "good" from "poor" performance. In the detailed technical report, HIC, chest Gs, and femur loads from NCAP test results are used in a variety of approaches. While the analyses using femur loads are not shown here, NHTSA wishes to point out that the detailed technical report does show similarly strong correlations between accident data and various combinations of femur loads with other injury measures. In Table 3, the following data for Cases A, B, C, and D are provided;

- average vehicle weight of car 1 and car 2,

- average drivers' age for car 1 and car 2,

- average drivers' HIC and chest G from NCAP for each car,

- the unadjusted fatality risk reductions for car 1 drivers as compared to car 2 drivers,

- the fatality risk reduction for car 1 drivers as compared to car 2 drivers adjusted by car weight and drivers' ages and sexes, and

- the level of statistical significance (one-sided p for the adjusted fatality risk reduction). A value of p equal to or less

than .05 indicates a significant reduction. A value of p less than .01 indicates a high level of statistical significance.

First, in Case A, all 370 events were examined by comparing the fatality risk for drivers of car 1, the car with the lower NCAP injury probability[10], to car 2. This comparison does not assure that vehicles designated as car 1 will have "good" NCAP results (i.e., HIC below 1,000 and chest Gs below 60), only that the drivers of car 1 have a lower maximum injury probability (to the head or chest) than the drivers of car 2. The injury probability is based on classification of NCAP results by utilizing the injury risk function curves as developed by GM and Ford. The drivers received fatal injuries in 199 of the vehicles which met the criterion while 228 fatalities occurred in car 2, the vehicle with the poorer NCAP performance. The expected numbers of fatalities, based on vehicle weight, driver age and sex, are 208 for car 1 and 217 for car 2. These values indicate a reduction in the fatality risk for the drivers of car 1 versus the drivers of car 2. The unadjusted reduction in actual fatality risk was

$$1-(199/228)=12.7 \text{ percent}$$

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[10] In the Society of Automotive Engineering (SAE) Paper No. 851246, "The Position of the United States Delegation to the ISO Working Group 6 on the Use of HIC in the Automotive Environment," P. Prasad and H. Mertz presented an injury risk function curve that relates the probability of an AIS≥4 head injury to HIC. In a 1990 SAE Paper No. 902338, "Assessing the Safety of Occupant Restraint Systems," D. Viano and S. Arepally expanded the application of this curve and provided the equations to calculate the probability of AIS≥4 injury to the head and chest.

and the adjusted reduction in actual fatalities was

$$1-[(199/228)/(208/217)]=8.7 \text{ percent.}$$

Case B in Table 3 provides the results from 170 events in which the drivers of car 1, the "good" performer, received HICs of 1,000 or less and chest Gs of 60 or less in the NCAP tests. That is, in the 35-mph NCAP test, car 1 met the FMVSS No. 208 criteria relative to head and chest requirements, whereas, car 2, the "poor" performer, exceeded one or both of these criteria. Fatalities occurred to 89 of the drivers in car 1 and 111 in car 2. Expected fatalities were 96 and 104, respectively. These values indicate a significant reduction in the unadjusted and adjusted fatality risks. The reduction in actual fatality risk was calculated to be 19.8 percent (unadjusted) and 13.5 percent (adjusted for vehicle weight, driver age, and sex).

For Case C, car 1 continued to be defined as in Case B, but the "poor" performer, car 2, is defined as having drivers' HICs which exceed 1,200 and/or chest Gs which exceed 70 in the NCAP tests. In the FARS data, cars in 104 head-on crashes meet these criteria. In comparison to Case B, Case C eliminates 66 collisions between cars in which the "poor" performer, car 2, had a driver's HIC greater than 1,000 and less than 1,201 and/or a driver's chest G greater than 60 and less than 71, and the "good" performer, car 1, met the FMVSS No. 208 HIC and chest G requirements in the NCAP tests. Fatalities occurred to 50 of the

Table 3. Summary of Real-World NCAP Effects Based on FARS Analysis of Car-to-Car Head-on Collisions

Parameter	Car No.	Case A*	Case B*	Case C*	Case D*
Average Vehicle Weight	1	2837	2920	2941	2944
	2	2802	2769	2769	2761
Average Drivers' Age	1	42.0	43.7	42.2	46.4
	2	42.5	41.1	41.0	43.5
Average Drivers' HIC from NCAP	1	721	747	742	712
	2	1117	1339	1609	1465
Average Drivers' Chest G from NCAP	1	45	46	45	43
	2	53	56	55	59
Reduction in Fatality Risk-Car 1 versus Car 2-Unadjusted FARS Data	1	12.7%	19.8%	29.6%	32.8%
Reduction in Fatality Risk-Car 1 versus Car 2-FARS Data Adjusted by Car Weight, Drivers' Ages and Sex	1	8.7%	13.5%	19.2%	26.7%
Level of Statistical Significance (one-sided p)		.053	.035	.017	.002

*Case A - Car 1 has a lower life-threatening injury risk to the driver than car 2 in NCAP test.

*Case B - Car 1 has a HIC value less than 1001 and a chest G less than 61 in the NCAP test. Car 2 has a HIC value greater than 1,000 and/or a chest G greater than 60 in the NCAP test.

*Case C - Car 1 has a HIC value less than 1,001 and a chest G less than 61 in the NCAP test. Car 2 has a HIC value greater than 1,200 and/or a chest G greater than 70 in the NCAP test.

*Case D - Car 1 has a HIC value less than 901 and a chest G less than 56 in the NCAP test. Car 2 has a HIC value greater than 1,250 and/or a chest G greater than 65 in the NCAP test.

drivers in car 1 and 71 of the drivers in car 2. Expected fatalities were 57 and 65. These events give even more substantial reductions in the unadjusted actual and adjusted fatality risks of 29.6 percent and 19.2 percent, respectively.

In one additional example, Case D, car 1 ("good") is defined as having drivers' HICs not to exceed 900 and chest Gs not to exceed 55 in NCAP. Car 2 ("poor") is defined as having drivers' HICs greater than 1,250 and/or chest Gs greater than 65 in NCAP. A total of 81 events met these requirements. Fatalities occurred to 39 of the drivers in car 1 and 58 of the drivers in car 2. Expected fatalities were 46 and 51. Reductions in the unadjusted and adjusted fatality risks for drivers of car 1 were 32.8 percent and 26.7 percent, respectively.

In summary, data in Table 3 provide an overview of the car-to-car crash events from FARS. For each of the four cases, there is little difference between the average curb weights for car 1 and car 2, the average drivers' ages are very similar, and, as expected, average HICs and chest Gs are very different depending on the definition of "good" and "poor" cars. With the small differences in average curb weights and average drivers' ages, the comparison of the reductions in unadjusted and adjusted fatality risks indicates that the findings are consistent (i.e., For Case A through Case D, there is a continuing trend of

decreasing fatality risks for the drivers of car 1 for both unadjusted and adjusted data.)

The reductions of fatality risk in Table 3 indicate that by making even a rough cut of NCAP vehicle performance, as in Case A, a positive correlation or trend is found between NCAP results and real-world, head-on collisions. These data provide statistically significant evidence that, when dividing the vehicles into traditional "good" and "poor" performers as defined by the HIC and chest G results from NCAP tests, strong correlations are shown between NCAP results and real-world crashes. Restrained drivers are at substantially lower risks of fatality in the "good" car. Depending on the definitions of "good" and "poor" cars, the reductions in fatality risks may be as large as 30 percent.

3.4.2 FARS Analysis: Car-to-Fixed Object Frontal Collisions

Concurrent with the car-to-car analysis, a more generalized study of FARS was conducted to determine if the trend of lower-fatality risks for "good" cars occurred in frontal crashes other than the car-to-car head-on collisions. In this analysis, the number of restrained drivers killed in single vehicle frontal, fixed-object collisions was obtained from FARS for each passenger car with applicable NCAP crash-test results. The fatality rates per

million vehicle years for the restrained drivers in the "good" and "poor" cars as defined, above, in Case B, Case C, and Case D were determined. Since the analysis is now referring to single-car crashes into fixed objects, there is no equivalent Case A.

The results from the three single-car crash studies are shown in Table 4 along with the average vehicle test weight, drivers' HICs, and drivers' chest Gs from NCAP.

Table 4. Summary of Real-World NCAP Effects Based on FARS Analysis of Car-to-Fixed Object Frontal Collisions

Parameter	Group No.	Case B*	Case C*	Case D*
Average Vehicle NCAP Test Weight	1	3183	3183	3150
	2	3197	3180	3202
Average Drivers' HICs from NCAP	1	722	722	676
	2	1315	1614	1435
Average Drivers' Chest Gs from NCAP	1	45	45	44
	2	58	58	62
Reduction in Fatality Rate-Cars in Group 1 versus Cars in Group 2-Actual FARS Data	1	19.2%	21.8%	35.7%

*Case B - Cars in Group 1 have HIC values less than 1,001 and chest Gs less than 61 in the NCAP tests. Cars in Group 2 have HIC values greater than 1,000 and/or chest Gs greater than 60 in the NCAP tests.

*Case C - Cars in Group 1 have HIC values less than 1,001 and chest Gs less than 61 in the NCAP tests. Cars in Group 2 have HIC values greater than 1,200 and/or chest Gs greater than 70 in the NCAP tests.

*Case D - Cars in Group 1 have HIC values less than 901 and chest Gs less than 56 in the NCAP tests. Cars in Group 2 have HIC values greater than 1,250 and/or chest Gs greater than 62 in the NCAP tests.

In this single car crash analysis, it is not feasible to adjust for driver age or vehicle exposure. Unlike the analysis of head-on collisions, this study does not adjust for differences in crash-involvement propensities. As was noted in Table 3, there is, on the average, little difference in the vehicle weights and driver ages of "good" and "poor" NCAP performers. Therefore, the results in Table 4 are from the actual, unadjusted FARS data. These results are a supplement to the statistical findings from the car-to-car, head-on crash analysis and should be compared only to the unadjusted data of the two-car crash analyses. These

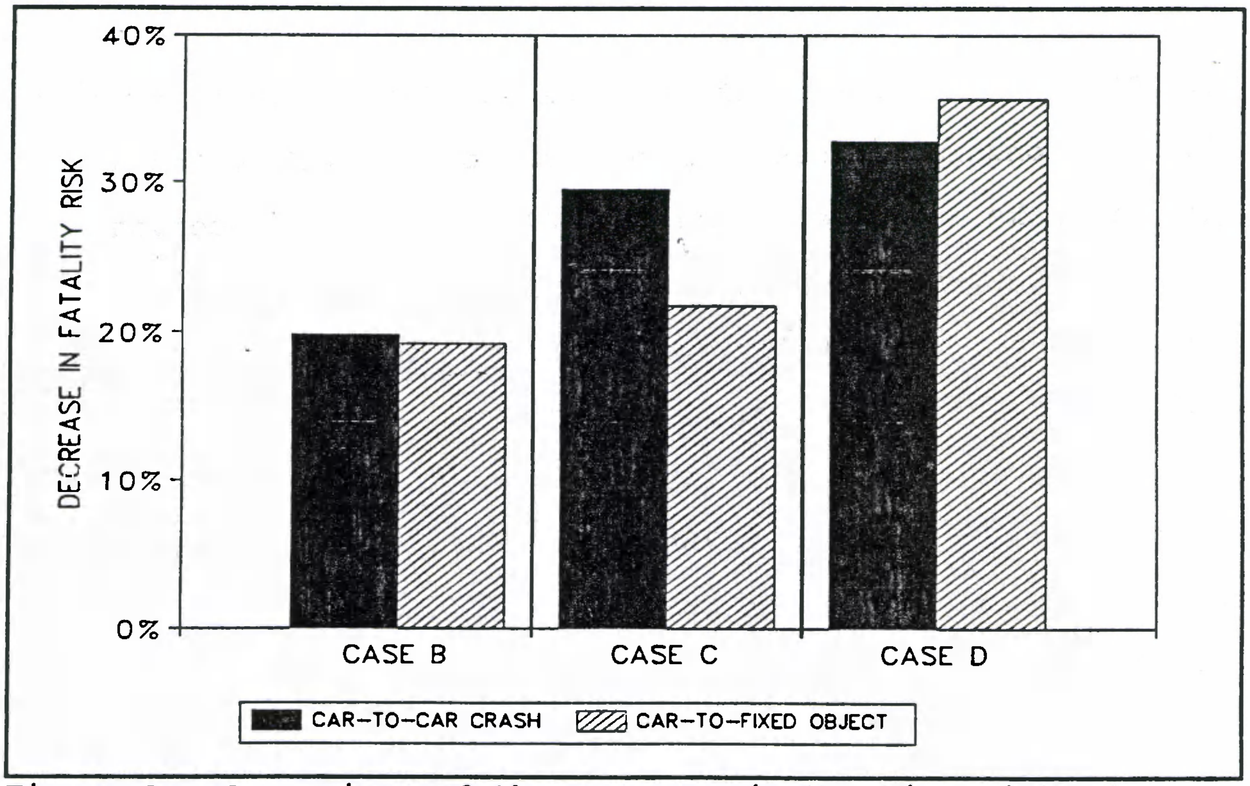


Figure 8. Comparison of the Decrease in Fatality Risks for "Good" Performing Cars in NCAP in Car-to-Car and Car-to-Fixed Object Collisions

comparisons are shown in Figure 8. Similar reductions in fatality risks for the drivers of car 1 are found. The statistical significance of these single car crash results cannot be ascertained because of unknown exposure factors. The results of this single-car crash study should be considered only as an indication as to whether the findings in the above car-to-car analysis may also be applicable to these other frontal crashes. The similar results, as shown in Figure 8, when compared to the car-to-car results continue to indicate a trend between "good" NCAP scores and decreased risks in actual highway accidents.

3.5 Study of a Specific Make and Model

The 1980-83 Honda Civic offers a unique opportunity to examine the relationship between NCAP performance and safety for a specific make and model. The MY 1981 Honda Civic received several safety-related changes to improve its NCAP performance as opposed to the MY 1980 Civic. The safety improvements to the MY 1981 (and later MY) Civics included:

- changing the steering column from a solid shaft to a telescopic shaft to reduce crash forces on the occupant through increased energy absorption and decreased intrusion,

- altering the steering column mounting brackets to reduce steering wheel and column intrusion,

- adding seat structure to reduce occupant submarining, and

- reducing belt spool-out by shortening belt length and adding a plastic collar on the retractor shaft, and by using different belt webbing material with lower elongation properties to keep occupants further away from the impact surfaces by reducing the occupant motion in a crash.

A comparison of NCAP crash-test scores for the MY 1980 and MY 1981 Civics in Table 5 shows the substantial reductions in the injury measures for the head and chest in the 1981 model Civic that resulted due to these improvements.

Aside from these specific, safety-related changes in MY 1981, the MY 1980-83 Civics are basically identical cars (a four year model run). That makes it possible to isolate the actual safety effects of changes related to NCAP from other changes that may occur when a make/model is redesigned.

Table 5. Comparison of Model Years 1980 and 1981 Honda Civic NCAP Test Results

Dummy Injury Parameter	Model Year 1980 Honda Civic	Model Year 1981 Honda Civic	Percent Reduction
Driver HIC	2626	607	77
Driver Chest G	54	41	24
Passenger HIC	1506	492	67
Passenger Chest G	47	35	25

An examination of the accident files was made to determine whether or not there was any statistical support for the proposition that the changes in the crashworthiness of 1981 Honda Civics, motivated by NCAP, were beneficial in the prevention of fatal injuries. A sufficient number of vehicles (MY 1980 and 1981-83 Honda Civics) had been on the roads for a period of time long enough to obtain statistical experience data.

In Table 6, a comparison of fatalities and fatality rates (for restrained front-seat occupants in frontal crashes in Honda Civics) in MY 1980 versus MY 1981-83 Honda Civics from the FARS file is given.

Table 6. Comparison of Model Year 1980 to Model Year 1981-83 Honda Civic Fatality Rates for Restrained Front Seat Occupants in Frontal Collisions-FARS Data (1982-1988)

Parameter	MY 1980 Honda Civic	MY 1981-83 Honda Civic
Exposure in Car Years	818,142	2,394,253
Fatalities (Restrained)	13	21
Restrained Fatality Rate/10,000 Car Years	0.153	.088
Reduction in Fatality Rate for Restrained Occupants in MY 1981-83 Civics	42.4 Percent	

The comparison found a 42 percent reduction in fatalities in the modified Honda Civics. This reduction in the fatality rate for a specific make and model continues to indicate the trend between

"good" NCAP scores and decreased risks in actual highway accidents.

3.6 Concluding Remarks on the Real-World/NCAP Studies

In these studies, NASS data have provided important information in evaluating the relationship of the NCAP test conditions to real-world crashes with the findings that:

- a large percentage of frontal crashes that result in serious injury have a direction of force and a frontal damage pattern similar to those in NCAP and FMVSS No. 208 tests,

- approximately 60 percent of the fatalities for restrained drivers occur below the NCAP delta V of 40 mph, and

- approximately 30 percent of the life-threatening injuries and 50 percent of the fatalities for restrained drivers occur within 5 mph of the NCAP delta V (35 to 45 mph),

These findings indicate that NCAP test conditions approximate real-world crash conditions covering a major segment of the safety problem.

From the FARS files, it has been feasible to determine that there is a significant correlation between NCAP results and real-world fatality risks for restrained drivers. Findings include:

- in car-to-car, head-on collisions between a "good" and a "poor" NCAP performer, reductions in fatality risk of the restrained driver of the "good" car may be as much as 30 percent lower than the fatality risk of the restrained drivers of the "poor" car. Significant reductions in fatality risk are found for a wide variety of definitions of "good" and "poor,"

- in car-to-fixed object crashes, the drivers of the "good" cars have approximately the same reduction in the unadjusted fatality risks as in the car-to-car collisions, and

- the specific case study of the Honda Civic, with an estimated fatality reduction of 42 percent between the "poorly" performing 1980 model and the improved 1981-83 models, supports the detailed statistical findings.

Section 4. The Effects of the Use of Hybrid II and Hybrid III Test Dummies in NCAP

Section 4. The Effects of the Use of Hybrid H and Hybrid HI Test Dunmies in NCAP

4.1 Evaluation of the Efficacy of Allowing Manufacturers to Choose Between the Hybrid III Test Dummy and the Hybrid II Test Dummy for the Purpose of NCAP Testing

In the final rulemaking action on FMVSS No. 208 in 1986, NHTSA concluded that the Hybrid II test dummy (Hybrid II) and the Hybrid III test dummy (Hybrid III) gave equivalent responses in the FMVSS No. 208 crash test environment. This conclusion of equivalency was based on comparable barrier crash testing and laboratory evaluations. Based on this conclusion, NHTSA allowed manufacturers to use either the Hybrid II or the Hybrid III to meet the automatic occupant protection requirements of the standard in the 30 mph crash test. NHTSA followed this regulatory action by allowing optional use of the two dummies in the NCAP tests, at the manufacturer's request. Until MY 1990, based on manufacturers' desires, the exclusive use of the Hybrid II continued in NCAP. Beginning with MY 1990 through MY 1993, about 30 percent (52 of 174) of the NCAP tests have been conducted with Hybrid III dummies.

The 1992 Conference Report requested that NHTSA address the efficacy of allowing motor vehicle manufacturers to choose between the "high tech" (i.e., Hybrid III) and "low tech" (i.e., Hybrid II) dummies for the purposes of NCAP testing. In response to this request, an analysis of the NCAP test data has been completed examining the responses of the two dummies and to estimate the effects on the NCAP results. The results of this analysis are presented in the following section.

4.1.1 Analysis of Hybrid II and Hybrid III Data from NCAP Tests

Tables 7 and 8 contain summaries of data from the MY 1990 through MY 1993 NCAP vehicles. Average results from passenger car tests are given in Table 7. Average results from light trucks, vans, and sport utility vehicle (LTVs) tests are given in Table 8.

In MYs 1990 through 1993, tests were conducted on 114 passenger cars. Hybrid II dummies were used as surrogates for the driver and right front seat passenger in 84 of these tests. Hybrid III dummies were used as surrogates in these seating positions in 25 of these tests. Five cars were tested in which the Hybrid III was used in the driver position and the Hybrid II was used in the right front passenger position. Data in Table 7 indicate that approximately 70 percent of these cars met all the requirements of FMVSS No. 208 (i.e., for head, chest, and upper legs) regardless of which dummies were used.

Table 7. Summary of Hybrid II and Hybrid III Measures in NCAP Passenger Cars (PCs)

Parameter	Hybrid II	Hybrid III
Percent of All PCs Meeting All FMVSS No. 208 Requirements in NCAP Tests	71 (76)	70 (23)
Average Driver HIC for PCs with Air bags	687 (34)	513 (24)
Average Driver Chest G for PCs with Air bags	50 (34)	47 (24)
Average Passenger HIC for PCs with Safety Belts only	734 (79)	821 (20)
Average Passenger Chest G for PCs with Safety Belts only	44 (79)	44 (20)

* Numbers in parentheses indicate number of PCs tested in NCAP where relevant response data were available.

Although, in the NCAP crash test data, no absolute comparisons between the responses of the two dummies can be made[11], some relative information may provide useful insight into the effects of the dummy options. For driver responses, the more relevant information is obtained from the driver air bag-equipped cars. In Table 7, the data indicate that the driver HIC average in the air bag-equipped cars is 34 percent higher in the group of cars with Hybrid II dummies than in the cars with the Hybrid III dummies. For the passenger dummies, restrained only by the belt systems, the HIC average is approximately 12 percent higher in the group of cars with the Hybrid III dummies. Figures 9 and 10 show these data along with the range of response values.

[11]Since structural and restraint characteristics of the group of cars tested with Hybrid IIs are different than those tested with Hybrid IIIs, direct comparisons are not possible.

Similar data are given for light trucks, vans, and sport utility vehicles in Table 8. Only four of these vehicles have been equipped with driver air bags and tested in NCAP. Therefore, the relevant information is limited to belt restrained drivers and passengers.

Table 8. Summary of Hybrid II and Hybrid III Measures in NCAP Light Trucks, Vans, and Sport Utility Vehicles (LTVs)

Parameter	Hybrid II	Hybrid III
Percent of All LTVs Meeting FMVSS 208 Requirements in NCAP Tests	30 (33)	33 (21)
Average Driver HIC for LTVs with Safety Belts only	1143 (34)	1052 (21)
Average Driver Chest G for LTVs with Safety Belts only	55 (34)	56 (21)
Average Passenger HIC for LTVs with Safety Belts only	933 (35)	976 (23)
Average Passenger Chest G for LTVs with Safety Belts only	50 (35)	51 (22)

* Numbers in parentheses indicate number of LTVs tested in NCAP where relevant response data were available.

In Table 8, the data indicate minor variations in the average HICs with differences in values between the two dummies of less than 10 percent. Figures 11 and 12 show these HIC data along with the range of response values.

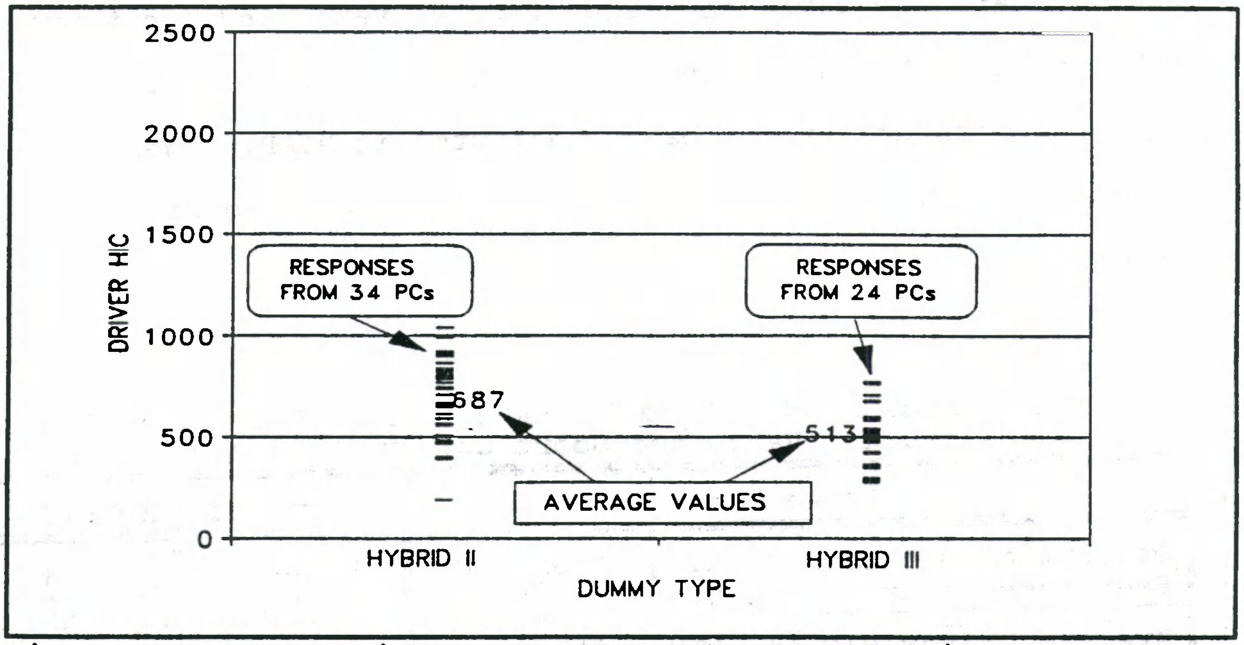


Figure 9. Information on the HIC Values of Hybrid II and Hybrid III Dummies in the Driver Position from NCAP Tests of MY 1990 through 1993 Passenger Cars (PCs) - Air Bags in all Driver Positions

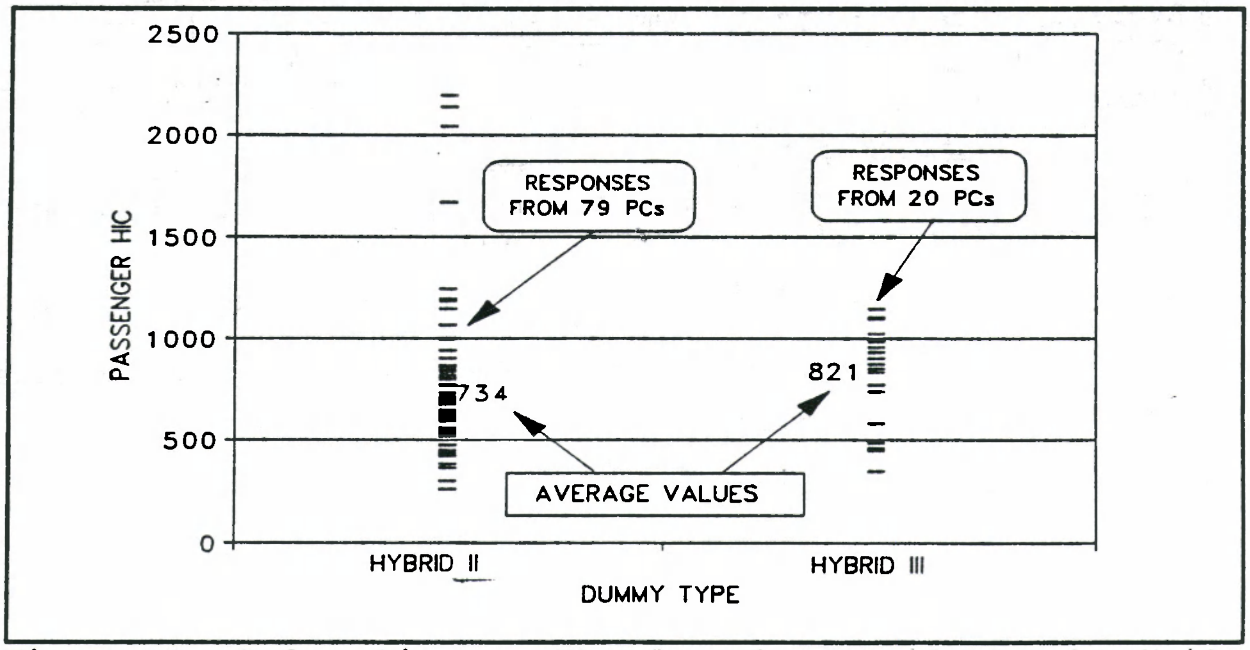


Figure 10. Information on HIC Values for Hybrid II and Hybrid III Dummies in the Right Front Seating Position from NCAP Tests of MY 1990 through 1993 Passenger Cars (PCs) - No Air Bags - Safety Belts only

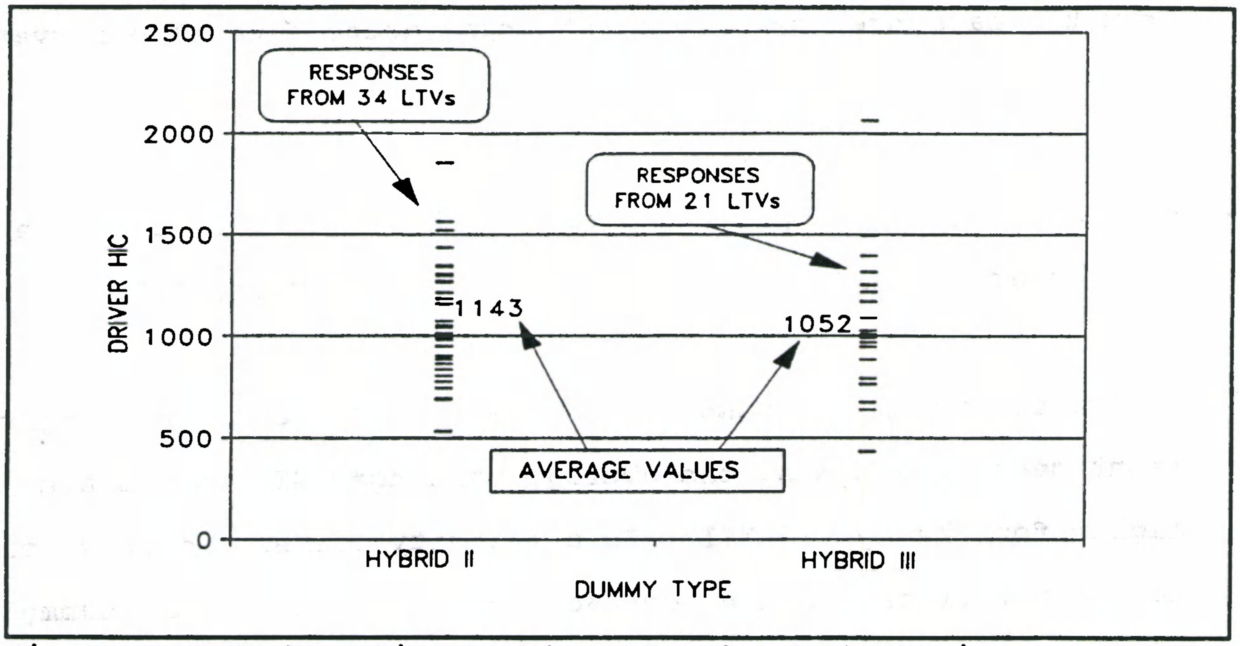


Figure 11. Information on the HIC Values of Hybrid II and Hybrid III Dummies in the Driver Position from NCAP Tests of MY 1990 through 1993 Light trucks, Vans,and Sport Utility Vehicles (LTVs) - No Air Bags - Safety Belts Only

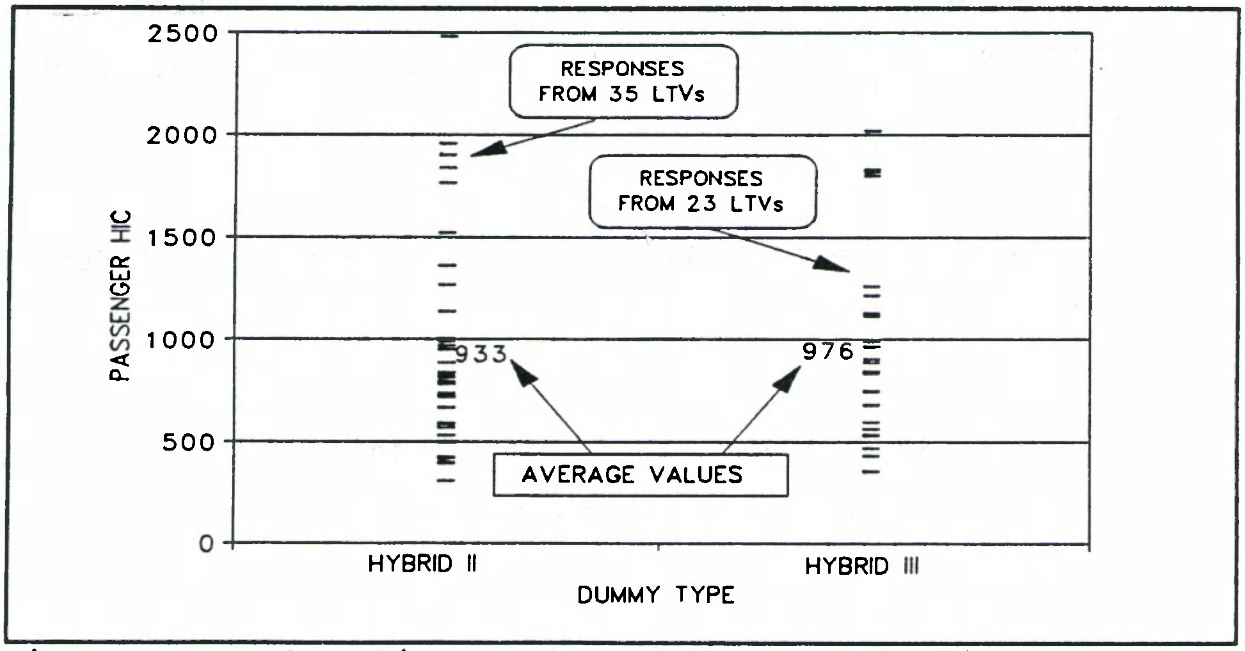


Figure 12. Information on the HIC Values of Hybrid II and Hybrid III Dummies in the Passenger Position from NCAP Tests of MY 1990 through 1993 Light Trucks, Vans, and Sport Utility Vehicles (LTVs) - No Air Bags - Safety Belts Only

From the passenger car and light truck data, general observations are:

- for the group of passenger cars with driver air bags, the average driver HIC values are lower for the Hybrid III,

- for the group of passenger cars with belt restrained right front seat passengers, the average passenger HIC values are higher for the Hybrid III. In a majority of these events, either no contact or only slight contact occurred between the dummy's head and any interior vehicle surface. Some motor vehicle manufacturers contend that the Hybrid III tends to produce higher HIC values than the Hybrid II in dynamic tests in which the head does not contact any surface. These data tend to support that position.

- average chest Gs are approximately the same for both dummies in passenger cars and LTVs, and

- approximately the same percentage of vehicles meet FMVSS No. 208 requirements in NCAP tests regardless of which dummies are used.

It is emphasized that these differences in response values may not necessarily be associated with differences in the designs of the two dummies, but could just as easily be the results of

different characteristics of vehicles and restraint systems. Only one direct comparison is contained in the NCAP tests. The MY 1991 Saturn SL2 model was tested with Hybrid III dummies in the driver and passenger positions restrained by the belt systems. This same car, but a 1992 model, was tested again with a Hybrid III in the driver position and a Hybrid II in the passenger position. The only change to the Saturn from 1991 to 1992 was the addition of a driver air bag. Results of these tests are given in Table 9. This single example shows only small differences between the results of the two passenger dummies. The head of the passenger dummy in each of these tests did not strike any interior vehicle surface.

Table 9. Hybrid II and Hybrid III Results from NCAP Tests of the MY 1991 and 1992 Saturn

Vehicle	Driver*		Passenger**	
	HIC	Chest G	HIC	Chest G
MY 1991 Saturn SL2 with passive belts	918	44	1018	46
MY 1992 Saturn SL2 with driver air bag	705	51	1063	47

* Hybrid III used in driver position for both MY 1991 and 1992 vehicles.
** Hybrid III used in passenger position for MY 1991 vehicle. Hybrid II used in passenger position for MY 1992 vehicle.

NHTSA is convinced that the Hybrid III is the more advanced test device and that any possibility of obtaining conflicting data from the use of the two dummies should be eliminated from NCAP and from FMVSS No. 208 testing by specifying exclusive use of the Hybrid III as soon as possible.

4.2 Review of the Federal Register Notices

NHTSA issued a Federal Register Notice in October 1992 requesting comments on establishing the Hybrid III as the only surrogate testing device to be used in NCAP beginning as early as MY 1994. NHTSA also issued a Notice of Proposed Rulemaking (NPRM) in December 1992 that proposes the mandatory use of the Hybrid III in FMVSS No. 208 beginning September 1, 1996. In these notices, NHTSA stated that:

- the Hybrid III appears to be more representative of human responses in frontal crashes. The Hybrid III represents the state-of-the-art of human simulation. Among other noteworthy advances, the Hybrid III has a more humanlike seated posture, head, neck, chest, and lumbar spine designs that meet biofidelic impact response requirements,

- use of the Hybrid III allows the assessment of more types of potential injury through its ability to monitor almost four times as many injury-indicating parameters as the Hybrid II, and

- use of a single dummy allows for better comparability of test results among vehicles and eliminates potential confusion by the public in understanding and interpreting the test results.

None of the commenters to the notices opposed in principle the exclusive use of the Hybrid III, and several of the commenters expressed unconditional support for its exclusive use. However, some commenters did raise concerns relating to leadtime and biomechanical or technical issues.

Lead time--NCAP imposes no mandatory obligations on the motor vehicle manufacturers. Although most manufacturers conduct crash tests at the NCAP test speed of 35 mph and, in some cases, may have imposed internal performance requirements[12], there are no regulatory requirements for meeting any specific criteria in NCAP. Therefore, the decision of exclusive use of the Hybrid III in NCAP does not impose any regulatory burden on the manufacturers. However, NHTSA also believes that an abrupt change in policy to no longer test with the Hybrid II in NCAP raises fairness issues. These issues relate to the fact that vehicles may have been designed with the Hybrid II, as allowed by NHTSA regulations; manufacturers may be uncertain as to how well their vehicles may perform with the Hybrid III; and NHTSA may not be providing sufficient time for manufacturers to improve their vehicles' performance using the Hybrid III.

For FMVSS No. 208, sufficient lead time will be provided in the final rulemaking to allow manufacturers to assure that their

---

[12]These internal performance requirements are laudable and, as shown in Section 3, may have led to significant safety improvements in crashes.

vehicles meet the specified criteria with the Hybrid III. To provide this lead-time, NHTSA will not require mandatory use of the Hybrid III until MY 1998. This is a two year extension beyond the MY 1996 date that was proposed in the December 1992 NPRM.

Biomechanical or technical issues--The Hybrid III has been used in 52 NCAP tests and in 62 of the FMVSS No. 208 compliance tests. Results from these tests indicate that there are no biomechanical or technical issues to impede the exclusive use of the Hybrid III, based on the injury criteria currently being measured. Minor issues that were raised by some manufacturers, such as improvements to the current chest deflection measurement device and changes to the ankle design, do not affect the biofidelity of the Hybrid III. These issues will be addressed in future rulemaking actions.

NHTSA has concluded from analysis of the NCAP data and the review and analysis of the comments to the two notices to proceed with exclusive use of the Hybrid III in NCAP beginning with MY 1996 vehicles. This is two years earlier than required by the recent amendment to FMVSS No. 208. In addition, NHTSA will immediately, beginning with MY 1994 vehicles, use the Hybrid III exclusively for all seating positions in which the occupant is protected by an air bag. Since air bags are in the vast majority of passenger cars and are rapidly being introduced into light trucks, when

coupled with manufacturer preference, nearly all seating positions will be tested with the Hybrid III. For example, of the 78 seating positions (39 vehicles) being tested in the MY 1994 NCAP, only 5 will be tested with the Hybrid II. NHTSA believes these changes fully comply with the Appropriations Committees' requests to expeditiously move toward exclusive use of the Hybrid III.

Section 5. The Future for NCAP

Section 5. The Future for NCAP

5.1 Make NCAP Easy to Understand

NCAP has produced extensive frontal crash test information for use by consumers and the media. However, as noted in Section 2, this information has been difficult for some consumers to understand and the media to use.

NHTSA's first step in planning the future for NCAP will be to pursue the goal of reaching a larger group of the population with simplified data that will assist them in making their vehicle purchase decision. NHTSA is proposing to ask for public comment on how to present information to consumers and the media with the hopes of developing a format that is more understandable. The primary element for FY 1994 is a consumer brochure that will be developed in a computerized format. This will permit easy updating. The format will also be adaptable to print media requirements. The brochure will utilize an easy to read and simple presentation technique. It will contain a description of NCAP and the comparative results from the vehicle tests.

5.2 Expand the Usefulness and Power of NCAP

NCAP has evolved into a real catalyst in the automobile market place. Consumer enlightening publications highlight crash test results as an important ingredient to consider in the vehicle selection process. As explained in Section 1, the overall trend of the NCAP test results indicate the favorable influence the program has had on motivating the manufacturers to improve restraint systems, steering assemblies, and structural crash characteristics of many of their products. Section 3 highlighted the significance of these improvements as shown, statistically, in the reduction of fatality risks for restrained occupants in the "good" performing passenger cars. In addition, NCAP continues to be a main source of research and engineering data for use by NHTSA and others in directing research programs and analyzing safety problems. With the exclusive use of the Hybrid III dummy in the NCAP frontal tests, as discussed in Section 4, NHTSA will expand the collection of safety information by utilizing the additional capabilities of the more advanced dummy to measure the potential for lower limb and neck injuries. From these perspectives, the frontal crash testing of NCAP has been and continues to be successful.

The focus group recommendations critically pointed out that NCAP provides information for frontal crashes only. Although the frontal crashes account for the highest percentage of fatalities,

as shown in Figure 13, side crashes and rollovers are also very significant crash modes. Almost 8,000 fatalities occurred in side crashes in 1991 and more than 9,000 fatalities occurred in rollover crashes. The focus group study indicates that consumers desire overall safety information on vehicles. In essence, NHTSA needs to expand the crash modes covered by NCAP.

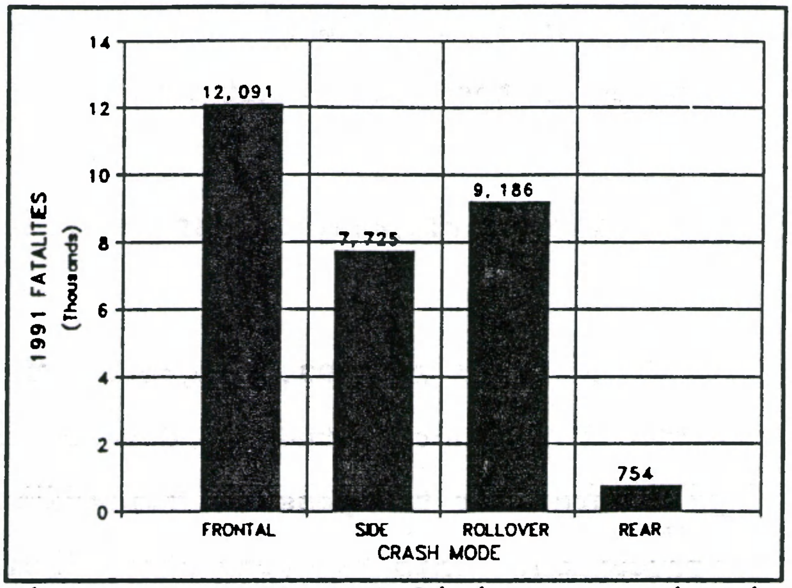


Figure 13. 1991 Fatalities occurring in Frontal, Side, Rollover, and Rear Crash Modes - Passenger Cars and Light Trucks.

The enactment of the upgraded side-impact protection standard, beginning with MY 1994 passenger cars, has provided the opportunity to expand NCAP into side-impact protection. The expansion of NCAP into side-impact protection has the potential for improving occupant protection significantly above that required in the applicable standard if the vehicle manufacturers, which have been responsive to the frontal NCAP test results, are equally responsive to such a program in side-impact testing. As in the frontal NCAP, a side-impact NCAP would provide an engineering data base which can be used to inform consumers of relative vehicle crashworthiness performance. That data base can

also serve as a basis for further research and additional safety studies in the side-impact area.

5.3 NHTSA is Prepared to Start a Side Impact NCAP

In FY 1992 and FY 1993, Congress provided funds as requested by NHTSA to conduct a study to develop the requirements and procedures for the possible expansion of NCAP into side-impact protection. This two-year study included a pilot crash testing program to determine an NCAP crash severity level, to assure that testing, instrumentation, and test device performance are consistent. The results from this program support the feasibility of a side-impact NCAP which could provide comparative results to consumers. If Congressional funding is provided, side-impact NCAP tests would be conducted on passenger cars and the information would be provided to consumers along with the frontal NCAP information. Initiation of this side-impact NCAP would provide consumers with comparative safety data on two of the most important crash modes.

5.4 Rollover Testing

Research efforts continue in NHTSA to determine the feasibility of determining vehicle crashworthiness performance in the rollover crash mode. These efforts have focussed on evaluating

vehicle structural integrity and restraint system effectiveness during dynamic rollover events. Advanced mathematical modelling techniques have been developed and applied, rollover test devices have been constructed, and several demonstration rollover tests have been conducted. NHTSA will continue to monitor these activities to determine the potential for providing consumers with comparative safety information on levels of protection in the rollover crash mode.

In addition to these crashworthiness rollover activities, NHTSA continues to study the merits of providing consumers with information on the roll stability of passenger cars and light trucks, vans, and sports utility vehicles. NHTSA published an Advanced Notice of Rulemaking on January 3, 1992 and a Planning Document for Rollover Prevention and Injury Mitigation on September 23, 1992. In these documents, potential methods for developing and providing consumer information are discussed. Comments to these documents are being reviewed by NHTSA.

5.5 In Conclusion

The future for NCAP includes several major goals:

• reach a larger group of the population with simplified data that will assist consumers in their vehicle purchases,

- expand the collection of safety information by utilizing the additional capabilities of the more advanced Hybrid III dummy to measure the potential for lower limb and neck injuries,

- expand NCAP into side-impact testing to provide comparative side impact information to consumers along with the frontal NCAP information, and

- monitor rollover safety activities to determine the potential for providing consumers with comparative information on levels of protection in the rollover crash mode and on vehicle roll stability.

5.6 Next Steps

NHTSA is considering holding a public meeting on NCAP. The public meeting could provide an open forum for consumer groups, media, foreign governments, national and international safety organizations, and motor vehicle manufacturers to discuss the above NCAP goals. Comments would be solicited on the material in this report and opportunities would be given for interested parties to suggest alternative or additional NCAP goals and activities. Such a meeting could be held in 1994.

Appendix A

News Release on New Car Assessment Program Historical Trends

U.S. Department of Transportation

News:

Office of the Assistant Secretary for Public Affairs
Washington, D.C. 20590

FOR IMMEDIATE RELEASE
Monday, September 27, 1993

NHTSA 42-93
Contact: Barry McCahill
Tel. No.: (202) 366-9550

NHTSA RELEASES REPORT ON NEW CAR ASSESSMENT PROGRAM HISTORICAL TRENDS

The National Highway Traffic Safety Administration (NHTSA) today released a report rating the performance, by manufacturer, of cars crash tested over the past 15 years.

According to NHTSA, the overall crash test performance of cars improved significantly between 1987 and 1993, compared to results for cars tested between 1979 and 1986. The safety agency credits the auto manufacturers with building better products and with greater availability of air bags as contributing factors to the improved performance in its 35 mph crash tests. Cars equipped with a driver's side air bag had average head injury scores that were 40 percent lower than cars without this safety equipment.

The safety agency began the New Car Assessment Program (NCAP) in 1979 in response to a Congressional mandate to provide consumers with a measure of relative crashworthiness of passenger motor vehicles. Federal safety standards require all passenger cars to meet injury criteria measured in a 30 mph frontal crash. The NCAP test is performed at 35 mph so that differences between vehicles may be observed more easily. Driver and passenger side crash dummies give data on forces to the head, chest and upper legs.

The Head Injury Criterion (HIC) is a measure of the potential for injury to the head of a car's occupant in a frontal crash, usually when the head contacts a hard object such as the steering column or instrument panel. Someone experiencing a HIC of 500 or less most likely will have little or no head injury. At a HIC of 1000, about 1 in 6 occupants may have either a life-threatening skull fracture or brain damage requiring immediate medical attention. At HICs of 2000 or more, nearly all crash victims experience life-threatening head injuries with a high probability of death or long-term disability.

(more)

Chest injury numbers above 60 indicate that chest injury is possible.

More than 300 passenger cars and 100 light trucks, vans and sport utility vehicles have been tested over the 15-year period. The report lists scores for the 18 manufacturers whose vehicles have been tested, highlighting notable safety improvements.

Copies of the report, "Historical Performance of Different Auto Manufacturers in the New Car Assessment Program Tests," may be obtained by calling (202) 366-9550.

Attached is a chart showing the historical performance by manufacturer.

###

TABLE 1. NCAP - SUMMARY DATA ON PASSENGER CARS

MANUFACTURER	NO. OF CARS TESTED		% MEETING FMVSS NO. 208 CRITERIA			DRIVER HIC AVERAGE			PASSENGER HIC AVERAGE			DRIVER CHEST G AVERAGE			PASSENGER CHEST G AVERAGE		
	MODEL YEARS		MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS		
	ALL	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93
GM	71	33	59	61	58	658	697	812	806	802	611	46	44	48	40	39	42
FORD	51	22	48	19	89	920	1090	693	796	1018	500	52	65	47	44	47	41
CHRYSLER	44	20	48	38	81	969	1111	799	974	1069	853	50	61	48	44	43	45
TOYOTA	29	13	82	62	62	883	910	849	753	853	631	50	50	51	47	48	44
NISSAN	25	15	40	20	53	982	1142	874	939	1301	697	53	66	51	46	50	43
HONDA	28	17	69	80	81	909	1176	736	795	1016	652	49	49	49	41	38	43
VOLKSWAGEN	17	8	19	10	33	1136	1250	945	956	911	1035	63	54	52	45	44	45
MAZDA	12	7	58	0	100	881	1065	750	1012	1445	703	55	60	61	48	49	46
MITSUBISHI	10	7	78	87	83	891	879	097	830	1108	865	54	62	50	44	45	44
PEUGEOT/RENAU	13	4	0	0	0	1906	1957	1793	1866	2011	1577	59	56	60	45	47	62
VOLVO	7	2	88	80	100	742	879	400	700	724	640	41	42	40	39	39	40
HYUNDAI	8	7	25	0	29	868	1000	071	971	2662	729	66	73	53	45	55	44
ISUZU	5	2	0	0	0	1570	1821	1194	1523	1711	1240	47	42	54	48	47	48
SUBARU	8	4	38	25	50	1055	1230	680	988	1293	682	53	64	51	48	49	43
MERCEDES	3	1	33	0	100	964	1078	800	979	1052	833	59	68	60	49	44	58
SAAB	5	3	40	0	87	858	754	594	1029	1304	846	48	55	43	38	40	37
BMW	3	2	33	0	50	1093	1539	070	622	547	698	49	42	52	40	39	40
TOTAL	338	165	60	37	63	967	1101	826	905	1055	746	50	51	49	44	44	44

Appendix B

Focus Group Test Material

Public Service Announcements (PSA's)

DATA SHEET #1

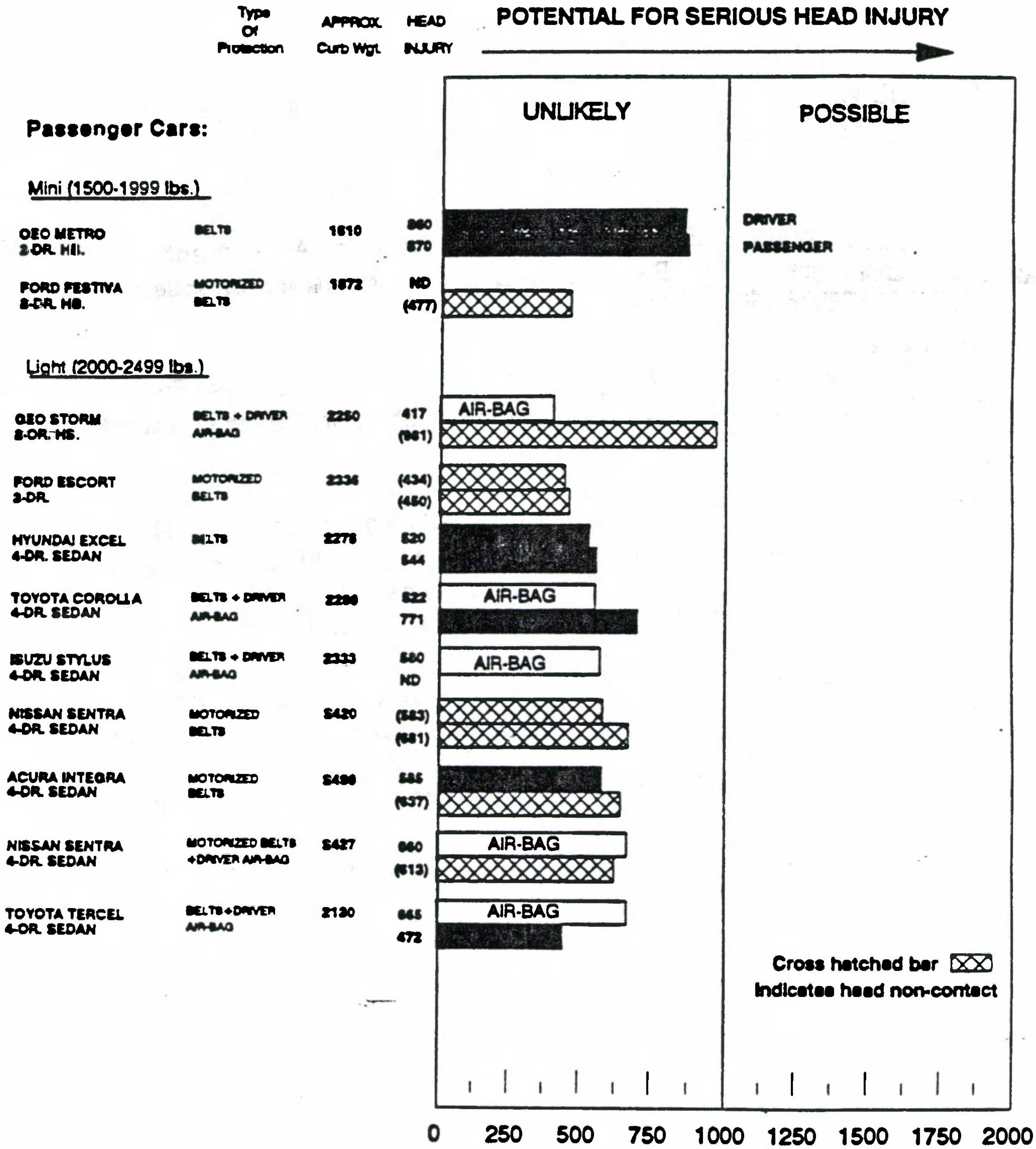
1993 NEW CAR ASSESSMENT PROGRAM RESULTS

VEHICLE	TYPE OF PROTECTION	APPROX. CURB WEIGHT (POUNDS)	HEAD INJURY DRIVER	HEAD INJURY PASSENGER	CHEST INJURY DRIVER	CHEST INJURY PASSENGER	ANTI-LOCKING BRAKE SYSTEM AVAILABLE?
PASSENGER CARS:							
Mini (1500 - 1999lbs.)							
[1]GEO METRO 2-DR. HB.	BELTS	1610	860	870	57	39	NO
FORD FESTIVA 2-DR. HB.	MOTORIZED BELTS	1872	ND	(477)	46	42	NO
Light (2000 - 2499lbs.)							
GEO STORM 2-DR. HB.	BELTS + DRIVER AIR-BAG	2250	417	(981)	47	45	NO
FORD ESCORT 2-DR.	MOTORIZED BELTS	2336	(434)	(450)	42	39	NO
HYUNDAI EXCEL 4-DR. SEDAN	BELTS	2278	520	544	52	37	NO
[2]TOYOTA COROLLA 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2286	522	771	62	45	OPT.
ISUZU STYLUS 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2333	580	ND	57	46	NO
NISSAN SENTRA 4-DR. SEDAN	MOTORIZED BELTS	2420	(583)	(681)	46	45	OPT.
ACURA INTEGRA 4-DR. SEDAN	MOTORIZED BELTS	2490	585	(637)	ND	42	OPT.
[2]NISSAN SENTRA 4-DR. SEDAN	MOTORIZED BELTS + DRIVER AIR-BAG	2427	660	(613)	47	44	OPT.
[2]TOYOTA TERCEL 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2130	665	472	52	41	OPT.

Comparisons must be made between vehicles within an approximate weight range of 500 pounds.
CONV. - Convertible HB - Hatchback ND - No Data 1,2,3 - See Note Page
Parentheses ( ) indicate the occupant's head did not contact an interior surface of the vehicle.

DATA SHEET #2

Head Injury Levels During 35* mph Crash Tests
1993 New Car Assessment Program



Comparisons must be made between vehicles within an approximate weight range of 500 pounds.
ND - No Data HB - Hatchback CONV. - Convertible
Parentheses ( ) indicate the occupant's head did not contact an interior surface of the vehicle.
* - 35 mph barrier crash tests represent a 70 mph closing speed.

NCAP RADIO :60

"SURVIVE"

ANNCR: Would your car survive a head-on collision at 35 miles per hour? Would you? Well, now there's a way to find out. Without doing any damage to your car – or your wallet.

For years the Federal government's New Car Assessment Program – NCAP – has been crash testing new automobiles to determine their safety.

These test results are available to you – absolutely free. So you can get detailed crash test information on the car you want to buy.

Federal safety requirements state that all automobiles must pass a 30 mile an hour front-end crash test. With NCAP, we go one step further by testing at 35 miles per hour. This amounts to a 36 percent increase in the potential for injury.

These higher speed, in-depth test results are not available from dealers. They are available to you, free, simply by calling 1-800-123-4567. That's 1-800-123-4567. Call today for test results that could have a real impact on the next car you buy.

NCAP crash testing. We can steer you in the right direction.

NCAP RADIO :60

"ACCIDENT"

ANNCR: If you're in the market for a new car, there's something you should hear.

SFX: CAR JAMS ON BREAKS, VERY LOUD, DRAWN-OUT SKID.

ANNCR: How well new cars perform in the governments high speed crash tests.

SFX: SKID CONTINUES.

ANNCR: But you don't have to discover this accidentally.

SFX: CAR SKID ABRUPTLY ENDS AS CAR SMASHES INTO A PARKED CAR.

ANNCR: Because all of these high speed crash test results are available to you – free. Through the National Highway Traffic Safety Administration's New Car Assessment Program – NCAP.

NCAP is a consumer information program which tests new cars' ability to withstand severe head-on collisions. And, to make this information more useful to you, NCAP tests cars at 35 miles per hour – 5 miles over the Federal safety requirement.

If you'd like to learn more about how the car or cars you're interested in faired in NCAP's tests, call 1-800-123-4567 for your free information booklet.

And discover which new cars can survive accidents – on purpose. Call NCAP today at 1-800-123-4567. NCAP. We wrote the book on new car safety.

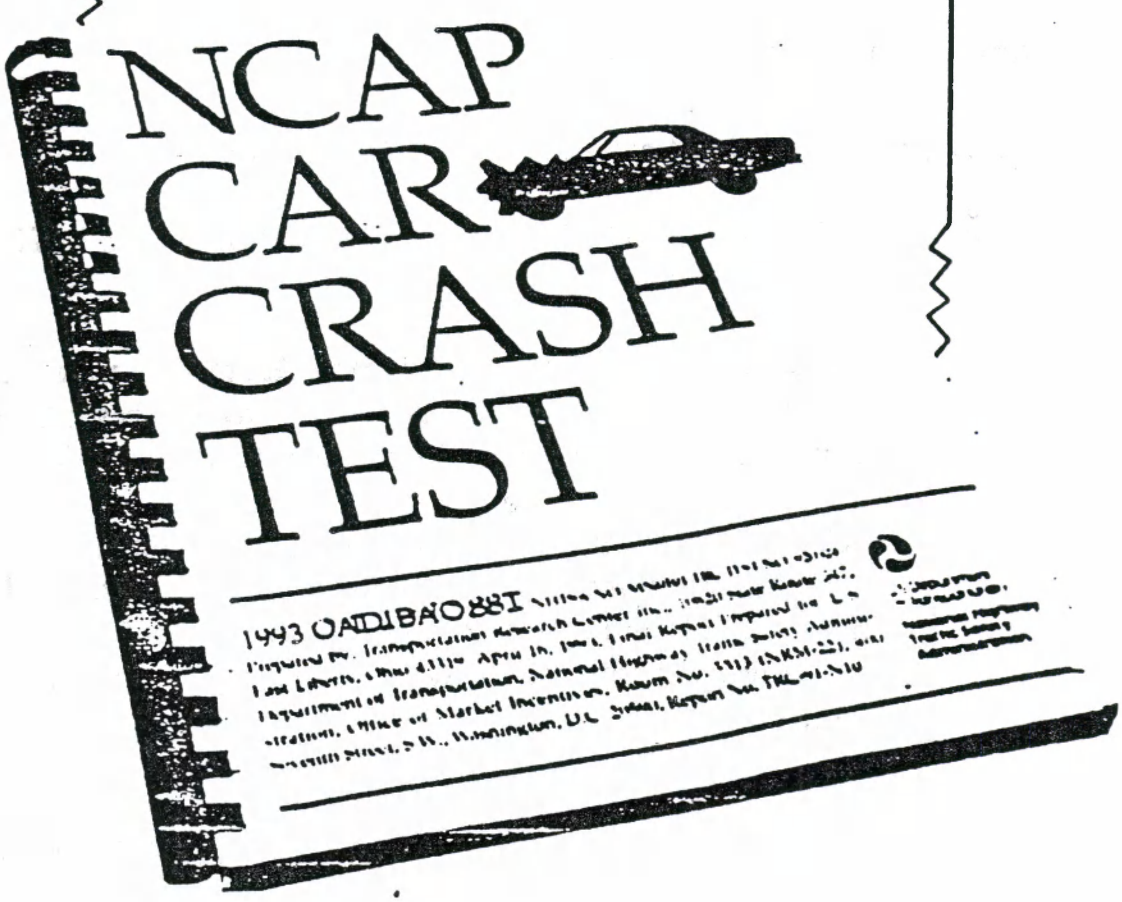
SFX: HONK, HONK.

New car value isn't determined by sticker price and mpg alone any more. For the smart consumer, it's also determined by safety. Which is why the National Highway Traffic Safety Administration began its New Car Assessment Program (NCAP).

This consumer information program tests the crashworthiness of most cars, vans and light trucks. Then, these results are made available to you – free. And since NCAP tests are conducted at 35 mph – 5 miles over Federal safety requirements – these results allow you to make the most detailed collision-safety comparisons possible.

So, if you want to find out more about the car you're going to trust with your life, call for the free crash test results. 1-800-000-0000.

NCAP. We'll Steer You In The Right Direction.



WHAT A NEW CAR STICKER DOESN'T TELL YOU.

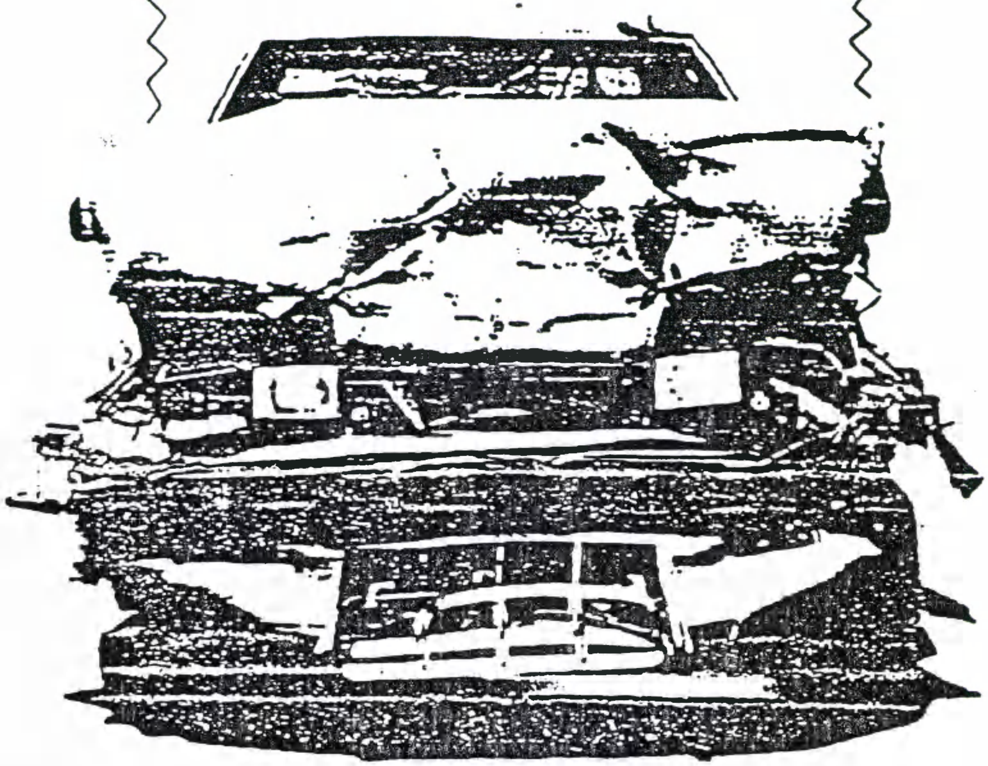
Find out free through the National Highway Traffic Safety Administration's New Car Assessment Program (NCAP).

This consumer information program tests the crash-worthiness of most cars, vans and light trucks. Then, these results are made available to you – free. And since NCAP tests are conducted at 35 mph – 5 miles over Federal safety requirements – these results allow you to make the most detailed collision-safety comparisons possible.

NCAP CAR CRASH TEST

So, if new car safety is important to you, call, 1-800-000-0000 for free crash test results. And discover how safe your new car is – on purpose.

NCAP. We'll Steer You In The Right Direction.



DON'T ACCIDENTALLY FIND OUT HOW SAFE YOUR CAR IS.

Appendix C

NCAP News Release with Simplified Format

FOR IMMEDIATE RELEASE

NHTSA
Contact: Barry McCahill
Tel. No.: (202) 366-9550

NHTSA RELEASES FIRST 1994 CRASH TEST RESULTS IN A NEW FORMAT

The National Highway Traffic Safety Administration (NHTSA) today released the first crash test results for 1994 cars and light trucks using a new "star" scoring system to make the results easier to understand.

According to NHTSA, the format for its New Car Assessment Program (NCAP) responds to consumer demand for reporting information in a way that is less technical and easier to understand. Focus groups of potential car buyers, the news media, callers to the agency's Auto Safety Hotline, the Congress and others have asked NHTSA to simplify NCAP results.

Results are now reported in a range of one to five stars, with five stars indicating the best crash protection for vehicles within the same weight class. Head and chest injury data are combined into a single rating, and reflected by the number of stars, which represents a vehicle's relative level of crash protection in a head-on collision.

Included today are new test results for the **Chevrolet Astro van, Chevrolet Camaro, Mitsubishi Galant 4-door, Chrysler New Yorker 4-door, and Dodge Caravan** as well as results for 44 vehicles previously tested by the agency which are valid for the 1994 versions of these vehicles. Results on a total of 83 model year 1994 vehicles eventually will be reported by the safety agency.

NHTSA's crash test procedures remain unchanged, and the results compare frontal crash protection only. The agency crashes vehicles into a fixed barrier at 35 mph, which is equivalent to a head-on collision between two identical vehicles, each moving at 35 mph. Instrumented dummies register forces and impacts during the crash, which are used by NHTSA to predict potential head and chest injuries.

-more-

New Car Assessment Program

How To Use This Chart

Vehicles should be compared against other vehicles in the same weight class. If a light vehicle collides head-on with a heavier vehicle at 35 mph, the occupants in the lighter vehicle could experience a greater chance of injury than the results of this test Indicate.

Vehicles are classified by the estimated chance of injury for the driver or passenger, and receive a one to five star rating, with five stars ★★★★★ indicating the best protection.

1994 MINI PASSENGER CARS
(1500 - 1999 lbs. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
GEO METRO 2-DR. HB.	1610 lbs.	DRIVER	★★★		✓
		PASSENGER	★★★★		✓

1994 LIGHT PASSENGER CARS
(2000 - 2499 lbs. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
HONDA CIVIC COUPE 2-DR.	2498 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★★	✓	
HYUNDAI EXCEL 4-DR. SEDAN	2278 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★★		✓
HYUNDAI EXCEL 2-DR. HB.	2200 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★★		✓
HYUNDAI SCOUPE 2-DR.	2201 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★		✓
MAZDA PROTEGE 4-DR. SEDAN	2417 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
NISSAN SENTRA 4-DR. SEDAN	2420 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★		✓
NISSAN SENTRA 4-DR. SEDAN	2427 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★		✓
SATURN SL2 4-DR. SEDAN	2481 lbs.	DRIVER	★★★★	✓	
		PASSENGER*	★★★		✓
TOYOTA TERCEL 4-DR. SEDAN	2130 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★★		✓

* HYBRID II DUMMY

1994 COMPACT PASSENGER CARS
(2500 - 2999 lbs. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET CAVALIER 4-DR. SEDAN	2540 lbs.	DRIVER	★★★★		✓
		PASSENGER	★★★★★		✓
FORD TEMPO 4-DR. SEDAN	2674 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★		✓
HONDA PRELUDE 2-DR.	2818 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★★		✓
MITSUBISHI ECLIPSE 2-DR. HB.	2594 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★		✓
MITSUBISHI GALANT 4-DR. SEDAN	2832 lbs.	DRIVER	NO DATA	✓	
		PASSENGER	★★★★	✓	
SUBARU LEGACY 4-DR. SEDAN	2791 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★		✓

* HYBRID II DUMMY

1994 MEDIUM PASSENGER CARS
(3000 - 3499 LBS. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
BUICK CENTURY 4-DR. SEDAN	3049 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★		✓
CHEVROLET CAMARO 2-DR. HB.	3408 lbs.	DRIVER	★★★★★	✓	
		PASSENGER	★★★★★	✓	
CHEVROLET LUMINA 4-DR. SEDAN	3155 lbs.	DRIVER*	★★		✓
		PASSENGER*	NO DATA		✓
DODGE INTREPID 4-DR. SEDAN	3254 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★	✓	
FORO TAURUS 4-DR. SEDAN	3256 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★	✓	
NISSAN MAXIMA 4-DR. SEDAN	3192 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★		✓

* HYBRID II DUMMY

1994 HEAVY PASSENGER CARS
(3500 lbs. & over Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
ACURA LEGEND 4-DR. SEDAN	3550 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★★	✓	
CHRYSLER NEW YORKER 4-DR. SEDAN	3589 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★	✓	
FORD CROWN VICTORIA 4-DR. SEDAN	3970 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★★★	✓	
LINCOLN CONTINENTAL 4-DR. SEDAN	3710 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	NO DATA	✓	
LINCOLN TOWN CAR 4-DR. SEDAN	4080 lbs.	DRIVER*	★★★★★	✓	
		PASSENGER*	NO DATA	✓	
PONTIAC BONNEVILLE 4-DR. SEDAN	3558 lbs.	DRIVER	★★★★★	✓	
		PASSENGER	★★★	✓	

* HYBRID II DUMMY

1994 SPORT UTILITY VEHICLES

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET BLAZER 4-DR. 4X4	3893 lbs.	DRIVER	★★★		✓
		PASSENGER	★★		✓
CHEVROLET SUBURBAN 4-DR. 4X4	5666 lbs.	DRIVER	★★★★		✓
		PASSENGER	★★★★		✓
FORD EXPLORER 4-DR. 4X4	4184 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
ISUZU RDDEO 4-DR. 4X4	4021 lbs.	DRIVER	★★		✓
		PASSENGER	★★★		✓
ISUZU TROOPER 4-DR. 4X4	4294 lbs.	DRIVER	★		✓
		PASSENGER	★★		✓
JEEP CHEROKEE 4-DR. 4X4	3270 lbs.	DRIVER	★★★		✓
		PASSENGER	★★★		✓
JEEP GRAND CHEROKEE 4-DR. 4X4	3748 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★		✓
NISSAN PATHFINDER 4-DR. 4X4	3932 lbs.	DRIVER*	★		✓
		PASSENGER*	★★★		✓
TOYOTA 4-RUNNER 4-DR. 4X4	4114 lbs.	DRIVER*	★		✓
		PASSENGER*	★★★★		✓

* HYBRID II DUMMY

1994 LIGHT TRUCKS

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET C-1500 PU 2-DR.	3838 lbs.	DRIVER	★★★★		✓
		PASSENGER	★★★★★		✓
FORD RANGER PU 2-DR.	3080 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
ISUZU PU 2-DR.	2840 lbs.	DRIVER	★★★		✓
		PASSENGER	★★★★		✓
MITSUBISHI MIGHTY MAX PU 2-DR.	2731 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★		✓
NISSAN PU 2-DR.	2793 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
TOYOTA PU 2-DR.	2563 lbs.	DRIVER*	★★		✓
		PASSENGER*	★★★★		✓

* HYBRID II DUMMY

1994 VANS

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET ASTRO VAN	4078 lbs.	DRIVER	★★★	✓	
		PASSENGER	★		✓
DODGE CARAVAN	3457 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★	✓	
DODGE RAM VAN	4890 lbs.	DRIVER	★		✓
		PASSENGER	★★		✓
FORD AEROSTAR VAN	3670 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★		✓
FORD ECONOLINE VAN	5166 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★		✓
VOLKSWAGEN EUROVAN VAN	3860 lbs.	DRIVER*	★		✓
		PASSENGER*	★★★		✓

* HYBRID II DUMMY

Public Affairs
5232
NCAP

Mr. Parsons
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and detailed in Section 3, there have been significant reductions in the fatality risks for restrained drivers of passenger cars involved in severe frontal crashes.

1.3 Review of NHTSA's Plan as Proposed in the February 1992 Report

In the FY 1992 Senate and Conference Appropriations Reports, NHTSA was required to utilize a variety of new methods in presenting NCAP data in order to make the data more easily understandable by consumers and more useful as a market incentive. The Committees proposed that these methods may include publications of lists of vehicle models performing best and worst on different injury criteria, lists of vehicle models with the highest and the lowest HIC, lists of vehicle models in rank order of their performance on NCAP tests, and the historical performance of different automobile manufacturers on NCAP tests. Congress included $150,000 in the FY 1992 budget to be used in the development and promotion of these new marketing techniques.

NHTSA proposed to:

- develop a report of the historical performance of the different automobile manufacturers in NCAP,

- analyze the NCAP data base and determine an appropriate format for presenting the various suggestions for new lists,

- evaluate the potential impact of these presentation methods on the car-buying public and evaluate the vehicle safety needs and choices of the automobile consumers through the use of consumer focus groups,

- enlist the help of media experts to determine improvements in NCAP data presentations.

The report of the historical performance of the different automobile manufacturers in NCAP was completed and delivered to the Committees and then made available to the public in September 1993. A summary of this historical performance report is given in Section 1.4. A copy of the News Release disseminating the report is included as Appendix A.

A simplified NCAP data presentation format has been developed and focus groups have been conducted to evaluate consumer reactions. Details of the focus group studies are given in Section 2 along with the results of the media survey.

In addition to the requirements on consumer information, the Committees also requested a study to analyze the results of NCAP data from previous model years to determine the validity of these

tests in predicting actual on-the-road risk of injuries and fatalities over the lifetime of the models. In an attempt to fulfill the Committees' requirements for this study, NHTSA proposed to:

- continue to examine data contained in NASS, Fatal Accident Reporting System (FARS), and individual state accident files, and

- analyze "hard-copy" (i.e., written) reports of crashes to evaluate and compare on a one-to-one basis the performance of specific models which have been tested in NCAP and also have been involved in high-severity frontal impacts on the highway.

A summary of these studies and the conclusions are presented in Section 3 of this report.

The Committees also required NHTSA to address the efficacy of allowing automobile manufacturers to choose between the "high-tech" (i.e., Hybrid III) and "low-tech" (i.e., Hybrid II) crash-test dummies for the purpose of NCAP testing. NHTSA proposed to:

- analyze the NCAP test data to evaluate and explain the differences between the two dummies and the effect that these differences may have had on the NCAP results, and

- use the analysis of comments to a Notice of Proposed Rulemaking (NPRM) which will require mandatory use of the Hybrid III dummy in FMVSS No. 208 testing in the mid to late 1990's.

These activities have been completed and are presented in Section 4 along with the schedule to phase out the use of the Hybrid II dummy.

1.4 An Update of NCAP Results and a Review of the Historical Performance of Different Auto Manufacturers in NCAP

In the February 1992 report, trends of improved vehicle safety performance as measured by NCAP were provided. Since that report, NCAP tests have been completed on MY 1992 and 1993 vehicles. These two additional years have been included in the trend analysis and are shown in Figure 3. These trends, based on the dummy HIC and chest G responses are shown for all tests of passenger cars that have been conducted through MY 1993. The average values for the dummy response parameters are given for each model year. Also, the averages for the fleet[3] of NCAP-tested passenger cars, as determined from vehicle registrations, are shown for each year. (Note: The file has not yet been

[3]After the first year of NCAP testing, MY 1979, this fleet included approximately two million of the passenger cars on the road. At the conclusion of the MY 1992 NCAP testing, this fleet constituted over 52 million of the registered passenger cars.

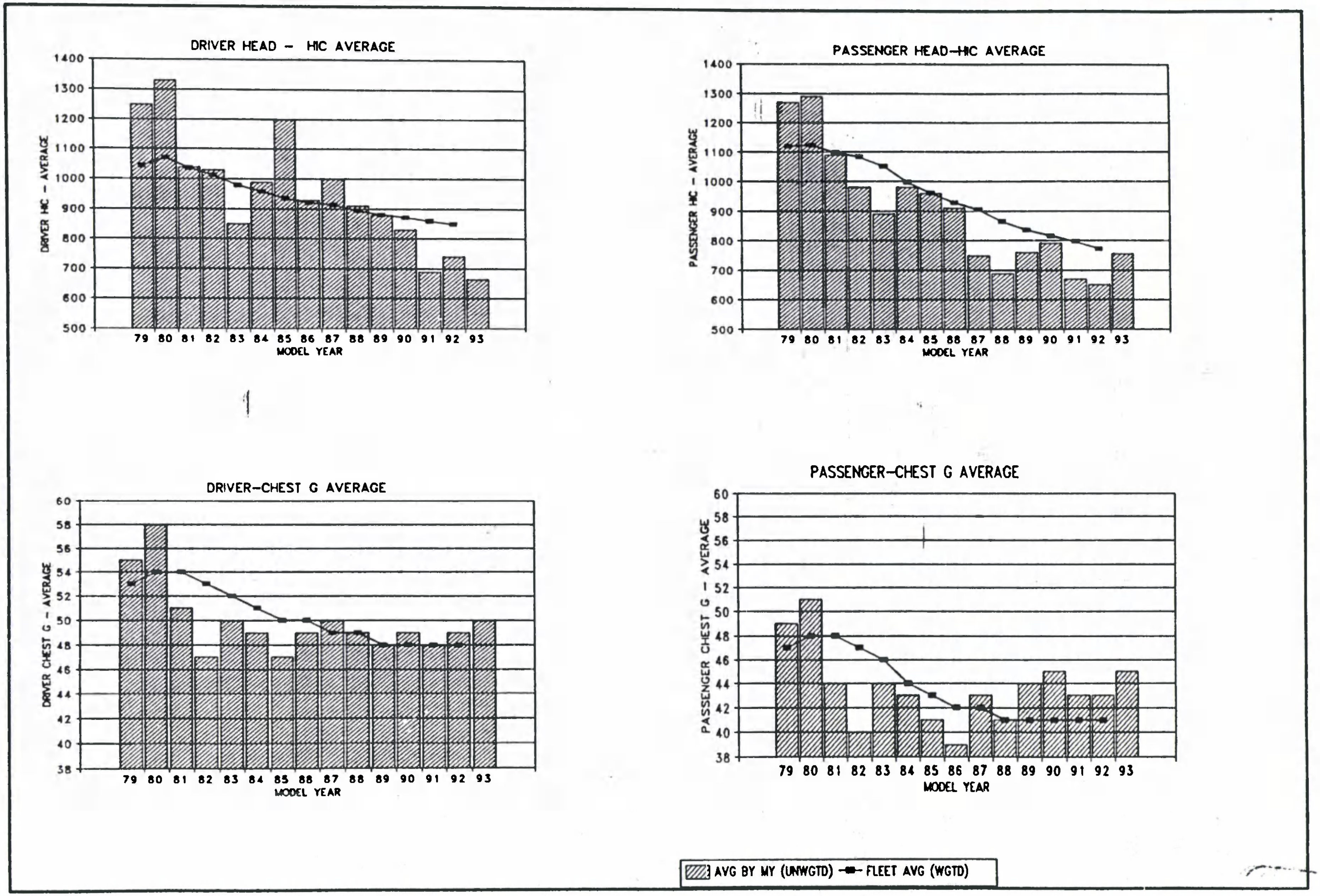

Figure 3. NCAP Dummy Response Trends for Passenger Cars

updated with vehicle registrations for MY 1993. Therefore, weighted values are only available through MY 1992.) As noted in the previous report, significant downward trends are shown for each of the injury parameters.

The Committees had requested in the 1992 Appropriations' report that the historical performance of different motor vehicle manufacturers in NCAP be developed and presented to consumers. NHTSA stated in the February 1992 report that, "A presentation of the historical performance of the different automobile manufacturers will be developed and presented to the focus groups as a consumer information document. This document will, as appropriate, highlight technological developments attributed to each manufacturer." NHTSA completed this document, transmitted it to the Committees, and then released it to the public in September 1993.

In Tables 1 and 2, summary information from this report on the different motor vehicle manufacturers is given. These data include: the number of vehicles which have been tested, the percentage of vehicles which have met FMVSS No. 208 requirements (HIC's not exceeding 1,000, chest G's not exceeding 60, and femur loads not exceeding 2,250) in the higher-speed NCAP tests, and overall average values for the driver HIC, passenger HIC, driver chest G, and passenger chest G. For passenger cars, where adequate data exist, this information also is given for two time

TABLE 1. NCAP - SUMMARY DATA ON PASSENGER CARS

MANUFACTURER	NO. OF CARS TESTED		% MEETING FMVSS NO. 208 CRITERIA			DRIVER HIC AVERAGE			PASSENGER HIC AVERAGE			DRIVER CHEST G AVERAGE			PASSENGER CHEST G AVERAGE		
	MODEL YEARS		MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS		
	ALL	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93
GM	71	33	59	61	58	858	897	812	806	802	811	46	44	48	40	39	42
FORD	51	22	48	19	89	920	1090	693	796	1018	500	52	55	47	44	47	41
CHRYSLER	44	20	48	38	61	969	1111	799	974	1069	853	50	51	48	44	43	45
TOYOTA	29	13	62	62	62	883	910	849	753	853	631	50	50	51	47	48	44
NISSAN	25	15	40	20	53	982	1142	874	939	1301	697	53	58	51	46	50	43
HONDA	28	17	69	50	81	909	1176	736	795	1016	652	49	49	49	41	38	43
VOLKSWAGEN	17	6	19	10	33	1136	1250	945	958	911	1035	53	54	52	45	44	45
MAZDA	12	7	58	0	100	861	1065	750	1012	1445	703	55	60	51	48	49	48
MITSUBISHI	10	7	78	87	83	891	879	897	830	1168	685	54	62	50	44	45	44
PEUGEOT/RENAU	13	4	0	0	0	1906	1957	1793	1866	2011	1577	59	58	80	49	47	52
VOLVO	7	2	86	80	100	742	879	400	700	724	640	41	42	40	39	39	40
HYUNDAI	8	7	25	0	29	888	1000	871	971	2662	729	56	73	53	45	55	44
ISUZU	5	2	0	0	0	1570	1821	1194	1523	1711	1240	47	42	54	48	47	48
SUBARU	8	4	38	25	50	1055	1230	880	988	1293	682	53	54	51	46	49	43
MERCEDES	3	1	33	0	100	984	1076	800	979	1052	833	59	58	60	49	44	58
SAAB	5	3	40	0	67	658	754	594	1029	1304	846	48	55	43	38	40	37
BMW	3	2	33	0	50	1093	1539	870	622	547	698	49	42	52	40	39	40
TOTAL	339	165	50	37	63	967	1101	826	905	1055	746	50	51	49	44	44	44

TABLE 2. NCAP - SUMMARY DATA ON LIGHT TRUCKS, VANS & SPORT UTILITY VEHICLES (LTVS)

MANUFACTURER	NO. OF LTVS TESTED	% MEETING FMVSS NO. 208	DRIVER HIC AVERAGE	PASSENGER HIC AVERAGE	DRIVER CHEST G AVERAGE	PASSENGER CHEST G AVERAGE
		MODEL YEARS	MODEL YEARS	MODEL YEARS	MODEL YEARS	MODEL YEARS
		ALL	ALL	ALL	ALL	ALL
GM	21	29	1274	1215	60	49
FORD	17	44	1124	901	52	47
CHRYSLER	18	44	857	1005	51	45
TOYOTA	12	8	1250	828	55	50
NISSAN	8	38	1080	810	54	46
VOLKSWAGEN	3	0	1507	874	56	49
MAZDA	3	33	1002	857	55	48
MITSUBISHI	6	50	1203	978	52	54
ISUZU	10	10	1282	1207	61	59
SUZUKI	3	33	1214	1548	62	53
TOTAL	101	31	1150	1020	55	49

periods, MY 1979 through MY 1986 and MY 1987 through MY 1993. The phase-in of the automatic occupant protection safety requirements of FMVSS No. 208 began in MY 1987 with a substantial increase in the use of air bags as supplemental restraints, which improved the safety performance of passenger cars.

Significant reductions in average driver HIC and passenger HIC values have occurred in MY 1987 through 1993 passenger cars when compared to MY 1979 through 1986 passenger cars. The average driver HIC values along with these reductions for the 6 major manufacturers are graphically shown in Figure 4.

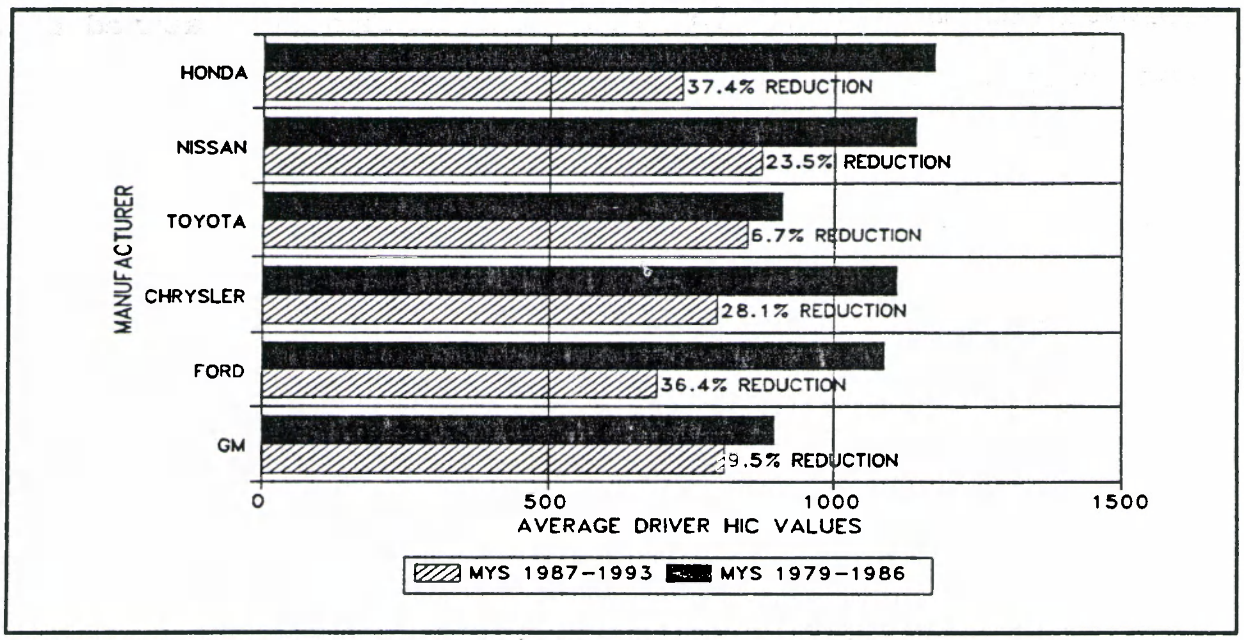

Figure 4. Average NCAP Driver HIC Values with the Percentage Reduction when Comparing MY 1987-1993 Passenger Cars to MY 1979-1986 Passenger Cars.

A much higher percentage of passenger cars are now meeting the requirements of FMVSS No. 208 at the higher NCAP crash speed.

Almost 80 percent of the passenger cars tested in NCAP during 1993 met the FMVSS No. 208 requirements. These historical records and the trends shown in Figure 3, indicate, as stated in the February 1992 report to Congress:

- that the vehicle manufacturers have the knowledge and capability to design passenger cars that provide exceptional safety in the severe 35-mph crash if all restraint systems are used, and

- that with the phase-in requirements of passive restraints beginning with MY 1987, the vehicle manufacturers significantly improved occupant protection in 35 mph crashes as measured by the dummy responses.

Section 2A. Focus Group Study

Section 2A. Focus Group Study and Media Survey

2A.1 Background and Objective

2A.1.1 Background

As mentioned in Section 1, NHTSA utilized $150,000 of the FY 1992 budget to evaluate new marketing techniques that would increase public awareness of NCAP crash test information and ensure that the information presented to the consumer is useful and easy to understand. This evaluation was conducted by using consumer focus groups.

To reiterate, NCAP tests are conducted using all occupant protection equipment provided with the vehicles so that test results demonstrate the relative crash protection provided to front seat occupants. Instruments located on each dummy's head, chest, and upper legs generate measurements that determine the likelihood of serious injury in a frontal collision. Only one vehicle of each make or model is tested. Vehicle models are selected from those that are new, potentially popular, or have been redesigned with new or improved safety equipment such as an air bag. Expensive luxury models are not tested as frequently as more popular models because information about these models is not

requested by many consumers. Domestic and foreign manufacturers are equally represented in the vehicles selected. The cars are purchased from existing dealer inventory, replicating the selection process in which the average consumer purchases a car.

NCAP's test results are grouped for comparisons between vehicles of similar size and weight. The NCAP test results compare a vehicle's level of protection with that of other like vehicles.

Unfortunately, this testing concept and NHTSA's reported results have been difficult for some consumers to understand. In the past NHTSA has reported the test results in a numerical format under the categories of HIC, chest G, and femur loads. Other organizations, such as Consumers Union, have taken the NHTSA results and presented them in a modified format which they believe would be easier for consumers to comprehend. Consumers have used this type of adaptation, but were not sure of the original source of the information even though acknowledgment was given to NHTSA.

NHTSA, as required by the Senate and Conference Reports, has investigated a variety of new methods for presenting NCAP data to make it more immediately informative to the car-buying public. NHTSA is proposing to adopt a variety of promotional efforts to advertise the availability of NCAP crash test results and to

better inform the public of its availability through the Auto Safety Hotline.

2A.1.2 Objectives

In recent years, focus group research projects have provided useful qualitative insights and programmatic direction on a variety of topics that could not be generated with large-scale quantitative surveys or other data-collection techniques unsuited to exploratory behavioral research. Focus groups have provided a practical way to elicit needed information about individuals' perceptions and buying habits.

The NHTSA focus group study had as its objectives to:

- assess vehicle-buyer perceptions, needs, and desires concerning the delivery and presentation of motor vehicle safety-performance data,

- identify the potential uses of NCAP information in vehicle selection, and

- gather preliminary information needed to plan an effective promotional campaign.

This includes the existing frontal-crash test information and assessment of the public's desire for other crash test information, e.g., side-impact performance.

2A.2 Methodology

2A.2.1 Overview

A "focus group" is an informal small-group discussion, led by a trained moderator, designed to elicit feelings and attitudes about a specific topic. Groups usually involve eight to ten people and last up to two hours.

In the spring of 1993, fifteen focus groups--seven of men and eight of women--were conducted in three cities; seven in Washington, DC, four in Dallas, and four in San Francisco. All of the participants had either recently purchased a new car or planned to do so in the near future. The discussion issues were designed to determine how participants regarded the importance of safety in general and of specific safety features in selecting a car; what types of safety information they wanted; and where they would like that information made available.

At the beginning of the sessions, participants discussed how they went about choosing a car, what features they looked for in a new

car, and the importance of safety features and safety information in making a selection. Next, participants read and gave their reactions to two sets of NCAP crash test data presentations. The last part of the session was devoted to reviewing two potential radio public service announcements and two print public service announcements promoting the availability of NCAP safety information.

2A.2.2 Participant Selection

Buyers of New Cars - All groups were composed of drivers who had either bought or leased a new car within the past year or planned to do so within the coming year. Whether this action was imminent or in the recent past, the new-car selection process was of considerable significance to all participants.

Hotline Callers - Most of the groups included at least one or two people who had previously called the NHTSA's Auto Safety Hotline and requested NCAP data.

Gender - Gender-specific groups--seven groups of men and eight groups of women--were used in order to identify any differences in the ways in which men and women in the groups viewed the importance of safety information, or assessed the information in the NCAP test materials. This also permitted identification of gender differences in responses to the advertisements.

Age - Age is also an important variable, but an examination of possible differences in responses by age was not within the scope of this project. People under 25 or over 55 years of age were not included in the groups.

People under 25 were excluded because few people in that age group can afford new cars. People over 55 were excluded to permit comparisons of parents of young children and non-parents of similar ages, since one purpose of the study was to determine whether parents of young children or those just starting to drive go about choosing a car differently from others.

Parental Status - Parents of young children were included to determine if they are more safety-conscious than people buying a new car for themselves. The participant screening process ensured that about half the participants had children under 18 years of age living at home.

Education - Participants represented a range of educational attainment levels. All participants had graduated from high school and most had at least some college or were college graduates. A few had advanced degrees.

Mileage - An effort was made to recruit high-mileage drivers. Because they spend more time in their cars it was assumed that they are more attuned to individual characteristics of the

automobiles they drive. High mileage drivers may be more concerned with certain automobile features. A few low-mileage drivers were included, but most participants drove more than the average number of miles. Men in the groups drove an average 19,500 miles per year, compared to a national average of 16,497 miles; women participants drove an average of 15,200 miles per year, compared to a national average of 9,438. The national average is based on the 1990 National Personal Transportation Survey.

2A.2.3 Participant Recruitment

Participants were recruited through a series of advertisements in local newspapers in the Washington, DC, Dallas, and San Francisco metropolitan areas. Callers who responded to these ads were asked questions included in an NCAP focus group screener.

Hotline callers were recruited by telephone. NHTSA provided lists of people who had previously requested NCAP data through the Auto Safety Hotline from each city. Potential respondents were told that this was a Department of Transportation study, given a brief description of a focus group, and an explanation of the scope of the study.

This procedure was followed to establish the credentials of the recruiters and to encourage Hotline callers to participate.

Interested Hotline callers were asked the questions in the focus group screener. A total of 22 Hotline callers participated in the study.

2A.2.4 Site Selection

In order to ascertain possible geographic differences in attitudes and perceptions relating to automobiles and automobile safety, groups were conducted in three geographic areas of the country: the East, the Southwest, and the West. Washington, DC, Dallas, and San Francisco were selected.

2A.2.5 Moderator's Guide

Each of the groups was led by an experienced moderator. A Moderator's Guide served as an outline for the group discussions. It included four sections:

- introduction, including factors considered when buying a car,

- discussion about a draft NCAP Crashworthiness Chart (NCAP Chart - see Figure 5)

- discussion on the MY 1993 NCAP news release data sheets (NCAP data sheets - see Appendix B), and

- discussion concerning the draft NCAP radio and print advertisements (see Appendix B).

The sessions opened with participants stating their names and the approximate number of miles they drove each year. The moderator then initiated a discussion of the importance of safety in their decision to buy a new car. After the participants became familiar with the NCAP data they were asked to identify effective ways of creating public awareness of the Auto Safety Hotline and the existence of NCAP data.

Participants discussed their opinions of the draft NCAP Chart and its accompanying cover page. A sample of this chart is shown in Figure 5. The discussion was designed to assess the clarity and usefulness of the information on the chart, as well as participants' reactions to the chart format.

NCAP data sheets were discussed next. Respondents discussed the clarity and usefulness of the data sheets both independently and as a supplement to the crash test chart. They also suggested ways to make this information easily available to the public.

Hotline callers discussed their experience with the Hotline in obtaining NCAP information and the usefulness of the information they received.

U.S. Department of Transportation

NEW CAR CRASHWORTHINESS

HOW TO USE THIS CHART

Crash tests measure three principal forces involved in driver and passenger injury: sudden deceleration, impact, and load. To simplify the results on the chart, the measurement of forces against the head and chest were plotted against a curve that measures the likelihood for serious injury. Each car's score indicates how well the car protects its occupants against injury in a 35 mph frontal crash test.

Cars should be evaluated against other cars within their own weight class. If a light car collides head-on with a heavier car at 35 mph, the occupants in the lighter car will experience a greater likelihood of injury than the results of this test indicate.

1-4 High numbers indicate greater potential for serious injury and less protection. For instance, if a car scores 3 on the chart in either the driver or passenger category, there is up to a 50% chance of serious injury. A serious injury is considered to be one requiring immediate hospitalization and may be life-threatening.

1 = 10% or less chance of serious injury
2 = 10% to 25% chance of serious injury
3 = 25% to 50% chance of serious injury
4 = 50% or greater chance of serious injury

o Normally the chance of head injury resulting from sudden deceleration without impact will not be as high as the chance of head injury resulting from impact. However, sometimes the score for sudden head deceleration without impact is the highest score recorded during that crash test. To indicate these non-impact occurrences, the score is denoted by an open circle. Please see Head Injury on the New Car Assessment Program Results for more details.

* There are several types of seat belts being offered in new cars. Shoulder belts that are adjustable are often more efficient and comfortable.

1993 LIGHT PASSENGER CARS (2000–2499 lbs.)

VEHICLE	TYPE	POSITION	LEVEL OF PROTECTION (The lower the number, the better the protection) 1	2	3	4	FEATURES AIR-BAGS	ADJUST-ABLE BELTS*	ANTI-LOCK BRAKES
Geo Storm	2-Dr. HB	Driver	•				•		
		Passenger		o					
Ford Escort	2-Dr.	Driver	•						
		Passenger	•						
Hyundai Excel	4-Dr. Sedan	Driver		•					
		Passenger	•						
Toyota Corolla	4-Dr. Sedan	Driver		•			•	•	OPT
		Passenger	•					•	
Isuzu Stylus	4-Dr. Sedan	Driver		•			•		
		Passenger	•						
Nissan Sentra	4-Dr. Sedan	Driver	•						OPT
		Passenger	•						
Acura Integra	4-Dr. Sedan	Driver	•						OPT
		Passenger	•						
Hyundai Excel	2-Dr. HB	Driver	•						
		Passenger	•						
Saturn SL2	4-Dr. Sedan	Driver		•			•		OPT
		Passenger		o					
Mazda Protege	4-Dr. Sedan	Driver		•					
		Passenger		•					
Toyota Celica	2-Dr.	Driver		•			•		OPT
		Passenger	•						
Hyundai Scoupe	2-Dr.	Driver		•					
		Passenger	•						
Mazda Miata	2-Dr. Conv.	Driver		•			•		OPT
		Passenger	•						

Figure 5. NCAP Crashworthiness Chart

The remainder of the session was spent assessing the effectiveness of two radio public service announcements and two print public service announcements designed to inform the public about the existence and availability of NCAP crash test data. Participants discussed a series of issues about each public service announcement--things they liked, or disliked, whether they thought the public service announcement was effective, and ways of improving it.

2A.2.6 Test Materials

The New Car Assessment Program Cover Page - Participants were given a brief description of the NCAP crash tests and the New Car Assessment Program. Three key points were covered in this section:

- the test consists of a 35 mph head-on crash into a fixed barrier,
- the crash simulates a head-on crash between two vehicles of the same weight, each travelling at 35 mph, and
- vehicle occupants are wearing seat belts.

A description of the draft NCAP Chart was also provided.

The Draft NCAP Chart - The chart used during the focus groups was derived from the HIC and chest Gs obtained in the crash tests. The purpose of the chart was to provide consumers with a quick, simplified, single point of comparison to evaluate the new cars listed.

A scale[4] was selected that related the probability of sustaining an injury to how well a car protected its occupants from receiving such an injury. This scale was called the Level of Protection Scale on the chart and the four points on that scale were equivalent to the increasing chances of severe injury. It was noted on the chart that the lower the number, the better the protection. Cars with a 10 percent or lower probability of severe injury were assigned a #1 level of protection; cars with a 11 to 25 percent probability of severe injury, a #2 level of protection; cars with 26 to 50 percent probability of severe injury, a #3 level of protection, and cars with a 51 percent or greater probability of severe injury received a #4 level of protection.

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[4]This scale is based on injury assessment curves, as given in the Society of Automotive Engineering (SAE) Paper No. 851246, "The Position of the United States Delegation to the ISO Working Group 6 on the Use of HIC in the Automotive Environment," P. Prasad and D. Viano and in the SAE Paper No. 902338, "Assessing the Safety of Occupant Restraint Systems," D. Viano and S. Arepally, and relates HIC and chest G scores to the probability of life-threatening, AIS 4 and greater, injury. (See Section 1 for a discussion of AIS levels.)

Non-impact HIC[5] - Of the two scores for each test car, HIC and chest G, the higher of the two was used to determine the car's rating on the chart's Level of Protection rating. The scores were not added or combined.

When a non-impact HIC score was the higher of the two scores, the chart indicated non-impact HIC with an open circle in the Level of Protection rating. In general, during a vehicle crash, the risk of injury is reduced if contact between the occupant head and interior surfaces is prevented. If a car had a non-impact HIC rating, but the chest G score was higher, and therefore responsible for the car's rating on the Level of Protection scale, the non-impact HIC was not noted.

As a service to the reader, available safety options were included on the chart to identify cars with optional safety features. A note about the availability of different types of seat belts was also provided.

The NCAP Data Sheets - The data sheets contained the crash test scores, as provided in the MY 1993 NCAP news releases. These sheets presented the HIC and chest G scores in tabular form and the HIC scores as a bar graph to illustrate relative likelihood of head injury.

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[5]A non-impact HIC score indicates the dummy's head did not strike any interior surfaces of the vehicle in the crash test.

NCAP Potential Promotional Materials - Two radio public service announcements and two print public service announcements were supplied by NHTSA for testing in focus groups. Their basic message was, "Call NHTSA for free auto safety information."

2A.3 Findings

2A.3.1 General

Desired Features - The moderator opened each discussion with what participants looked for when choosing a new car once they had decided on price and type of car (e.g., a four-door sedan). A number of things were mentioned, the most common being reliability; economic factors such as fuel economy, repair costs, and resale value; and safety. Comfort, interior space, ease of handling, and style were also mentioned.

Safety Features Sought - Safety or specific safety features were regarded as important by all groups, with women somewhat more likely than men to cite safety as one of the features they sought.

Few respondents mentioned crash test results--largely because few knew at the beginning of the focus groups that such information was available. When asked what safety characteristics they want

information about, both men and women mentioned anti-lock brakes the most, followed closely by air bags. At the end of the sessions, however, when participants were asked to rank nine automobile characteristics in order of importance in choosing a car, crash test results ranked number one in importance for women and number three for men, somewhat ahead of anti-lock brakes.

Women with children mentioned that they would look for specific safety features such as child safety locks and child safety seats when buying a car. They also mentioned wanting large, heavy cars for protection in a crash. Some of the men said that while safety was less important than certain other features in cars they drove themselves, it was the most important in cars for their wives and children.

A few participants commented that since all cars had to meet certain safety standards, buyers could take safety for granted and, therefore, could pay more attention to other features such as styling or comfort.

Sources of new car information - Most participants said they talked to other people about cars they were considering. Many said they also did further research. Auto magazines were a popular source of information. Some respondents said they purchased auto magazines only when planning to buy a new car. Other sources mentioned included the library, AAA, *The Car Book,*

The Car Buyer's Guide, newspapers, and popular magazines. A few respondents mentioned that before they buy a car they rent the make and model they are interested in to see if they like it. *Consumer Reports,* insurance agents, and auto magazines were the most popular sources of information.

Availability of information - Most agreed that safety information produced by Federal agencies should be available at automobile dealerships. They felt that automobile dealers should be required by law to furnish such information to prospective customers. It should be noted that respondents were quick to point out that they would mistrust dealers as the source for this kind of information, but they would believe the data to be true if it was made clear it had been provided by a government agency.

Participants also suggested placing a safety rating number on new car stickers, in auto brochures, in owners' manuals, and in auto advertisements. Someone suggested that if no single standard rating could be developed, new-car stickers might carry an 800 number that prospective customers could call for safety information. Insurance companies were also suggested by all the groups as a channel for distributing Federal safety information. Some suggested that the information could be mailed along with premium notices.

Other recommendations for placement of information included; libraries, departments of motor vehicles, post offices, institutions which make car loans (such as banks and credit unions), AAA offices, new car shows, and other public places such as supermarkets, shopping malls, and doctors' offices.

Suggested print outlets included *Consumer Reports*, April issue (dealing entirely with new cars), car safety handbooks, the *Bluebook*, auto magazines, *The Car Book*, and newspapers and popular magazines.

Safety Information Sought - Most participants seriously considered the comparative safety and safety features afforded by different makes and models of cars. They were interested in specific safety features--anti-lock brakes, air bags, safety locks--offered on the different models. They wanted to know about crash rates for different models and about the protection afforded drivers and passengers in a crash. Parents of young children were especially concerned about the safety of back-seat passengers. Some said they checked on recalls of previous years' models.

Weight of the vehicle, strength of construction, and stopping distance after braking were other things participants said they wanted to know.

2A.3.2 Reactions To NCAP Information

NCAP Chart Materials - The chart evoked mixed reactions from the groups. They had no trouble understanding what the chart was about, and they regarded the information as valuable. Women were somewhat more likely than men to say that the information was important and useful. By and large, they liked the chart format, and agreed that the "Levels of Protection" were clear, easy to understand, and easy to use. However, the symbols and the explanatory notes were generally regarded as unclear, too technical, and confusing.

In a discussion of the chart, most respondents said that it gave information about the protection afforded the occupants in a head-on crash by various cars in a given weight class.

The meaning of the symbols was less clear. While participants had no difficulty understanding "Levels of Protection," almost no one understood the significance of the two symbols (a full circle and an open circle) that denoted head injury with and without impact, respectively. Most participants believed that a head injury was not possible unless there was an impact, therefore, "head injury without impact" was confusing. One respondent called the idea "preposterous." Though the groups spent

considerable time trying to work out an explanation for the symbols, in most cases they did not interpret them correctly.

Participants found the information useful, but they felt that this information alone was not an adequate indication of the safety of a car. As several respondents pointed out, the results of this test do not apply to other kinds of collisions. Many respondents said they would use the information to eliminate various cars from consideration, but would not purchase a car merely because it scored well on this particular test.

Although they regarded the level of protection score as an incomplete measure of auto safety, participants felt it was important information. Participants felt that a long, complicated explanation was unnecessary--all they needed to know was the Level of Protection.

In discussing what else they would like to know about the crash tests, some participants asked if the passenger category included back-seat passengers. Others participants wondered if every make and model of car sold in the U.S. is tested by NCAP, or only a sample; and others asked whether each model is tested several times or only once.

Additional Information - While respondents found the information in the chart important and useful, most regarded it as only a

beginning. Most participants felt that although the chart was helpful, it was not a true measure of protection on the highway.

They agreed that head-on collisions are rare in real life, and that a car's performance on the NCAP test tells nothing about how it will fare in other kinds of collisions. Most groups clearly called for information about side-impact and rear-end collisions, which they regarded as the most common. Some also wanted data on corner-to-corner collisions and rollovers.

A few wanted to know about back-seat passenger safety in all kinds of collisions, and they asked what kinds of factors (such as differences in design or construction) made some cars safer than others.

Group members were very concerned about driver and passenger safety in crashes at highway speeds, and between cars of different weights and of different makes and models. They asked if the Federal Government could use existing highway accident statistics to provide information about the relative safety of various makes and models in real-life accidents--preferably in a simple, non-technical form.

There was considerable enthusiasm for the idea of compiling all safety data (highway crash statistics as well as crash test results) into a single, standardized rating system which would

apply to all vehicles, and which could be read and comprehended at a glance by the consumer.

NCAP Data Sheets - The groups discussed the numerical data sheets. Most respondents disliked the data sheets. They found them overwhelming--too confusing, too technical, and too hard to read. Many participants said frankly that they would throw out the tabulated data without even attempting to read it. They found the explanatory note confusing and they had to flip back and forth repeatedly between this note and the data sheets.

Again, participants were confused by the numbers in parentheses (non-impact HIC) on both tabular data sheets and the bar graphs because most did not understand that there could be a head injury without impact.

At first glance, participants liked the bar graph format better than the tabular data. At closer inspection, they became more confused. They did not agree on whether the graph contained the same information as the tabular data; they did not understand the numbers in parentheses; and the footnote, "35 mph barrier crash tests represent a 70 mph closing speed," left most of them at a loss.

Participants were confused by the "Unlikely" and "Possible" headings on the bar chart, and in many cases misunderstood them.

Group members generally agreed that none of the information on the data sheets changed their understanding of the test results presented in the draft NCAP chart.

Most participants said they would not read the data sheets if they also had the chart, which they felt was much easier to understand. They said that the data sheets added nothing to their understanding of the chart.

2A.3.3 Reactions to NCAP Promotional Materials

Participants regarded the message from the promotional materials--that auto safety information is available free from the Federal Government--as important and valuable, something that they and other consumers would want to know about and be informed about. Their comments and criticisms dealt with the effectiveness of the materials in conveying this message, not with the message itself.

They expressed resistance to most product advertising and noted that they would be much more accepting of government-sponsored messages; thus, they emphasized that a reader or listener should be made aware at the outset that the safety information and the public service announcement itself comes from a Federal agency.

There was consensus that three elements should be included in every public service announcement concerning the NCAP program:

- a clear identification of the Federal Government as the source of the public service announcement,

- a prominent statement that the information is free, and

- a conspicuous and easy-to-remember 800 number.

Participants also said they would more likely read or listen to an ad when it was clear something was being offered for free. They suggested that the word "free" be featured prominently in any public service announcement regarding the availability of NCAP's crash test data.

Participants said they do the majority of their radio listening in their cars, and assumed most other people do too. Because it is so difficult to write down a phone number while driving, participants insisted that providing an easy-to-remember, catchy phone number in the radio public service announcements was very important. They also said it would be helpful to display the easy-to-remember 800 number in a conspicuous place on the print public service announcements.

Patterns of response to the materials were fairly consistent across all the groups. All groups strongly suggested emphasizing the fact that the information is free, and again stressed the importance of an easy-to-remember phone number.

2A.4 Conclusions and Recommendations from the Focus Group Study

While women seemed to place somewhat more emphasis on auto safety than men, safety was of major importance for both men and women, both for themselves and for their families. Participants said they spent considerable time and effort in obtaining information about the safety characteristics of cars they were considering for purchase.

Many respondents said they would like a standard rating system that would apply to all new cars sold in this country, based on a combination of standardized crash tests and highway accident data. There was considerable support for requiring that this rating be displayed on all new car stickers.

Recommendations relating to the NCAP tests, presentation of the test results, distribution and placement of this information for use by consumers, and advertising to increase public awareness of the program are listed below and discussed in the study report.

- Continue and expand the NCAP program. Consider conducting additional kinds of crash tests, and include measures of potential injuries to rear-seat passengers.

- Present information on crash tests in a form that is non-technical and as short and simple as possible.

- Prepare a cover page for the NCAP Chart which describes the testing program.

- Retain the NCAP Chart with some changes.

- Send tabulated data (HIC and chest G scores) to anyone who requests information to supplement the "level of protection" ratings in the NCAP Chart.

- Provide NCAP data at a variety of locations frequented by new-car buyers.

- Furnish NCAP data to publishers of magazines and newspapers; those publications commonly consulted by new car buyers cited by participants included: *Consumer Reports*, car magazines, newspapers, and general-interest magazines.

- Maintain up-to-date information concerning consumers' preferred sources of information on the crashworthiness of new cars.

- Develop a partnership program with auto-safety advocates to promote wider use of NCAP test results.

- Explore possible enhancements of NCAP coverage by the press.

- Identify the Federal Government clearly and conspicuously as the source of the information and the public service advertising.

- Emphasize that the safety information provided by NCAP is free.

- Choose an 800 number that is easy to remember, and display it prominently in any promotional materials.

Section 2B. Media Survey

Section 2B. Media Survey

2B.1 Background

Over the past few years, NCAP has lost some of its appeal to the general press. NHTSA has made improvements to the NCAP press release, highlighting impact and non-impact HIC as well as differentiating between dummy contact with and without an air bag. The press releases also contain more explanation concerning interpretation of the test results. However, the media did not respond in a positive manner by giving NCAP more coverage. NHTSA expanded the video tape coverage of the test vehicles. But this did not increase the request level from the television media.

This situation was highlighted within NHTSA as one of the problems that required attention when the FY 1992 Senate and Conference Appropriations Reports required NHTSA to utilize a variety of new methods in making the NCAP information more useful as a market incentive. In its February 1992 NCAP report to the Committees, NHTSA stated that it would initially conduct a survey of the automobile and general media in the Washington, DC, area. The objective of the survey was to determine what improvements can be made to the NCAP information that will motivate the media to promote it. NHTSA recognizes the limitations of this survey,

but it is the beginning of an ongoing response to the needs of the media.

2B.2 Is NCAP Still Newsworthy?

NHTSA's Office of Public and Consumer Affairs conducted a questionnaire guided interview of six of the key reporters that routinely cover automotive safety issues for the National Press Corps based in Washington, DC. The six reporters were selected because, collectively, their work has national exposure. They represent the national wire services, daily newspapers in Detroit, New York City, and Washington, DC, and automotive industry trade publications. Also, these individuals are knowledgeable about the detailed aspects of the NCAP.

The verbal comments from the reporters were collected using an 11 question survey. The survey questions are listed below:

1. How would you rate the newsworthiness of a release of new NCAP results?

2. Do you think the perceived newsworthiness of NCAP results has declined from past years?

3. Do you believe that the NCAP results are taken by your readers/listeners/viewers to be a useful index of an automobile's safety?

4. In your view, do the limitations of the NCAP test procedure as described in the NCAP press release discourage readers from taking the test seriously? (e.g., full frontal crash only; no applicability across weight categories; no demonstrated linkage to real world experience.)

5. Are the purpose and limitations of the NCAP test presented clearly in the current press release text?

6. Are the charts understandable and helpful?

7. There is now little variation between vehicles tested, with most test results coming in well below the thresholds NHTSA identifies as significant -- 1,000 HIC and 60 Gs of chest deceleration. Does this lack of variation make it more difficult for you to produce news stories with an interesting lead?

8. What changes could be made in the presentation of the NCAP data to make the release of each new report a more newsworthy event?

9. NHTSA makes no interpretation of the NCAP test results beyond presenting them in tables and graphs. Should NHTSA go further in highlighting aspects of the tests or in explaining why a test produced a certain result?

10. Should NHTSA explore other forms of NCAP testing, such as side impact or rear impact tests? Would this create significant new public interest?

11. Fatality rates for small cars per number of cars registered are much higher than for large cars. Is NHTSA doing a disservice to people interested in buying a safe car by minimizing the relative danger of smaller vehicles in the current NCAP presentation?

2B.3 Survey Findings and Recommendations

Opinions on the program varied widely. One reporter characterizes the program as a source of misinformation, while another reporter believes that consumers can never get enough information on automobile safety and the NCAP results are used to respond to the many readers who contact him by phone.

In general, the reporters who continuously cover NHTSA and NCAP seem to be quite familiar with the scope and limitations of the program. They have worked out methods of adapting the story to

their own media. But, they are divided on the usefulness of the program. They are looking for more unity, context, and interpretation of the numbers. They want more clarification. They need information that is clear and understandable.

One common theme was that they understand why NHTSA releases the test results in small batches, but it creates some problems for them in comparing, interpreting individual results, and presenting newsworthy information. A wire service reporter said that often she will not write a story on a specific NCAP release, preferring instead to combine it with another release. She does this because she usually presents the story on which car did best and which did worse. She does not think it is fair to make the comparisons in small batches. If she calls attention to the worst car in a batch, she is concerned that everyone in the next batch may be worse than the one she picked on. However, she says she would not want us to hold back on releases of new test results.

A reporter for a trade paper also commented on the small number of vehicles in each press release. But he agreed that the releases should not be withheld or lumped together in larger groups. His readers in the industry require that the numerical test results be immediately reported because they want to see the results as soon as possible for the vehicles they build and those of their competitors. He said his audience is expert enough to

understand all the caveats relating to the program. They are interested in seeing the numbers to gauge their effect on the safety conscious consumers and to make comparisons with other manufacturers' vehicles.

He notes that NHTSA groups pickup trucks, vans, etc., in each release and he thinks it is a good idea because it enables comparisons and enhances understanding.

One reporter suggested that NHTSA make two releases, one for the media and another for the general public in a simplified form. However, he does not pay any attention to the femur loads and chest Gs. He also suggests there should be material made available on trends in the numbers, showing how a given manufacturer had improved a particular model over the years.

On the question of additional interpretation, all reporters agreed it could be useful. There is still a genuine problem that the HIC number is a difficult concept to explain. They understand the need for three pages of extensive explanation and caveats, but it does not make their job easier. They receive complaints from manufacturers constantly about oversimplification or unfairness. The wire service reporter looks for outside interpretation of the figures from various experts to put the results in context.

One reporter suggested that NHTSA hold a press conference to discuss all of the tests and provide some analysis of trends. This could be scheduled for the end of the program each year or planned for releasing the final test results each year. He referred to the news conference held by Jack Gillis, author of *The Car Book*, as an example that the NCAP program can be general interest news as well as a source of controversial automobile safety issues. When asked, most reporters concurred on the value of a news conference summarizing the year's events.

Most of the reporters expressed some curiosity about side impact NCAP or rear impact tests. While they disagreed on whether this would significantly heighten public interest, they did agree that additional test modes would broaden the appeal and desire for the test results.

Nearly all the reporters discount the idea that the variation between vehicles is too low and, therefore, insignificant. They want to report on the differences that exist.

Section 2C. Review and Proposed Implementation of Focus Group and Media Recommendations

Section 2C. Review and Proposed Implementation of Focus Group and Media Recommendations

2C.1 Review of Recommendations

NHTSA has reviewed the recommendations from the focus group participants and the media. The review was conducted to determine which recommendations from both entities would produce the largest increase in consumer usage of the test results while requiring low initial funding. Also, NHTSA sought recommendations that would improve consumer and media interest in the program.

One often-heard recommendation was to make the presentation of the test results simple and easy to understand:

Consumers - *Present information on crash tests in a form that is non-technical and as short and simple as possible.*

Media - *Need information that is clear and understandable.*

This recommendation became the primary goal because it also met NHTSA's main objective - *Something that would produce the largest*

increase in consumer usage of the test results while requiring the least initial funding.

When participants in the focus groups were asked which sources they sought for new car information, the majority responded by listing various publications; i.e., books, magazines, and newspapers. Some stated that they talked to other people about the cars they were considering. But *Consumer Reports* and auto magazines were their most popular sources of information. This confirmed NHTSA's contention that the print media is an important avenue to disseminate NCAP test results. Thus, more emphasis should be directed toward promotional products that can be easily utilized in various types of publications.

Reporters who were surveyed concurred in the recommendation that a news conference should be held at the end of each year's NCAP. This would fulfill many of their needs for access to more information.

The focus group participants felt that head-on collisions are rare in real life, and that a car's performance on the NCAP test tells nothing about how it will fare in other kinds of collisions. Most groups clearly called for information about side-impact and rear-end collisions, which they regarded as the most common. Some also wanted data on corner-to-corner collisions and rollovers.

The participants and the reporters strongly recommended that NCAP should include other modes of crash testing:

Consumers - *Consider conducting additional kinds of crash tests, and include measures of potential injury to rear seat passengers.*

Media - *Additional test modes would broaden the appeal and desire for the test results.*

This recommendation requires a major increase in the program's budget. NHTSA has developed a side impact test procedure and is prepared to begin the program when funds are appropriated. Approximately $40 thousand will be required to purchase a vehicle and to conduct each side impact test.

2C.2 Implementation of the Recommendations

In the FY 1994 budget, NHTSA requested and received $250 thousand to implement new NCAP promotional methods and dissemination efforts recommended by the focus groups and the media survey. Based on NHTSA's review of the recommendations, the following efforts have been selected. The breakdown below gives details of these efforts and the anticipated expenditures.

- A consumer brochure will be developed in a computerized format that will permit easy updating. This format will also be adaptable to print media requirements. The brochure will utilize an easy to read and simple presentation technique. It will contain a description of NCAP and the comparative results from the vehicle tests. It will clearly state that these data were developed by the Federal Government and additional information may be obtained by calling a toll free hotline number. This initial development of the brochure will require a one time expenditure of $50 thousand.

- The NCAP brochure will be reproduced for dissemination at strategic consumer locations. In addition to making it adaptable for media publication, NHTSA is deliberating the feasibility of distributing it through existing networks to local and state organizations (Public Health Departments, Departments of Motor Vehicles, Law Enforcement Organizations, etc.), to insurance companies and associations, to consumer groups, and at public events (automobile shows, etc.). Annual cost for this printing and distribution effort will be $110 thousand.

- NCAP promotional efforts will be expanded. The draft public service radio and print media announcements, developed in FY 1993, will be revised based on the focus group comments. Simple public service video press releases will be developed from NCAP test films. These promotional materials will be furnished to

media commonly consulted by new car buyers, as cited by focus group participants, including: *Consumer Reports*, car magazines, newspapers, and other automobile publications. Annual costs for these promotional efforts will be $90 thousand.

- The NCAP news releases will be continued as in past years. However, these releases will use a simplified format based on recommendations by the focus group participants[6]. A copy of the first FY 1994 NCAP news release with the simplified format is included as Appendix C. An automated fax system will be investigated to allow improved response to consumer requests for the simplified data as well as the detailed test results.

- NHTSA also is considering the recommendation that a news conference be held at the end of each year's NCAP. This would fulfill many of the media's needs for access to more information.

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[6]After NHTSA review, some changes have been made to the simplified format that was used in the focus groups. These changes further simplify the data presentation and are based on the combined effects of HIC and chest Gs. In the press releases, NCAP results are reported in a one to five star classification system, with five stars indicating the best crash protection. In addition, NHTSA is considering holding a public meeting to allow further review of this simplified format as well as NCAP future activities. More information on this public meeting is given in Section 5.6.

Section 3. Real-World Correlation with NCAP Test Results

Section 3. Real-World Correlation with NCAP Test Results

3.1 NHTSA's Approach in Comparing NCAP Results to Actual On-the-Road Injury and Fatality Risks

In response to the Committees' request to compare the results of NCAP data from previous model years to determine the validity of these tests in estimating the risks of actual on-the-road injuries and fatalities over the lifetime of the models, NHTSA has continued to examine data contained in individual state files, NASS, and the Fatal Accident Reporting System (FARS). In addition, studies have been conducted of hard-copy accident files to evaluate and compare on a one-to-one basis the performance of specific models which have been tested in NCAP and also have been involved in severe real-world frontal crashes.

3.2 The Use of State Files in Real-World/NCAP Studies

Individual states maintain police-reported accident data files. These files provide the largest existing number of real-world crash events of any file. These files have been examined relative to the study of NCAP correlation to real-world crashes. NHTSA has concluded that, presently, these files have two major shortcomings that have limited their use in this study. First,

injury coding is based only on the police officer's judgment at the scene of the accident and is often not a reliable estimate of the actual severity level of an injury or its threat to life. Secondly, the recorded use of safety belts by the occupants is subject to significant bias since, in most crashes, it is based on a statement by the crash victim and may not be supported by physical evidence. Even with these shortcomings, NHTSA will continue to examine the possible use of these data because their large sample sizes make them useful for statistical analyses.

3.3 The Use of NASS in Real-World/NCAP Studies

NASS contains extensive information on selected real-world crashes. However, the amount of crash information on individual makes and models remains inadequate for studying correlations to NCAP results. The major importance of NASS is the nationally representative detailed information on types and causes of injury, crash speeds, and crash configurations. These detailed data are used to establish and support vehicle and highway safety priorities.

The detailed data in the NASS file were examined to determine how the NCAP test conditions relate to real-world crashes. Two of the more important crash parameters for frontal crashes are the change in velocity (delta V) which occurs during the impact and the impact configuration. As previously noted, the NCAP tests

result in delta Vs of approximately 40 mph and the NCAP crash configuration is a full-frontal barrier impact.

Crash Severity--In Figure 2, Section 1, the distributions of injury and fatality versus delta V as found in the NASS file for restrained drivers in frontal towaway crashes are given. These data indicate that almost 60 percent of the fatalities and approximately 90 percent of the serious injuries for restrained drivers occur below the NCAP delta V of 40 mph. Assuming that NCAP results reflect the relative potential safety that a vehicle provides for belted occupants within 5 mph of the NCAP delta V (i.e., the NCAP data are applicable from 35- to 45-mph delta V), nearly 50 percent of the fatalities occur within this range.

Crash Type--The NCAP test configuration is based on FMVSS No. 208. This configuration is a full-frontal crash into a fixed-rigid barrier. This is approximately the same as two similar vehicles colliding head-on. Such collisions result in extensive damage across the full front of the vehicle and expose the occupants to high forces which must be effectively controlled by the restraint systems and the gradual deformation of the vehicle structure in order to prevent serious or fatal injury.

In Figures 6 and 7, NASS data provide insight into the relationship of real-world crash configurations to this laboratory test condition.

In Figure 6, it is seen that more than 70 percent of the real-world frontal crashes which result in AIS 3 or greater injuries have a direction of force of 12 o'clock or head-on. In Figure 7, it is shown that 54 percent of the frontal crashes have induced or direct damage across the full front of the vehicle and another 27 percent have induced or direct damage which extends two-thirds of the way across the front of the vehicle.

These NASS data indicate that the FMVSS No. 208 and NCAP test configurations reflect closely the real-world frontal crash configurations which result in the largest number of serious injuries and fatalities.

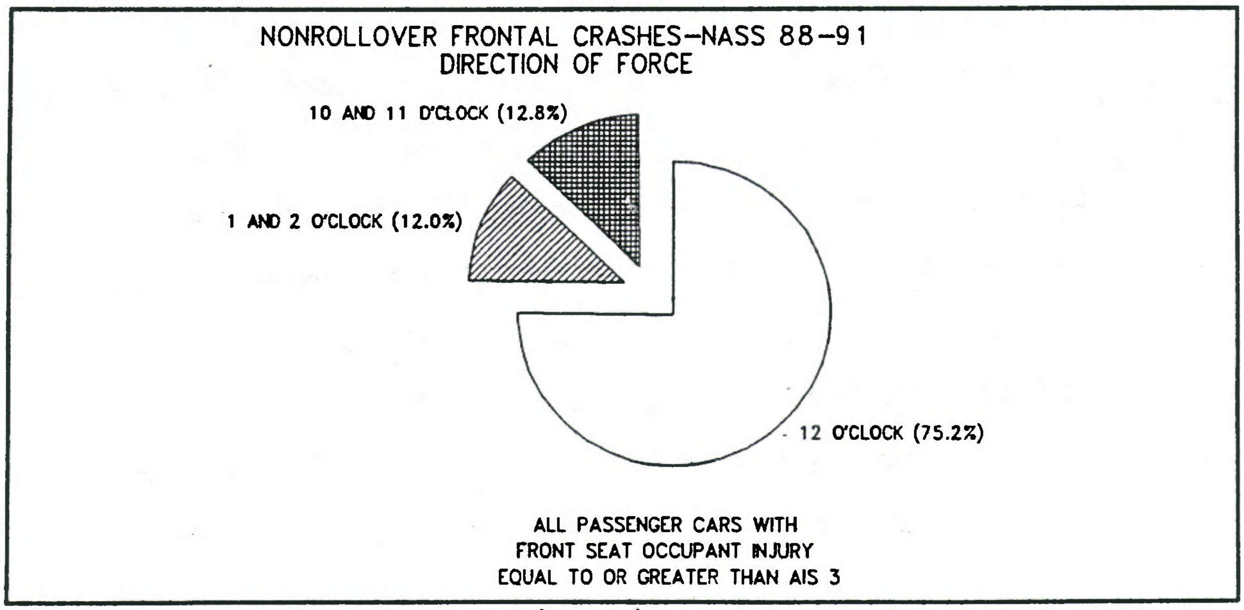

Figure 6. Frontal Impact Direction of Force from 1988-1991 NASS - Retrained and Unrestrained Front Seat Occupants

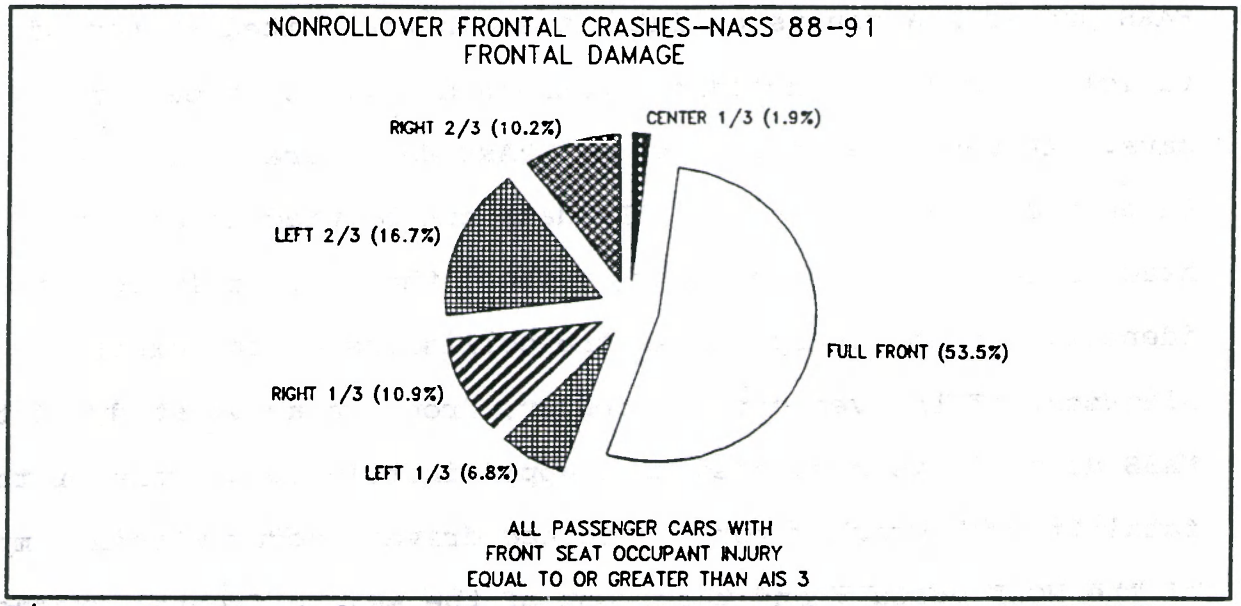

Figure 7. Frontal Impact Damage Pattern from 1988-1991 NASS - Restrained and Unrestrained Front Seat Occupants

3.4 The Use of FARS in Real-World/NCAP Studies

As noted, NASS data are very beneficial in determining the distribution of parameters such as the injury levels, delta Vs and crash configuration in the overall national crash patterns. However, the amount of data on specific vehicle makes and models is insufficient to evaluate the effectiveness of NCAP results in estimating actual on-the-road risk of injuries and fatalities. NHTSA has concluded that the accident data file in which this effectiveness can be reliably studied is FARS and, since FARS is a fatal accident file, this effectiveness can only be studied from the perspective of fatality reduction.

FARS provides a census of fatalities in the United States of vehicle occupants, including restrained drivers of passenger cars. At the time of this study, FARS data were available through mid-1992. Whereas FARS data can be used to distinguish head-on collisions from other crashes, they currently do not identify the impact speeds in the collisions or the exact alignment of the vehicles. However, from the above study of the NASS data, it is estimated that approximately 50 percent of the fatal frontal crashes for restrained drivers occur within 5 mph of the NCAP delta V and that most of the severe frontal crashes involve damage across a large portion of the front of the vehicle (as occurs in NCAP tests). However, there are many major differences between the NCAP controlled laboratory crash tests and real-world, head-on crashes. These include:

- differences between the physical characteristics of the human driver population and the anthropomorphic dummy (the dummy represents a 50th percentile male),

- injury and fatality risk variations due to age and sex, and

- location of the fatal lesions (injury parameters are measured only in the head, chest, and femurs of the dummies in NCAP).

Although the controlled test approximates a sizable portion of the fatal frontal crashes relative to crash severity, there

remains some 50 percent of the real-world events which are more than 5 mph greater than or less than the NCAP delta V. As a consequence, it is inappropriate to expect perfect correlation between NCAP test results and actual fatality risks from the FARS files. However, if there is significant correlation between the two, it suggests that the NCAP scores reflect, to some extent, actual crashworthiness in a range of crashes that goes beyond the specific crash conditions simulated in NCAP tests.

NHTSA's major occupant protection crash standard (FMVSS No. 208) is based on the premise that vehicles which have dummy HICs, chest G values, and femur loads below 1,000, 60, and 2,250 respectively, in 30-mph barrier crash tests will provide improved occupant protection in the real world as compared to vehicles that do not meet these criteria. This premise is accepted by the safety community and motor vehicle manufacturers. From this premise, it may be inferred that low dummy responses in NCAP tests at 35 mph should reflect better than average safety in real-world crashes, regardless of the inherent differences between real-world crashes and NCAP tests. NHTSA has concluded that FARS provides adequate data to determine whether this premise of improved safety with lower dummy responses is valid in the spectrum of real-world frontal crash events.

3.4.1 FARS Analysis: Car-to-Car Frontal Head-on Collisions

An extensive statistical study of FARS has been completed and will be published as a NHTSA technical report and presented at a safety conference[7] in 1994. This study focuses on head-on collisions between two passenger cars (Insufficient NCAP and FARS data are available to include light trucks, vans, and sport utility vehicles in this study). The goal of the analysis is to determine whether cars with high injury scores in NCAP tests had more fatalities than would be expected, given the weights of the cars, and the age and sex of the occupants involved in the crashes. A summary of findings of this statistical study is given in the following paragraphs.

The large diversity of fatality rates in accident data often reflects more on the types of people who drive the cars and how they drive them than the actual crashworthiness of the cars. For example, "high-performance" cars, popular with young male drivers, have an exceptionally high frequency of fatal crashes - because they are driven in an unsafe manner - even though they may be just as "crashworthy" (i.e., provide equal occupant

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[7]The report is scheduled to be presented at the 14th International Technical Conference on Experimental Vehicles. This conference, co-sponsored by NHTSA and the host country, brings together the international safety community and world automobile manufacturers approximately every other year to share advancements in technical information and improvements in occupant safety.

protection in a given crash) as other models. The FARS statistical analysis objective was to attempt to isolate the actual crashworthiness differences between cars, removing differences attributable to the way the cars are driven, the ages of the occupants, etc., and then to determine if these crashworthiness differences on the highway correlate with NCAP performance as measured in controlled laboratory tests.

Since NCAP is a frontal-impact test, involving dummies protected by safety belts, this FARS study is limited to frontal crashes involving belted occupants. Only the FARS data for head-on collisions between two passenger cars, each with a belted driver, that resulted in a fatality to one or to both of the drivers, are used. A head-on collision is a special type of highway crash that is ideally suited for studying crashworthiness differences between two cars. Both cars are in essentially the same frontal collision. Whether one of them had a "safe" driver and the other an "unsafe" driver is of little relevance at the moment they collide head on. Which drivers die and which survive will depend primarily on the relative crashworthiness of the two cars, their relative weights, and the ages and sexes (vulnerability to injury) of the two drivers.

Head-on collisions between two passenger cars, with both drivers belted, were identified in the FARS file, through mid-1992. By using the Vehicle Identification Numbers and available vehicle

characteristics information, accurate curb weights of the cars were determined. Applicable NCAP results were then assigned to each relevant passenger car make and model in FARS. A file of 370 head-on crashes was created in which vehicle curb weights, drivers' ages and sexes, and NCAP results are known for each of the 740 passenger cars[8], and both drivers were belted. A total of 427 drivers were fatally injured out of the 740 drivers included in these crashes.

In each of these 370 crashes, at least one of the drivers received fatal injuries. And, in 57 cases, both drivers were killed. As stated, which of the drivers die and which survive will depend primarily on the relative crashworthiness of the two cars, their relative weights, and the ages and sexes (vulnerability to injury) of the two drivers.

In the FARS file, if car 1 and car 2 weigh exactly the same, and both drivers are the same age and sex, the likelihood of a driver fatality in a head-on collision would be expected to be equal in car 1 and car 2. More generally, if car 1 and car 2 have different weights, and their drivers are not necessarily the same

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[8]A major reduction in NCAP driver HIC values has occurred with the introduction of air bags. NHTSA expects that this significant improvement in occupant protection, due to air bags, will result in reduced risks in fatalities and injuries. However, only 3 percent of the 740 passenger cars in this study were equipped with air bags. Therefore, the positive effects of air bag protection are essentially not reflected in this analysis.

age, it is still possible to predict the expected fatality risk for each driver in a head-on collision between these two cars. Factors which establish the relationship between fatality risk and vehicle weight[9], and the drivers' ages and sexes were determined from the accident data.

Given a set of collisions, from this FARS file of 370 head-on crashes, in which car 1 always has lower NCAP scores (see definitions in Table 3) than car 2, the actual fatalities are tallied for the car 1s and the car 2s. The unadjusted actual fatality reduction for cars with the lower NCAP scores is the difference in these actual fatalities. The expected fatalities, based on the adjustments for car weight, age, and sex, are also summed up for the car 1s and the car 2s. The adjusted actual fatality reduction is the difference in actual fatalities relative to the difference in expected fatalities. In the analyses, both the unadjusted and adjusted actual fatality reductions are given to allow a comparison of the effects of these adjustments. Levels of statistical significance are derived for the adjusted fatalities relative to the unadjusted actual fatalities.

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[9]Adjustments for vehicle weights in car-to-car collisions, essentially, are adjustments to reflect the higher delta V that is experienced by the lighter weight car. For example, in a frontal head-on collision between a 2,000 pound car and a 4,000 pound car, the delta V for the lighter car will be twice that of the heavier car.

In Table 3, results of four statistical studies, Cases A, B, C, and D, are given, each of which uses two NCAP parameters, HIC and chest Gs, to distinguish "good" from "poor" performance. In the detailed technical report, HIC, chest Gs, and femur loads from NCAP test results are used in a variety of approaches. While the analyses using femur loads are not shown here, NHTSA wishes to point out that the detailed technical report does show similarly strong correlations between accident data and various combinations of femur loads with other injury measures. In Table 3, the following data for Cases A, B, C, and D are provided;

- average vehicle weight of car 1 and car 2,

- average drivers' age for car 1 and car 2,

- average drivers' HIC and chest G from NCAP for each car,

- the unadjusted fatality risk reductions for car 1 drivers as compared to car 2 drivers,

- the fatality risk reduction for car 1 drivers as compared to car 2 drivers adjusted by car weight and drivers' ages and sexes, and

- the level of statistical significance (one-sided p for the adjusted fatality risk reduction). A value of p equal to or less

than .05 indicates a significant reduction. A value of p less than .01 indicates a high level of statistical significance.

First, in Case A, all 370 events were examined by comparing the fatality risk for drivers of car 1, the car with the lower NCAP injury probability[10], to car 2. This comparison does not assure that vehicles designated as car 1 will have "good" NCAP results (i.e., HIC below 1,000 and chest Gs below 60), only that the drivers of car 1 have a lower maximum injury probability (to the head or chest) than the drivers of car 2. The injury probability is based on classification of NCAP results by utilizing the injury risk function curves as developed by GM and Ford. The drivers received fatal injuries in 199 of the vehicles which met the criterion while 228 fatalities occurred in car 2, the vehicle with the poorer NCAP performance. The expected numbers of fatalities, based on vehicle weight, driver age and sex, are 208 for car 1 and 217 for car 2. These values indicate a reduction in the fatality risk for the drivers of car 1 versus the drivers of car 2. The unadjusted reduction in actual fatality risk was

$$1-(199/228)=12.7 \text{ percent}$$

[10] In the Society of Automotive Engineering (SAE) Paper No. 851246, "The Position of the United States Delegation to the ISO Working Group 6 on the Use of HIC in the Automotive Environment," P. Prasad and H. Mertz presented an injury risk function curve that relates the probability of an AIS≥4 head injury to HIC. In a 1990 SAE Paper No. 902338, "Assessing the Safety of Occupant Restraint Systems," D. Viano and S. Arepally expanded the application of this curve and provided the equations to calculate the probability of AIS≥4 injury to the head and chest.

and the adjusted reduction in actual fatalities was

$$1-[(199/228)/(208/217)]=8.7 \text{ percent.}$$

Case B in Table 3 provides the results from 170 events in which the drivers of car 1, the "good" performer, received HICs of 1,000 or less and chest Gs of 60 or less in the NCAP tests. That is, in the 35-mph NCAP test, car 1 met the FMVSS No. 208 criteria relative to head and chest requirements, whereas, car 2, the "poor" performer, exceeded one or both of these criteria. Fatalities occurred to 89 of the drivers in car 1 and 111 in car 2. Expected fatalities were 96 and 104, respectively. These values indicate a significant reduction in the unadjusted and adjusted fatality risks. The reduction in actual fatality risk was calculated to be 19.8 percent (unadjusted) and 13.5 percent (adjusted for vehicle weight, driver age, and sex).

For Case C, car 1 continued to be defined as in Case B, but the "poor" performer, car 2, is defined as having drivers' HICs which exceed 1,200 and/or chest Gs which exceed 70 in the NCAP tests. In the FARS data, cars in 104 head-on crashes meet these criteria. In comparison to Case B, Case C eliminates 66 collisions between cars in which the "poor" performer, car 2, had a driver's HIC greater than 1,000 and less than 1,201 and/or a driver's chest G greater than 60 and less than 71, and the "good" performer, car 1, met the FMVSS No. 208 HIC and chest G requirements in the NCAP tests. Fatalities occurred to 50 of the

Table 3. Summary of Real-World NCAP Effects Based on FARS Analysis of Car-to-Car Head-on Collisions

Parameter	Car No.	Case A*	Case B*	Case C*	Case D*
Average Vehicle Weight	1	2837	2920	2941	2944
	2	2802	2769	2769	2761
Average Drivers' Age	1	42.0	43.7	42.2	46.4
	2	42.5	41.1	41.0	43.5
Average Drivers' HIC from NCAP	1	721	747	742	712
	2	1117	1339	1609	1465
Average Drivers' Chest G from NCAP	1	45	46	45	43
	2	53	56	55	59
Reduction in Fatality Risk-Car 1 versus Car 2-Unadjusted FARS Data	1	12.7%	19.8%	29.6%	32.8%
Reduction in Fatality Risk-Car 1 versus Car 2-FARS Data Adjusted by Car Weight, Drivers' Ages and Sex	1	8.7%	13.5%	19.2%	26.7%
Level of Statistical Significance (one-sided p)		.053	.035	.017	.002

*Case A - Car 1 has a lower life-threatening injury risk to the driver than car 2 in NCAP test.

*Case B - Car 1 has a HIC value less than 1001 and a chest G less than 61 in the NCAP test. Car 2 has a HIC value greater than 1,000 and/or a chest G greater than 60 in the NCAP test.

*Case C - Car 1 has a HIC value less than 1,001 and a chest G less than 61 in the NCAP test. Car 2 has a HIC value greater than 1,200 and/or a chest G greater than 70 in the NCAP test.

*Case D - Car 1 has a HIC value less than 901 and a chest G less than 56 in the NCAP test. Car 2 has a HIC value greater than 1,250 and/or a chest G greater than 65 in the NCAP test.

drivers in car 1 and 71 of the drivers in car 2. Expected fatalities were 57 and 65. These events give even more substantial reductions in the unadjusted actual and adjusted fatality risks of 29.6 percent and 19.2 percent, respectively.

In one additional example, Case D, car 1 ("good") is defined as having drivers' HICs not to exceed 900 and chest Gs not to exceed 55 in NCAP. Car 2 ("poor") is defined as having drivers' HICs greater than 1,250 and/or chest Gs greater than 65 in NCAP. A total of 81 events met these requirements. Fatalities occurred to 39 of the drivers in car 1 and 58 of the drivers in car 2. Expected fatalities were 46 and 51. Reductions in the unadjusted and adjusted fatality risks for drivers of car 1 were 32.8 percent and 26.7 percent, respectively.

In summary, data in Table 3 provide an overview of the car-to-car crash events from FARS. For each of the four cases, there is little difference between the average curb weights for car 1 and car 2, the average drivers' ages are very similar, and, as expected, average HICs and chest Gs are very different depending on the definition of "good" and "poor" cars. With the small differences in average curb weights and average drivers' ages, the comparison of the reductions in unadjusted and adjusted fatality risks indicates that the findings are consistent (i.e., For Case A through Case D, there is a continuing trend of

decreasing fatality risks for the drivers of car 1 for both unadjusted and adjusted data.)

The reductions of fatality risk in Table 3 indicate that by making even a rough cut of NCAP vehicle performance, as in Case A, a positive correlation or trend is found between NCAP results and real-world, head-on collisions. These data provide statistically significant evidence that, when dividing the vehicles into traditional "good" and "poor" performers as defined by the HIC and chest G results from NCAP tests, strong correlations are shown between NCAP results and real-world crashes. Restrained drivers are at substantially lower risks of fatality in the "good" car. Depending on the definitions of "good" and "poor" cars, the reductions in fatality risks may be as large as 30 percent.

3.4.2 FARS Analysis: Car-to-Fixed Object Frontal Collisions

Concurrent with the car-to-car analysis, a more generalized study of FARS was conducted to determine if the trend of lower-fatality risks for "good" cars occurred in frontal crashes other than the car-to-car head-on collisions. In this analysis, the number of restrained drivers killed in single vehicle frontal, fixed-object collisions was obtained from FARS for each passenger car with applicable NCAP crash-test results. The fatality rates per

million vehicle years for the restrained drivers in the "good" and "poor" cars as defined, above, in Case B, Case C, and Case D were determined. Since the analysis is now referring to single-car crashes into fixed objects, there is no equivalent Case A.

The results from the three single-car crash studies are shown in Table 4 along with the average vehicle test weight, drivers' HICs, and drivers' chest Gs from NCAP.

Table 4. Summary of Real-World NCAP Effects Based on FARS Analysis of Car-to-Fixed Object Frontal Collisions

Parameter	Group No.	Case B*	Case C*	Case D*
Average Vehicle NCAP Test Weight	1	3183	3183	3150
	2	3197	3180	3202
Average Drivers' HICs from NCAP	1	722	722	676
	2	1315	1614	1435
Average Drivers' Chest Gs from NCAP	1	45	45	44
	2	58	58	62
Reduction in Fatality Rate-Cars in Group 1 versus Cars in Group 2-Actual FARS Data	1	19.2%	21.8%	35.7%

*Case B - Cars in Group 1 have HIC values less than 1,001 and chest Gs less than 61 in the NCAP tests. Cars in Group 2 have HIC values greater than 1,000 and/or chest Gs greater than 60 in the NCAP tests.

*Case C - Cars in Group 1 have HIC values less than 1,001 and chest Gs less than 61 in the NCAP tests. Cars in Group 2 have HIC values greater than 1,200 and/or chest Gs greater than 70 in the NCAP tests.

*Case D - Cars in Group 1 have HIC values less than 901 and chest Gs less than 56 in the NCAP tests. Cars in Group 2 have HIC values greater than 1,250 and/or chest Gs greater than 62 in the NCAP tests.

In this single car crash analysis, it is not feasible to adjust for driver age or vehicle exposure. Unlike the analysis of head-on collisions, this study does not adjust for differences in crash-involvement propensities. As was noted in Table 3, there is, on the average, little difference in the vehicle weights and driver ages of "good" and "poor" NCAP performers. Therefore, the results in Table 4 are from the actual, unadjusted FARS data. These results are a supplement to the statistical findings from the car-to-car, head-on crash analysis and should be compared only to the unadjusted data of the two-car crash analyses. These

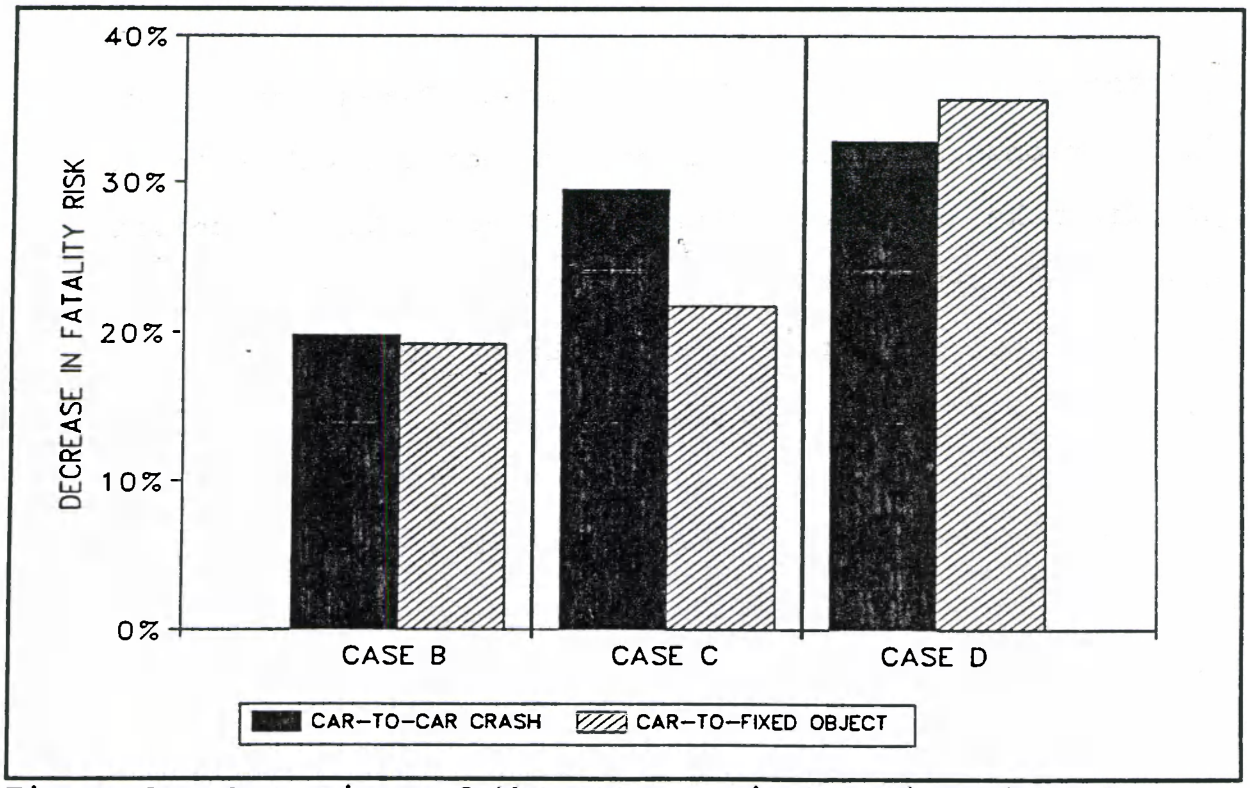


Figure 8. Comparison of the Decrease in Fatality Risks for "Good" Performing Cars in NCAP in Car-to-Car and Car-to-Fixed Object Collisions

comparisons are shown in Figure 8. Similar reductions in fatality risks for the drivers of car 1 are found. The statistical significance of these single car crash results cannot be ascertained because of unknown exposure factors. The results of this single-car crash study should be considered only as an indication as to whether the findings in the above car-to-car analysis may also be applicable to these other frontal crashes. The similar results, as shown in Figure 8, when compared to the car-to-car results continue to indicate a trend between "good" NCAP scores and decreased risks in actual highway accidents.

3.5 Study of a Specific Make and Model

The 1980-83 Honda Civic offers a unique opportunity to examine the relationship between NCAP performance and safety for a specific make and model. The MY 1981 Honda Civic received several safety-related changes to improve its NCAP performance as opposed to the MY 1980 Civic. The safety improvements to the MY 1981 (and later MY) Civics included:

- changing the steering column from a solid shaft to a telescopic shaft to reduce crash forces on the occupant through increased energy absorption and decreased intrusion,

- altering the steering column mounting brackets to reduce steering wheel and column intrusion,

- adding seat structure to reduce occupant submarining, and

- reducing belt spool-out by shortening belt length and adding a plastic collar on the retractor shaft, and by using different belt webbing material with lower elongation properties to keep occupants further away from the impact surfaces by reducing the occupant motion in a crash.

A comparison of NCAP crash-test scores for the MY 1980 and MY 1981 Civics in Table 5 shows the substantial reductions in the injury measures for the head and chest in the 1981 model Civic that resulted due to these improvements.

Aside from these specific, safety-related changes in MY 1981, the MY 1980-83 Civics are basically identical cars (a four year model run). That makes it possible to isolate the actual safety effects of changes related to NCAP from other changes that may occur when a make/model is redesigned.

Table 5. Comparison of Model Years 1980 and 1981 Honda Civic NCAP Test Results

Dummy Injury Parameter	Model Year 1980 Honda Civic	Model Year 1981 Honda Civic	Percent Reduction
Driver HIC	2626	607	77
Driver Chest G	54	41	24
Passenger HIC	1506	492	67
Passenger Chest G	47	35	25

An examination of the accident files was made to determine whether or not there was any statistical support for the proposition that the changes in the crashworthiness of 1981 Honda Civics, motivated by NCAP, were beneficial in the prevention of fatal injuries. A sufficient number of vehicles (MY 1980 and 1981-83 Honda Civics) had been on the roads for a period of time long enough to obtain statistical experience data.

In Table 6, a comparison of fatalities and fatality rates (for restrained front-seat occupants in frontal crashes in Honda Civics) in MY 1980 versus MY 1981-83 Honda Civics from the FARS file is given.

Table 6. Comparison of Model Year 1980 to Model Year 1981-83 Honda Civic Fatality Rates for Restrained Front Seat Occupants in Frontal Collisions-FARS Data (1982-1988)

Parameter	MY 1980 Honda Civic	MY 1981-83 Honda Civic
Exposure in Car Years	818,142	2,394,253
Fatalities (Restrained)	13	21
Restrained Fatality Rate/10,000 Car Years	0.153	.088
Reduction in Fatality Rate for Restrained Occupants in MY 1981-83 Civics	42.4 Percent	

The comparison found a 42 percent reduction in fatalities in the modified Honda Civics. This reduction in the fatality rate for a specific make and model continues to indicate the trend between

"good" NCAP scores and decreased risks in actual highway accidents.

3.6 Concluding Remarks on the Real-World/NCAP Studies

In these studies, NASS data have provided important information in evaluating the relationship of the NCAP test conditions to real-world crashes with the findings that:

- a large percentage of frontal crashes that result in serious injury have a direction of force and a frontal damage pattern similar to those in NCAP and FMVSS No. 208 tests,

- approximately 60 percent of the fatalities for restrained drivers occur below the NCAP delta V of 40 mph, and

- approximately 30 percent of the life-threatening injuries and 50 percent of the fatalities for restrained drivers occur within 5 mph of the NCAP delta V (35 to 45 mph),

These findings indicate that NCAP test conditions approximate real-world crash conditions covering a major segment of the safety problem.

From the FARS files, it has been feasible to determine that there is a significant correlation between NCAP results and real-world fatality risks for restrained drivers. Findings include:

- in car-to-car, head-on collisions between a "good" and a "poor" NCAP performer, reductions in fatality risk of the restrained driver of the "good" car may be as much as 30 percent lower than the fatality risk of the restrained drivers of the "poor" car. Significant reductions in fatality risk are found for a wide variety of definitions of "good" and "poor,"

- in car-to-fixed object crashes, the drivers of the "good" cars have approximately the same reduction in the unadjusted fatality risks as in the car-to-car collisions, and

- the specific case study of the Honda Civic, with an estimated fatality reduction of 42 percent between the "poorly" performing 1980 model and the improved 1981-83 models, supports the detailed statistical findings.

Section 4. The Effects of the Use of Hybrid H and Hybrid HI Test Dummies in NCAP

Section 4. The Effects of the Use of Hybrid H and Hybrid HI Test Dummies in NCAP

4.1 Evaluation of the Efficacy of Allowing Manufacturers to Choose Between the Hybrid III Test Dummy and the Hybrid II Test Dummy for the Purpose of NCAP Testing

In the final rulemaking action on FMVSS No. 208 in 1986, NHTSA concluded that the Hybrid II test dummy (Hybrid II) and the Hybrid III test dummy (Hybrid III) gave equivalent responses in the FMVSS No. 208 crash test environment. This conclusion of equivalency was based on comparable barrier crash testing and laboratory evaluations. Based on this conclusion, NHTSA allowed manufacturers to use either the Hybrid II or the Hybrid III to meet the automatic occupant protection requirements of the standard in the 30 mph crash test. NHTSA followed this regulatory action by allowing optional use of the two dummies in the NCAP tests, at the manufacturer's request. Until MY 1990, based on manufacturers' desires, the exclusive use of the Hybrid II continued in NCAP. Beginning with MY 1990 through MY 1993, about 30 percent (52 of 174) of the NCAP tests have been conducted with Hybrid III dummies.

The 1992 Conference Report requested that NHTSA address the efficacy of allowing motor vehicle manufacturers to choose between the "high tech" (i.e., Hybrid III) and "low tech" (i.e., Hybrid II) dummies for the purposes of NCAP testing. In response to this request, an analysis of the NCAP test data has been completed examining the responses of the two dummies and to estimate the effects on the NCAP results. The results of this analysis are presented in the following section.

4.1.1 Analysis of Hybrid II and Hybrid III Data from NCAP Tests

Tables 7 and 8 contain summaries of data from the MY 1990 through MY 1993 NCAP vehicles. Average results from passenger car tests are given in Table 7. Average results from light trucks, vans, and sport utility vehicle (LTVs) tests are given in Table 8.

In MYs 1990 through 1993, tests were conducted on 114 passenger cars. Hybrid II dummies were used as surrogates for the driver and right front seat passenger in 84 of these tests. Hybrid III dummies were used as surrogates in these seating positions in 25 of these tests. Five cars were tested in which the Hybrid III was used in the driver position and the Hybrid II was used in the right front passenger position. Data in Table 7 indicate that approximately 70 percent of these cars met all the requirements of FMVSS No. 208 (i.e., for head, chest, and upper legs) regardless of which dummies were used.

Table 7. Summary of Hybrid II and Hybrid III Measures in NCAP Passenger Cars (PCs)

Parameter	Hybrid II	Hybrid III
Percent of All PCs Meeting All FMVSS No. 208 Requirements in NCAP Tests	71 (76)	70 (23)
Average Driver HIC for PCs with Air bags	687 (34)	513 (24)
Average Driver Chest G for PCs with Air bags	50 (34)	47 (24)
Average Passenger HIC for PCs with Safety Belts only	734 (79)	821 (20)
Average Passenger Chest G for PCs with Safety Belts only	44 (79)	44 (20)

* Numbers in parentheses indicate number of PCs tested in NCAP where relevant response data were available.

Although, in the NCAP crash test data, no absolute comparisons between the responses of the two dummies can be made[11], some relative information may provide useful insight into the effects of the dummy options. For driver responses, the more relevant information is obtained from the driver air bag-equipped cars. In Table 7, the data indicate that the driver HIC average in the air bag-equipped cars is 34 percent higher in the group of cars with Hybrid II dummies than in the cars with the Hybrid III dummies. For the passenger dummies, restrained only by the belt systems, the HIC average is approximately 12 percent higher in the group of cars with the Hybrid III dummies. Figures 9 and 10 show these data along with the range of response values.

[11]Since structural and restraint characteristics of the group of cars tested with Hybrid IIs are different than those tested with Hybrid IIIs, direct comparisons are not possible.

Similar data are given for light trucks, vans, and sport utility vehicles in Table 8. Only four of these vehicles have been equipped with driver air bags and tested in NCAP. Therefore, the relevant information is limited to belt restrained drivers and passengers.

Table 8. Summary of Hybrid II and Hybrid III Measures in NCAP Light Trucks, Vans, and Sport Utility Vehicles (LTVs)

Parameter	Hybrid II	Hybrid III
Percent of All LTVs Meeting FMVSS 208 Requirements in NCAP Tests	30 (33)	33 (21)
Average Driver HIC for LTVs with Safety Belts only	1143 (34)	1052 (21)
Average Driver Chest G for LTVs with Safety Belts only	55 (34)	56 (21)
Average Passenger HIC for LTVs with Safety Belts only	933 (35)	976 (23)
Average Passenger Chest G for LTVs with Safety Belts only	50 (35)	51 (22)

* Numbers in parentheses indicate number of LTVs tested in NCAP where relevant response data were available.

In Table 8, the data indicate minor variations in the average HICs with differences in values between the two dummies of less than 10 percent. Figures 11 and 12 show these HIC data along with the range of response values.

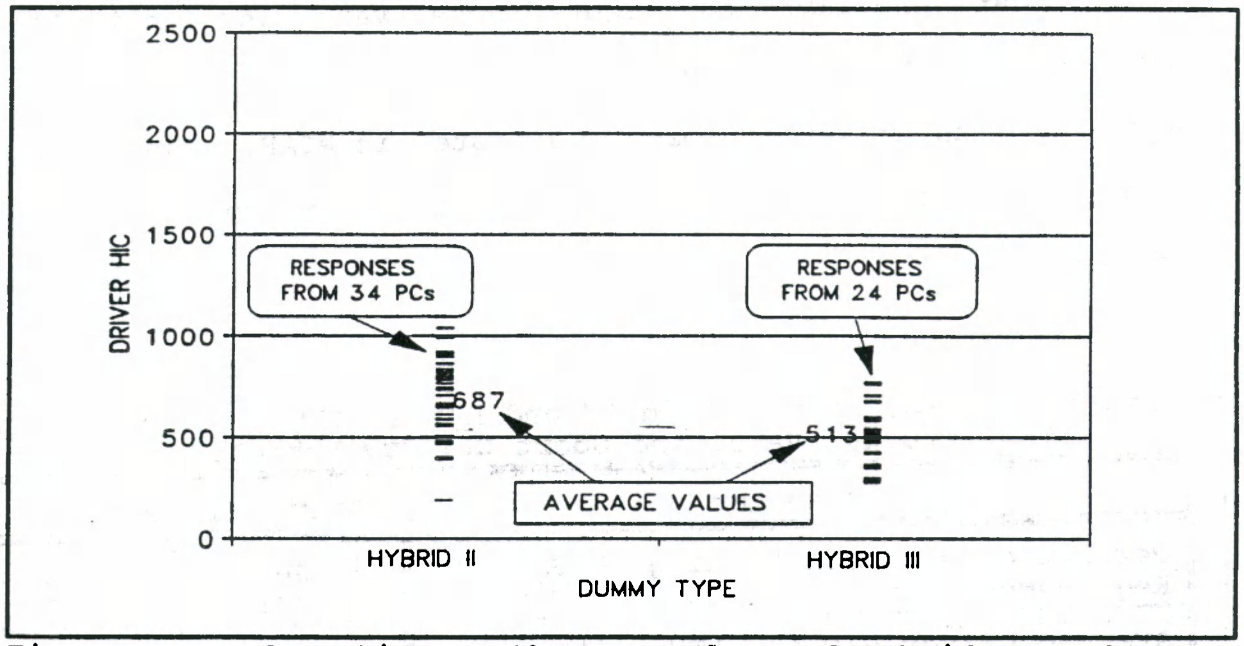


Figure 9. Information on the HIC Values of Hybrid II and Hybrid III Dummies in the Driver Position from NCAP Tests of MY 1990 through 1993 Passenger Cars (PCs) - Air Bags in all Driver Positions

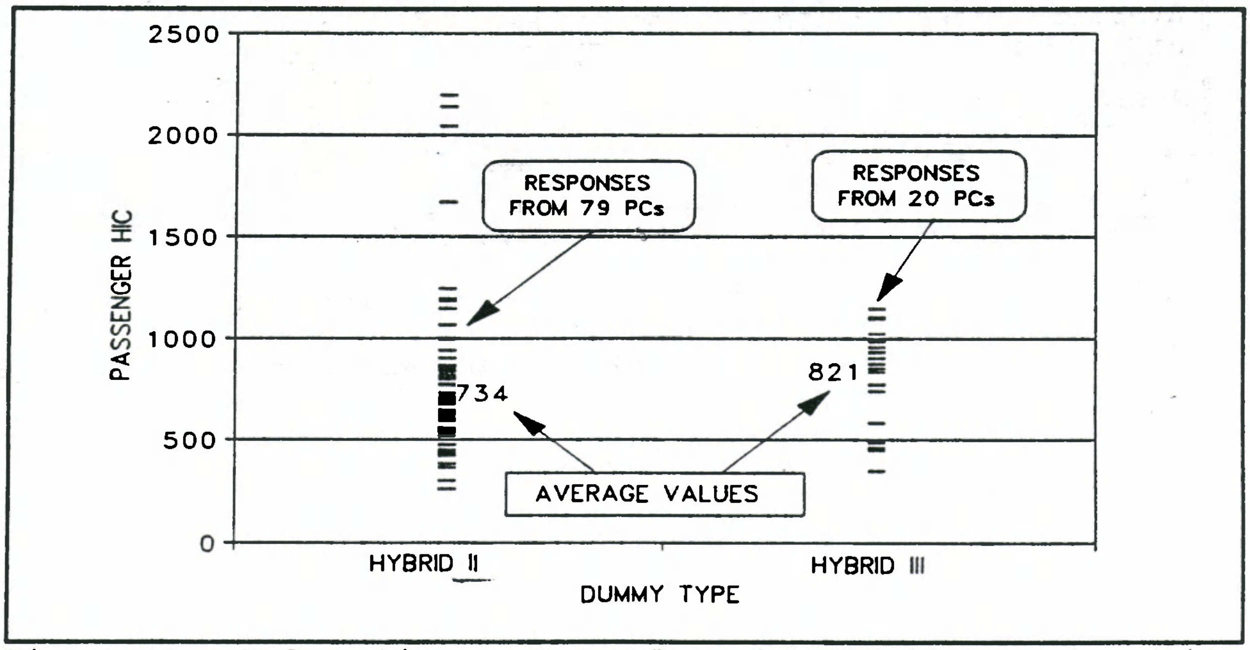


Figure 10. Information on HIC Values for Hybrid II and Hybrid III Dummies in the Right Front Seating Position from NCAP Tests of MY 1990 through 1993 Passenger Cars (PCs) - No Air Bags - Safety Belts only

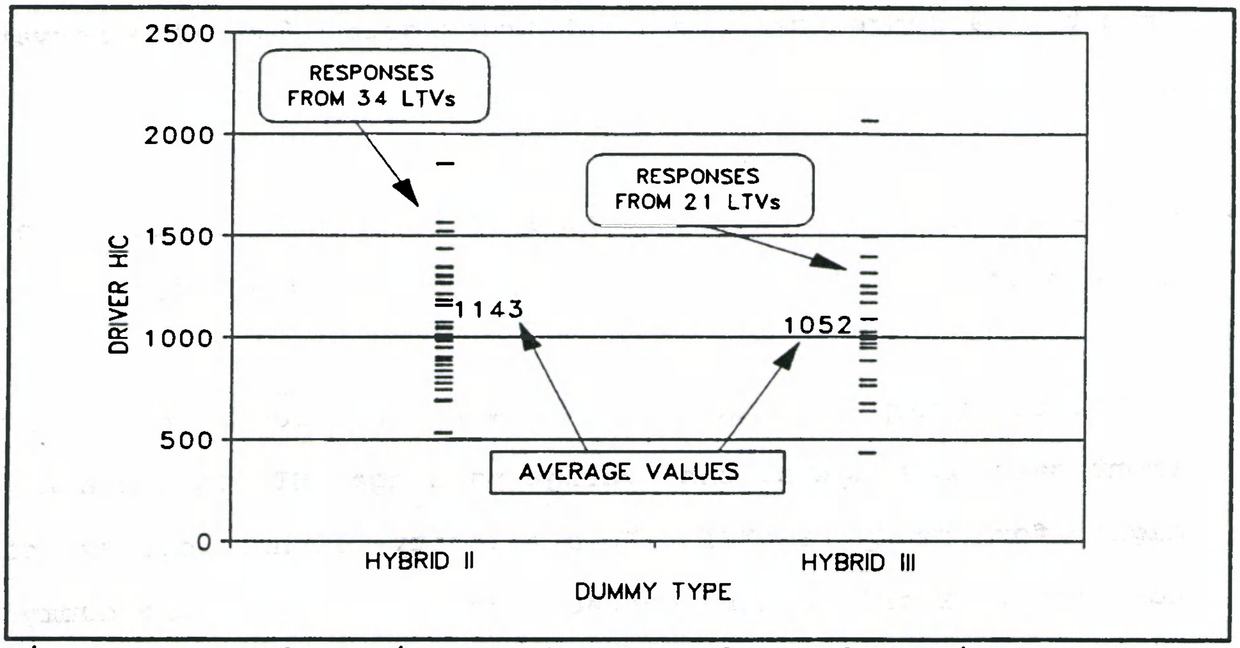


Figure 11. Information on the HIC Values of Hybrid II and Hybrid III Dummies in the Driver Position from NCAP Tests of MY 1990 through 1993 Light trucks, Vans,and Sport Utility Vehicles (LTVs) - No Air Bags - Safety Belts Only

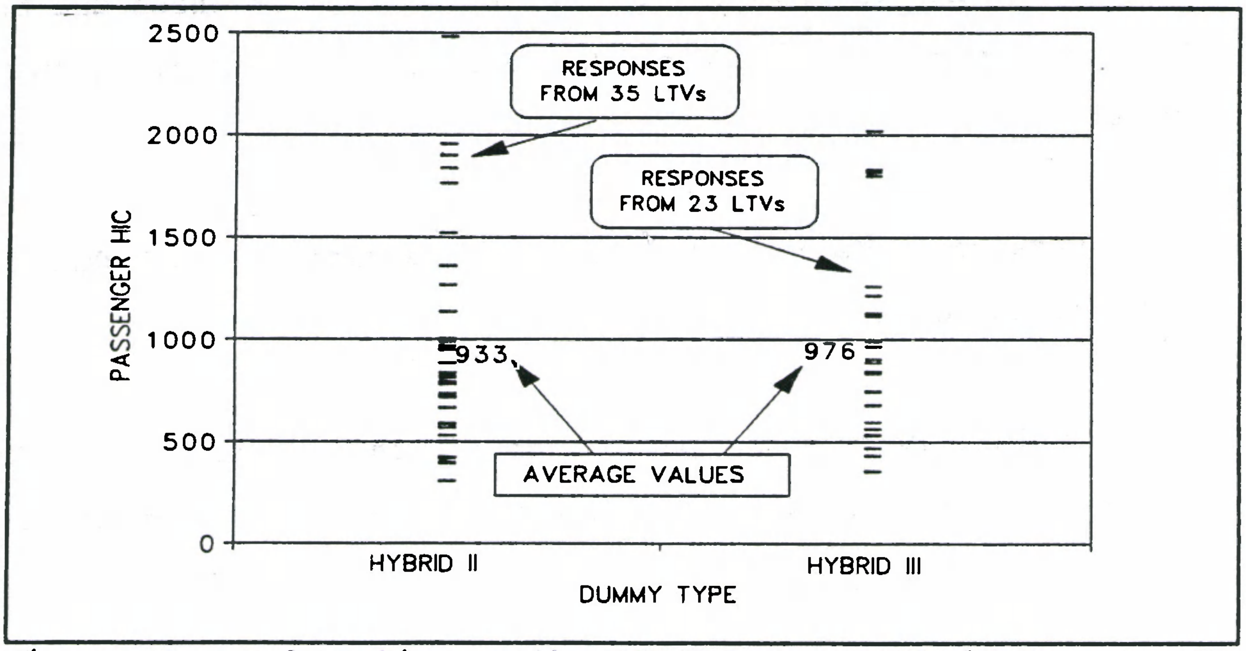


Figure 12. Information on the HIC Values of Hybrid II and Hybrid III Dummies in the Passenger Position from NCAP Tests of MY 1990 through 1993 Light Trucks, Vans, and Sport Utility Vehicles (LTVs) - No Air Bags - Safety Belts Only

From the passenger car and light truck data, general observations are:

- for the group of passenger cars with driver air bags, the average driver HIC values are lower for the Hybrid III,

- for the group of passenger cars with belt restrained right front seat passengers, the average passenger HIC values are higher for the Hybrid III. In a majority of these events, either no contact or only slight contact occurred between the dummy's head and any interior vehicle surface. Some motor vehicle manufacturers contend that the Hybrid III tends to produce higher HIC values than the Hybrid II in dynamic tests in which the head does not contact any surface. These data tend to support that position.

- average chest Gs are approximately the same for both dummies in passenger cars and LTVs, and

- approximately the same percentage of vehicles meet FMVSS No. 208 requirements in NCAP tests regardless of which dummies are used.

It is emphasized that these differences in response values may not necessarily be associated with differences in the designs of the two dummies, but could just as easily be the results of

different characteristics of vehicles and restraint systems. Only one direct comparison is contained in the NCAP tests. The MY 1991 Saturn SL2 model was tested with Hybrid III dummies in the driver and passenger positions restrained by the belt systems. This same car, but a 1992 model, was tested again with a Hybrid III in the driver position and a Hybrid II in the passenger position. The only change to the Saturn from 1991 to 1992 was the addition of a driver air bag. Results of these tests are given in Table 9. This single example shows only small differences between the results of the two passenger dummies. The head of the passenger dummy in each of these tests did not strike any interior vehicle surface.

Table 9. Hybrid II and Hybrid III Results from NCAP Tests of the MY 1991 and 1992 Saturn

Vehicle	Driver*		Passenger**	
	HIC	Chest G	HIC	Chest G
MY 1991 Saturn SL2 with passive belts	918	44	1018	46
MY 1992 Saturn SL2 with driver air bag	705	51	1063	47

* Hybrid III used in driver position for both MY 1991 and 1992 vehicles.
** Hybrid III used in passenger position for MY 1991 vehicle. Hybrid II used in passenger position for MY 1992 vehicle.

NHTSA is convinced that the Hybrid III is the more advanced test device and that any possibility of obtaining conflicting data from the use of the two dummies should be eliminated from NCAP and from FMVSS No. 208 testing by specifying exclusive use of the Hybrid III as soon as possible.

4.2 Review of the Federal Register Notices

NHTSA issued a Federal Register Notice in October 1992 requesting comments on establishing the Hybrid III as the only surrogate testing device to be used in NCAP beginning as early as MY 1994. NHTSA also issued a Notice of Proposed Rulemaking (NPRM) in December 1992 that proposes the mandatory use of the Hybrid III in FMVSS No. 208 beginning September 1, 1996. In these notices, NHTSA stated that:

- the Hybrid III appears to be more representative of human responses in frontal crashes. The Hybrid III represents the state-of-the-art of human simulation. Among other noteworthy advances, the Hybrid III has a more humanlike seated posture, head, neck, chest, and lumbar spine designs that meet biofidelic impact response requirements,

- use of the Hybrid III allows the assessment of more types of potential injury through its ability to monitor almost four times as many injury-indicating parameters as the Hybrid II, and

- use of a single dummy allows for better comparability of test results among vehicles and eliminates potential confusion by the public in understanding and interpreting the test results.

None of the commenters to the notices opposed in principle the exclusive use of the Hybrid III, and several of the commenters expressed unconditional support for its exclusive use. However, some commenters did raise concerns relating to leadtime and biomechanical or technical issues.

Lead time--NCAP imposes no mandatory obligations on the motor vehicle manufacturers. Although most manufacturers conduct crash tests at the NCAP test speed of 35 mph and, in some cases, may have imposed internal performance requirements[12], there are no regulatory requirements for meeting any specific criteria in NCAP. Therefore, the decision of exclusive use of the Hybrid III in NCAP does not impose any regulatory burden on the manufacturers. However, NHTSA also believes that an abrupt change in policy to no longer test with the Hybrid II in NCAP raises fairness issues. These issues relate to the fact that vehicles may have been designed with the Hybrid II, as allowed by NHTSA regulations; manufacturers may be uncertain as to how well their vehicles may perform with the Hybrid III; and NHTSA may not be providing sufficient time for manufacturers to improve their vehicles' performance using the Hybrid III.

For FMVSS No. 208, sufficient lead time will be provided in the final rulemaking to allow manufacturers to assure that their

[12]These internal performance requirements are laudable and, as shown in Section 3, may have led to significant safety improvements in crashes.

vehicles meet the specified criteria with the Hybrid III. To provide this lead-time, NHTSA will not require mandatory use of the Hybrid III until MY 1998. This is a two year extension beyond the MY 1996 date that was proposed in the December 1992 NPRM.

Biomechanical or technical issues--The Hybrid III has been used in 52 NCAP tests and in 62 of the FMVSS No. 208 compliance tests. Results from these tests indicate that there are no biomechanical or technical issues to impede the exclusive use of the Hybrid III, based on the injury criteria currently being measured. Minor issues that were raised by some manufacturers, such as improvements to the current chest deflection measurement device and changes to the ankle design, do not affect the biofidelity of the Hybrid III. These issues will be addressed in future rulemaking actions.

NHTSA has concluded from analysis of the NCAP data and the review and analysis of the comments to the two notices to proceed with exclusive use of the Hybrid III in NCAP beginning with MY 1996 vehicles. This is two years earlier than required by the recent amendment to FMVSS No. 208. In addition, NHTSA will immediately, beginning with MY 1994 vehicles, use the Hybrid III exclusively for all seating positions in which the occupant is protected by an air bag. Since air bags are in the vast majority of passenger cars and are rapidly being introduced into light trucks, when

coupled with manufacturer preference, nearly all seating positions will be tested with the Hybrid III. For example, of the 78 seating positions (39 vehicles) being tested in the MY 1994 NCAP, only 5 will be tested with the Hybrid II. NHTSA believes these changes fully comply with the Appropriations Committees' requests to expeditiously move toward exclusive use of the Hybrid III.

Section 5. The Future for NCAP

Section 5. The Future for NCAP

5.1 Make NCAP Easy to Understand

NCAP has produced extensive frontal crash test information for use by consumers and the media. However, as noted in Section 2, this information has been difficult for some consumers to understand and the media to use.

NHTSA's first step in planning the future for NCAP will be to pursue the goal of reaching a larger group of the population with simplified data that will assist them in making their vehicle purchase decision. NHTSA is proposing to ask for public comment on how to present information to consumers and the media with the hopes of developing a format that is more understandable. The primary element for FY 1994 is a consumer brochure that will be developed in a computerized format. This will permit easy updating. The format will also be adaptable to print media requirements. The brochure will utilize an easy to read and simple presentation technique. It will contain a description of NCAP and the comparative results from the vehicle tests.

5.2 Expand the Usefulness and Power of NCAP

NCAP has evolved into a real catalyst in the automobile market place. Consumer enlightening publications highlight crash test results as an important ingredient to consider in the vehicle selection process. As explained in Section 1, the overall trend of the NCAP test results indicate the favorable influence the program has had on motivating the manufacturers to improve restraint systems, steering assemblies, and structural crash characteristics of many of their products. Section 3 highlighted the significance of these improvements as shown, statistically, in the reduction of fatality risks for restrained occupants in the "good" performing passenger cars. In addition, NCAP continues to be a main source of research and engineering data for use by NHTSA and others in directing research programs and analyzing safety problems. With the exclusive use of the Hybrid III dummy in the NCAP frontal tests, as discussed in Section 4, NHTSA will expand the collection of safety information by utilizing the additional capabilities of the more advanced dummy to measure the potential for lower limb and neck injuries. From these perspectives, the frontal crash testing of NCAP has been and continues to be successful.

The focus group recommendations critically pointed out that NCAP provides information for frontal crashes only. Although the frontal crashes account for the highest percentage of fatalities,

as shown in Figure 13, side crashes and rollovers are also very significant crash modes. Almost 8,000 fatalities occurred in side crashes in 1991 and more than 9,000 fatalities occurred in rollover crashes. The focus group study indicates that consumers desire overall safety information on vehicles. In essence, NHTSA needs to expand the crash modes covered by NCAP.

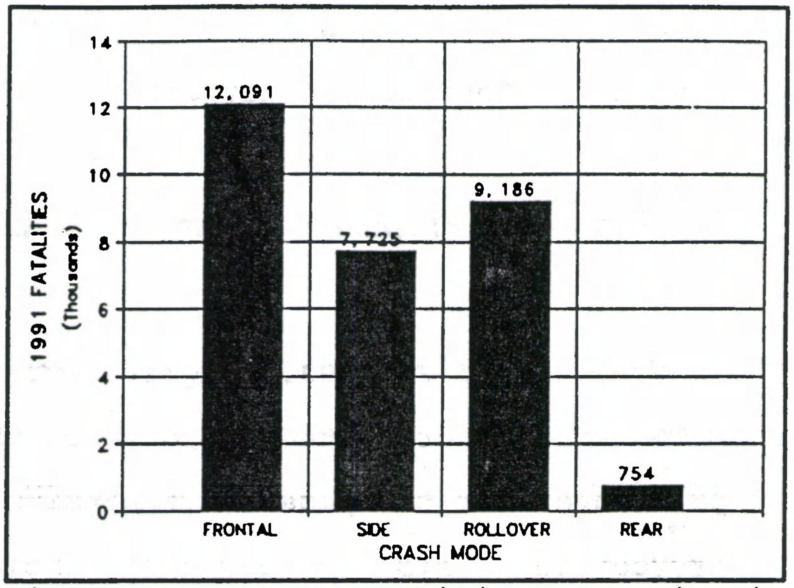


Figure 13. 1991 Fatalities occurring in Frontal, Side, Rollover, and Rear Crash Modes - Passenger Cars and Light Trucks.

The enactment of the upgraded side-impact protection standard, beginning with MY 1994 passenger cars, has provided the opportunity to expand NCAP into side-impact protection. The expansion of NCAP into side-impact protection has the potential for improving occupant protection significantly above that required in the applicable standard if the vehicle manufacturers, which have been responsive to the frontal NCAP test results, are equally responsive to such a program in side-impact testing. As in the frontal NCAP, a side-impact NCAP would provide an engineering data base which can be used to inform consumers of relative vehicle crashworthiness performance. That data base can

also serve as a basis for further research and additional safety studies in the side-impact area.

5.3 NHTSA is Prepared to Start a Side Impact NCAP

In FY 1992 and FY 1993, Congress provided funds as requested by NHTSA to conduct a study to develop the requirements and procedures for the possible expansion of NCAP into side-impact protection. This two-year study included a pilot crash testing program to determine an NCAP crash severity level, to assure that testing, instrumentation, and test device performance are consistent. The results from this program support the feasibility of a side-impact NCAP which could provide comparative results to consumers. If Congressional funding is provided, side-impact NCAP tests would be conducted on passenger cars and the information would be provided to consumers along with the frontal NCAP information. Initiation of this side-impact NCAP would provide consumers with comparative safety data on two of the most important crash modes.

5.4 Rollover Testing

Research efforts continue in NHTSA to determine the feasibility of determining vehicle crashworthiness performance in the rollover crash mode. These efforts have focussed on evaluating

vehicle structural integrity and restraint system effectiveness during dynamic rollover events. Advanced mathematical modelling techniques have been developed and applied, rollover test devices have been constructed, and several demonstration rollover tests have been conducted. NHTSA will continue to monitor these activities to determine the potential for providing consumers with comparative safety information on levels of protection in the rollover crash mode.

In addition to these crashworthiness rollover activities, NHTSA continues to study the merits of providing consumers with information on the roll stability of passenger cars and light trucks, vans, and sports utility vehicles. NHTSA published an Advanced Notice of Rulemaking on January 3, 1992 and a Planning Document for Rollover Prevention and Injury Mitigation on September 23, 1992. In these documents, potential methods for developing and providing consumer information are discussed. Comments to these documents are being reviewed by NHTSA.

5.5 In Conclusion

The future for NCAP includes several major goals:

- reach a larger group of the population with simplified data that will assist consumers in their vehicle purchases,

- expand the collection of safety information by utilizing the additional capabilities of the more advanced Hybrid III dummy to measure the potential for lower limb and neck injuries,

- expand NCAP into side-impact testing to provide comparative side impact information to consumers along with the frontal NCAP information, and

- monitor rollover safety activities to determine the potential for providing consumers with comparative information on levels of protection in the rollover crash mode and on vehicle roll stability.

5.6 Next Steps

NHTSA is considering holding a public meeting on NCAP. The public meeting could provide an open forum for consumer groups, media, foreign governments, national and international safety organizations, and motor vehicle manufacturers to discuss the above NCAP goals. Comments would be solicited on the material in this report and opportunities would be given for interested parties to suggest alternative or additional NCAP goals and activities. Such a meeting could be held in 1994.

Appendix A

News Release on New Car Assessment Program Historical Trends

U.S. Department of Transportation

News:

Office of the Assistant Secretary for Public Affairs
Washington, D.C. 20590

FOR IMMEDIATE RELEASE
Monday, September 27, 1993

NHTSA 42-93
Contact: Barry McCahill
Tel. No.: (202) 366-9550

NHTSA RELEASES REPORT ON NEW CAR ASSESSMENT PROGRAM HISTORICAL TRENDS

The National Highway Traffic Safety Administration (NHTSA) today released a report rating the performance, by manufacturer, of cars crash tested over the past 15 years.

According to NHTSA, the overall crash test performance of cars improved significantly between 1987 and 1993, compared to results for cars tested between 1979 and 1986. The safety agency credits the auto manufacturers with building better products and with greater availability of air bags as contributing factors to the improved performance in its 35 mph crash tests. Cars equipped with a driver's side air bag had average head injury scores that were 40 percent lower than cars without this safety equipment.

The safety agency began the New Car Assessment Program (NCAP) in 1979 in response to a Congressional mandate to provide consumers with a measure of relative crashworthiness of passenger motor vehicles. Federal safety standards require all passenger cars to meet injury criteria measured in a 30 mph frontal crash. The NCAP test is performed at 35 mph so that differences between vehicles may be observed more easily. Driver and passenger side crash dummies give data on forces to the head, chest and upper legs.

The Head Injury Criterion (HIC) is a measure of the potential for injury to the head of a car's occupant in a frontal crash, usually when the head contacts a hard object such as the steering column or instrument panel. Someone experiencing a HIC of 500 or less most likely will have little or no head injury. At a HIC of 1000, about 1 in 6 occupants may have either a life-threatening skull fracture or brain damage requiring immediate medical attention. At HICs of 2000 or more, nearly all crash victims experience life-threatening head injuries with a high probability of death or long-term disability.

(more)

Chest injury numbers above 60 indicate that chest injury is possible.

More than 300 passenger cars and 100 light trucks, vans and sport utility vehicles have been tested over the 15-year period. The report lists scores for the 18 manufacturers whose vehicles have been tested, highlighting notable safety improvements.

Copies of the report, "Historical Performance of Different Auto Manufacturers in the New Car Assessment Program Tests," may be obtained by calling (202) 366-9550.

Attached is a chart showing the historical performance by manufacturer.

###

TABLE 1. NCAP - SUMMARY DATA ON PASSENGER CARS

MANUFACTURER	NO. OF CARS TESTED		% MEETING FMVSS NO. 208 CRITERIA			DRIVER HIC AVERAGE			PASSENGER HIC AVERAGE			DRIVER CHEST G AVERAGE			PASSENGER CHEST G AVERAGE		
	MODEL YEARS		MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS		
	ALL	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93
GM	71	33	59	61	58	858	897	812	808	802	811	46	44	48	40	39	42
FORD	51	22	48	19	89	920	1090	693	796	1018	500	52	55	47	44	47	41
CHRYSLER	44	20	48	38	81	969	1111	799	974	1089	853	50	61	48	44	43	45
TOYOTA	29	13	82	82	82	883	910	849	753	853	631	50	50	51	47	48	44
NISSAN	25	15	40	20	53	982	1142	874	939	1301	697	53	58	51	48	50	43
HONDA	28	17	69	50	81	909	1178	736	795	1016	652	49	49	49	41	38	43
VOLKSWAGEN	17	8	19	10	33	1136	1250	945	958	911	1035	53	54	52	45	44	45
MAZDA	12	7	58	0	100	881	1065	750	1012	1445	703	55	60	61	48	49	48
MITSUBISHI	10	7	78	67	83	891	879	897	830	1168	685	54	62	50	44	45	44
PEUGEOT/RENAU	13	4	0	0	0	1906	1957	1793	1866	2011	1577	59	58	60	49	47	52
VOLVO	7	2	88	80	100	742	879	400	700	724	640	41	42	40	39	39	40
HYUNDAI	8	7	25	0	29	888	1000	871	971	2662	729	58	73	53	45	55	44
ISUZU	5	2	0	0	0	1570	1821	1194	1523	1711	1240	47	42	54	48	47	48
SUBARU	8	4	38	25	50	1055	1230	880	988	1293	682	53	64	51	48	49	43
MERCEDES	3	1	33	0	100	984	1078	800	979	1052	833	59	58	60	49	44	58
SAAB	5	3	40	0	67	658	754	594	1029	1304	846	48	55	43	38	40	37
BMW	3	2	33	0	50	1093	1539	870	622	547	698	49	42	62	40	39	40
TOTAL	339	185	50	37	83	987	1101	826	905	1055	748	50	51	49	44	44	44

Appendix B

Focus Group Test Material

Public Service Announcements (PSA's)

DATA SHEET #1

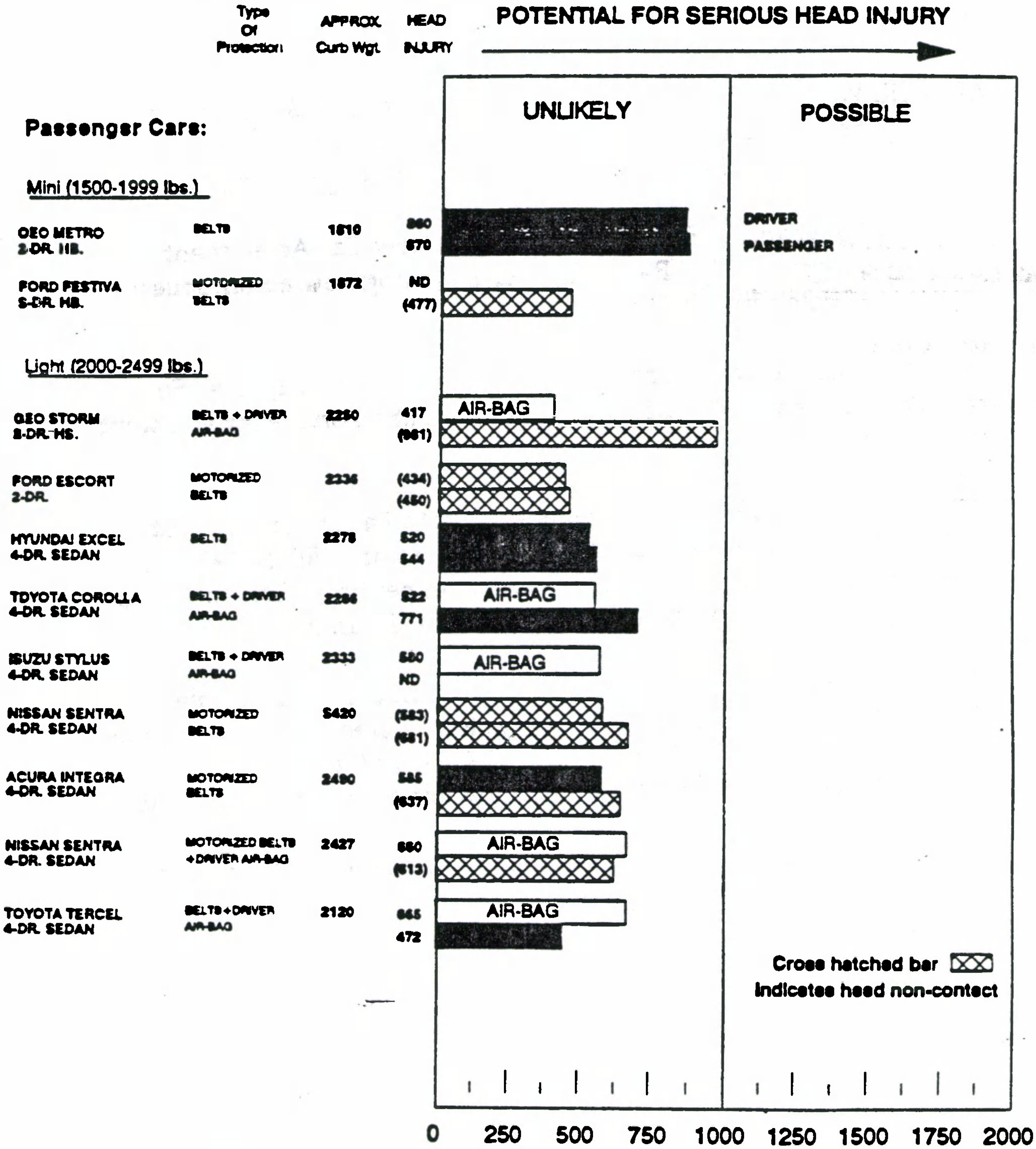
1993 NEW CAR ASSESSMENT PROGRAM RESULTS

VEHICLE	TYPE OF PROTECTION	APPROX. CURB WEIGHT (POUNDS)	HEAD INJURY DRIVER	HEAD INJURY PASSENGER	CHEST INJURY DRIVER	CHEST INJURY PASSENGER	ANTI-LOCKING BRAKE SYSTEM AVAILABLE?
PASSENGER CARS:							
Mini (1500 - 1999lbs.)							
[1]GEO METRO 2-DR. HB.	BELTS	1610	860	870	57	39	NO
FORD FESTIVA 2-DR. HB.	MOTORIZED BELTS	1872	ND	(477)	46	42	NO
Light (2000 - 2499lbs.)							
GEO STORM 2-DR. HB.	BELTS + DRIVER AIR-BAG	2250	417	(981)	47	45	NO
FORD ESCORT 2-DR.	MOTORIZED BELTS	2336	(434)	(450)	42	39	NO
HYUNDAI EXCEL 4-DR. SEDAN	BELTS	2278	520	544	52	37	NO
[2]TOYOTA COROLLA 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2286	522	771	62	45	OPT.
ISUZU STYLUS 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2333	580	ND	57	46	NO
NISSAN SENTRA 4-DR. SEDAN	MOTORIZED BELTS	2420	(583)	(681)	46	45	OPT.
ACURA INTEGRA 4-DR. SEDAN	MOTORIZED BELTS	2490	585	(637)	ND	42	OPT.
[2]NISSAN SENTRA 4-DR. SEDAN	MOTORIZED BELTS + DRIVER AIR-BAG	2427	660	(613)	47	44	OPT.
[2]TOYOTA TERCEL 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2130	665	472	52	41	OPT.

Comparisons must be made between vehicles within an approximate weight range of 500 pounds.
CONV. - Convertible HB - Hatchback ND - No Data 1,2,3 - See Note Page
Parentheses ( ) indicate the occupant's head did not contact an interior surface of the vehicle.

DATA SHEET #2

Head Injury Levels During 35* mph Crash Tests
1993 New Car Assessment Program



Comparisons must be made between vehicles within an approximate weight range of 500 pounds.

ND - No Data HB - Hatchback CONV. - Convertible

Parentheses ( ) indicate the occupant's head did not contact an interior surface of the vehicle.

* - 35 mph barrier crash tests represent a 70 mph closing speed.

NCAP RADIO :60

"SURVIVE"

ANNCR: Would your car survive a head-on collision at 35 miles per hour? Would you? Well, now there's a way to find out. Without doing any damage to your car – or your wallet.

For years the Federal government's New Car Assessment Program – NCAP – has been crash testing new automobiles to determine their safety.

These test results are available to you – absolutely free. So you can get detailed crash test information on the car you want to buy.

Federal safety requirements state that all automobiles must pass a 30 mile an hour front-end crash test. With NCAP, we go one step further by testing at 35 miles per hour. This amounts to a 36 percent increase in the potential for injury.

These higher speed, in-depth test results are not available from dealers. They are available to you, free, simply by calling 1-800-123-4567. That's 1-800-123-4567. Call today for test results that could have a real impact on the next car you buy.

NCAP crash testing. We can steer you in the right direction.

NCAP RADIO :60

"ACCIDENT"

ANNCR: If you're in the market for a new car, there's something you should hear.

SFX: CAR JAMS ON BREAKS, VERY LOUD, DRAWN-OUT SKID.

ANNCR: How well new cars perform in the governments high speed crash tests.

SFX: SKID CONTINUES.

ANNCR: But you don't have to discover this accidentally.

SFX: CAR SKID ABRUPTLY ENDS AS CAR SMASHES INTO A PARKED CAR.

ANNCR: Because all of these high speed crash test results are available to you – free. Through the National Highway Traffic Safety Administration's New Car Assessment Program – NCAP.

NCAP is a consumer information program which tests new cars' ability to withstand severe head-on collisions. And, to make this information more useful to you, NCAP tests cars at 35 miles per hour – 5 miles over the Federal safety requirement.

If you'd like to learn more about how the car or cars you're interested in faired in NCAP's tests, call 1-800-123-4567 for your free information booklet.

And discover which new cars can survive accidents – on purpose. Call NCAP today at 1-800-123-4567. NCAP. We wrote the book on new car safety.

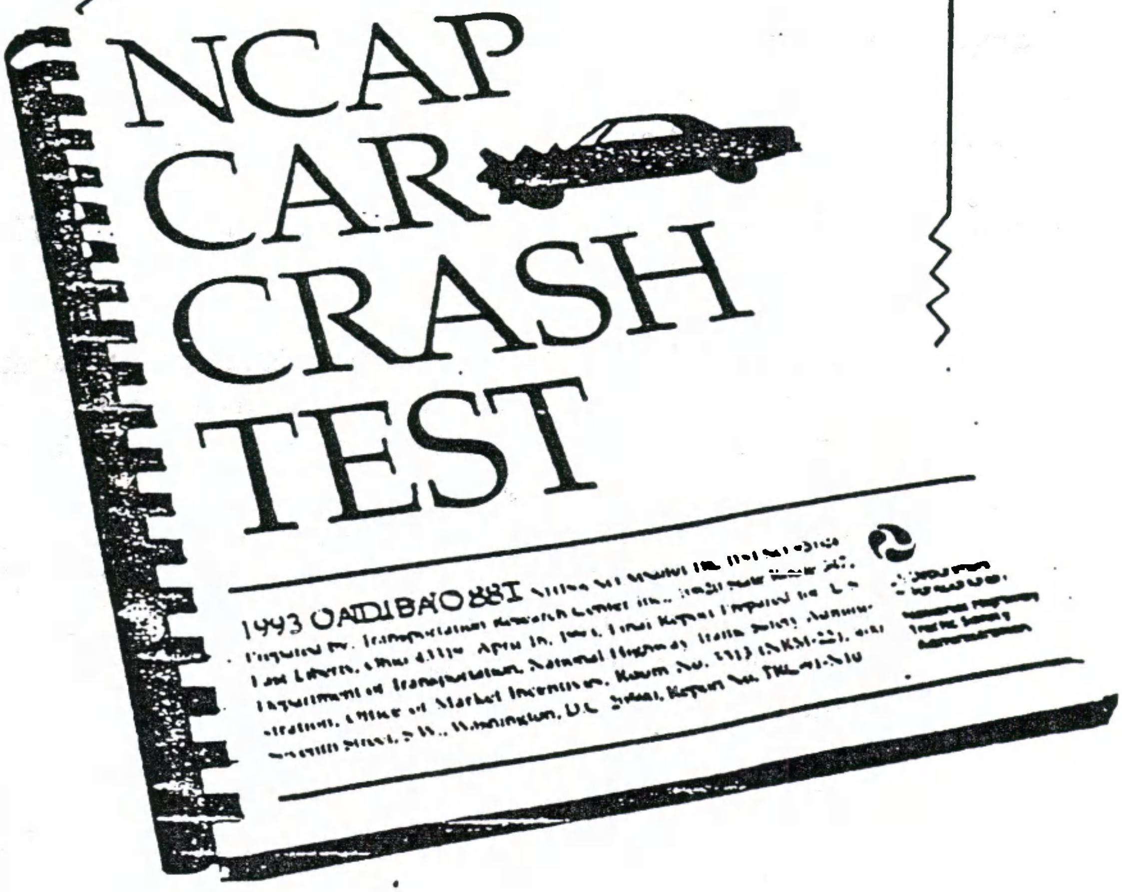
SFX: HONK, HONK.

New car value isn't determined by sticker price and mpg alone any more. For the smart consumer, it's also determined by safety. Which is why the National Highway Traffic Safety Administration began its New Car Assessment Program (NCAP).

This consumer information program tests the crashworthiness of most cars, vans and light trucks. Then, these results are made available to you – free. And since NCAP tests are conducted at 35 mph – 5 miles over Federal safety requirements – these results allow you to make the most detailed collision-safety comparisons possible.

So, if you want to find out more about the car you're going to trust with your life, call for the free crash test results. 1-800-000-0000.

NCAP. We'll Steer You In The Right Direction.



WHAT A NEW CAR STICKER DOESN'T TELL YOU.

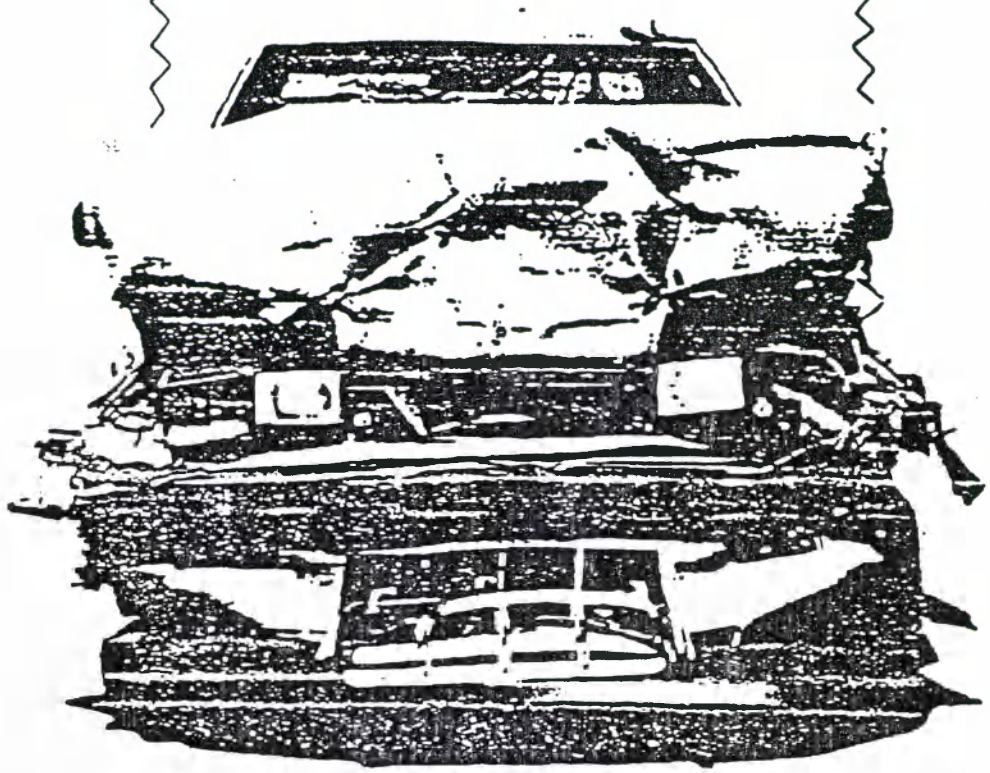
Find out free through the National Highway Traffic Safety Administration's New Car Assessment Program (NCAP).

This consumer information program tests the crash-worthiness of most cars, vans and light trucks. Then, these results are made available to you – free. And since NCAP tests are conducted at 35 mph – 5 miles over Federal safety requirements – these results allow you to make the most detailed collision-safety comparisons possible.

NCAP
CAR
CRASH
TEST

So, if new car safety is important to you, call, 1-800-000-0000 for free crash test results. And discover how safe your new car is – on purpose.

NCAP. We'll Steer You In The Right Direction.



DON'T ACCIDENTALLY FIND OUT HOW SAFE YOUR CAR IS.

Appendix C

NCAP News Release with Simplified Format

FOR IMMEDIATE RELEASE

NHTSA
Contact: Barry McCahill
Tel. No.: (202) 366-9550

**NHTSA RELEASES FIRST
1994 CRASH TEST RESULTS
IN A NEW FORMAT**

The National Highway Traffic Safety Administration (NHTSA) today released the first crash test results for 1994 cars and light trucks using a new "star" scoring system to make the results easier to understand.

According to NHTSA, the format for its New Car Assessment Program (NCAP) responds to consumer demand for reporting information in a way that is less technical and easier to understand. Focus groups of potential car buyers, the news media, callers to the agency's Auto Safety Hotline, the Congress and others have asked NHTSA to simplify NCAP results.

Results are now reported in a range of one to five stars, with five stars indicating the best crash protection for vehicles within the same weight class. Head and chest injury data are combined into a single rating, and reflected by the number of stars, which represents a vehicle's relative level of crash protection in a head-on collision.

Included today are new test results for the **Chevrolet Astro van, Chevrolet Camaro, Mitsubishi Galant 4-door, Chrysler New Yorker 4-door, and Dodge Caravan** as well as results for 44 vehicles previously tested by the agency which are valid for the 1994 versions of these vehicles. Results on a total of 83 model year 1994 vehicles eventually will be reported by the safety agency.

NHTSA's crash test procedures remain unchanged, and the results compare frontal crash protection only. The agency crashes vehicles into a fixed barrier at 35 mph, which is equivalent to a head-on collision between two identical vehicles, each moving at 35 mph. Instrumented dummies register forces and impacts during the crash, which are used by NHTSA to predict potential head and chest injuries.

-more-

New Car Assessment Program

How To Use This Chart

Vehicles should be compared against other vehicles in the same weight class. If a light vehicle collides head-on with a heavier vehicle at 35 mph, the occupants in the lighter vehicle could experience a greater chance of injury than the results of this test indicate.

Vehicles are classified by the estimated chance of injury for the driver or passenger, and receive a one to five star rating, with five stars ★★★★★ indicating the best protection.

1994 MINI PASSENGER CARS
(1500 - 1999 lbs. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
GEO METRO 2-DR. HB.	1610 lbs.	DRIVER	★★★		✓
		PASSENGER	★★★★		✓

1994 LIGHT PASSENGER CARS
(2000 - 2499 lbs. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
HONDA CIVIC COUPE 2-DR.	2498 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★★	✓	
HYUNDAI EXCEL 4-DR. SEDAN	2278 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★★		✓
HYUNDAI EXCEL 2-DR. HB.	2200 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★★		✓
HYUNDAI SCOUPE 2-DR.	2201 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★		✓
MAZDA PROTEGE 4-DR. SEDAN	2417 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
NISSAN SENTRA 4-DR. SEDAN	2420 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★		✓
NISSAN SENTRA 4-DR. SEDAN	2427 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★		✓
SATURN SL2 4-DR. SEDAN	2481 lbs.	DRIVER	★★★★	✓	
		PASSENGER*	★★★		✓
TOYOTA TERCEL 4-DR. SEDAN	2130 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★★		✓

* HYBRID II DUMMY

1994 COMPACT PASSENGER CARS
(2500 - 2999 lbs. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET CAVALIER 4-DR. SEDAN	2540 lbs.	DRIVER	★★★★		✓
		PASSENGER	★★★★★		✓
FORD TEMPO 4-DR. SEDAN	2674 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★		✓
HONDA PRELUDE 2-DR.	2818 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★★		✓
MITSUBISHI ECLIPSE 2-DR. HB.	2594 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★		✓
MITSUBISHI GALANT 4-DR. SEDAN	2832 lbs.	DRIVER	NO DATA	✓	
		PASSENGER	★★★★	✓	
SUBARU LEGACY 4-DR. SEDAN	2791 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★		✓

* HYBRID II DUMMY

1994 MEDIUM PASSENGER CARS
(3000 - 3499 LBS. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
BUICK CENTURY 4-DR. SEDAN	3049 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★		✓
CHEVROLET CAMARO 2-DR. HB.	3408 lbs.	DRIVER	★★★★★	✓	
		PASSENGER	★★★★★	✓	
CHEVROLET LUMINA 4-DR. SEDAN	3155 lbs.	DRIVER*	★★		✓
		PASSENGER*	NO DATA		✓
DODGE INTREPID 4-DR. SEDAN	3254 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★	✓	
FORD TAURUS 4-DR. SEDAN	3258 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★	✓	
NISSAN MAXIMA 4-OR. SEDAN	3192 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★		✓

* HYBRID II DUMMY

1994 HEAVY PASSENGER CARS
(3500 lbs. & over Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
ACURA LEGEND 4-DR. SEDAN	3550 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★★	✓	
CHRYSLER NEW YORKER 4-DR. SEDAN	3589 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★	✓	
FORD CROWN VICTORIA 4-DR. SEDAN	3970 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★★★	✓	
LINCOLN CONTINENTAL 4-DR. SEDAN	3710 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	NO DATA	✓	
LINCOLN TOWN CAR 4-DR. SEDAN	4080 lbs.	DRIVER*	★★★★★	✓	
		PASSENGER*	NO DATA	✓	
PONTIAC BONNEVILLE 4-DR. SEDAN	3558 lbs.	DRIVER	★★★★★	✓	
		PASSENGER	★★★	✓	

* HYBRID II DUMMY

1994 SPORT UTILITY VEHICLES

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET BLAZER 4-DR. 4X4	3893 lbs.	DRIVER	★★★		✓
		PASSENGER	★★		✓
CHEVROLET SUBURBAN 4-OR. 4X4	5666 lbs.	DRIVER	★★★★		✓
		PASSENGER	★★★★		✓
FORD EXPLORER 4-DR. 4X4	4184 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
ISUZU RODEO 4-DR. 4X4	4021 lbs.	DRIVER	★★		✓
		PASSENGER	★★★		✓
ISUZU TROOPER 4-DR. 4X4	4294 lbs.	DRIVER	★		✓
		PASSENGER	★★		✓
JEEP CHEROKEE 4-DR. 4X4	3270 lbs.	DRIVER	★★★		✓
		PASSENGER	★★★		✓
JEEP GRAND CHEROKEE 4-DR. 4X4	3748 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★		✓
NISSAN PATHFINDER 4-DR. 4X4	3932 lbs.	DRIVER*	★		✓
		PASSENGER*	★★★		✓
TOYOTA 4-RUNNER 4-DR. 4X4	4114 lbs.	DRIVER*	★		✓
		PASSENGER*	★★★★		✓

* HYBRID II DUMMY

1994 LIGHT TRUCKS

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET C-1500 PU 2-DR.	3838 lbs.	DRIVER	★★★★		✓
		PASSENGER	★★★★★		✓
FORD RANGER PU 2-DR.	3080 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
ISUZU PU 2-DR.	2840 lbs.	DRIVER	★★★		✓
		PASSENGER	★★★★		✓
MITSUBISHI MIGHTY MAX PU 2-DR.	2731 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★		✓
NISSAN PU 2-DR.	2793 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
TOYOTA PU 2-DR.	2563 lbs.	DRIVER*	★★		✓
		PASSENGER*	★★★★		✓

* HYBRID II DUMMY

1994 VANS

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET ASTRO VAN	4078 lbs.	DRIVER	★★★	✓	
		PASSENGER	★		✓
DODGE CARAVAN	3457 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★	✓	
DODGE RAM VAN	4890 lbs.	DRIVER	★		✓
		PASSENGER	★★		✓
FORD AEROSTAR VAN	3670 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★		✓
FORD ECONDLINE VAN	5166 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★		✓
VOLKSWAGEN EUROVAN VAN	3860 lbs.	DRIVER*	★		✓
		PASSENGER*	★★★		✓

* HYBRID II DUMMY

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NCAP

Mr. Parsons
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NEW CAR ASSESSMENT PROGRAM

Response to the NCAP FY 1992 Congressional Requirements

Report to the Congress
December 1993

Executive Summary

Response to the NCAP FY 1992 Congressional Requirements
Report to the Congress
December 1993

The FY 1992 Senate and Conference Appropriations Reports required the National Highway Traffic Safety Administration (NHTSA) to:

- implement improved methods of informing consumers of the comparative levels of safety of passenger vehicles as measured in the New Car Assessment Program (NCAP),

- examine and study the results of previous model year NCAP results to determine the validity of these test data in predicting actual on-the-road injuries and fatalities, and

- address the efficacy of allowing manufacturers to choose between the "high tech" and "low tech" crash test dummies for the purpose of NCAP testing.

In February 1992, a plan and schedule were presented to the Committees that detailed how NHTSA would comply with these requirements. This report presents results of NHTSA studies that address the three requirements and completes the 1992 plan. In addition, the report also includes a review of NCAP historical performance and future goals for NCAP as required by the FY 1992 Conference Report.

This report provides:

- the results of an 18-month study to assess consumer and media needs in understanding and promoting the use of NCAP data. This included contracts for consumer focus groups and media studies, using $150,000 earmarked in the FY 1992 budget. These studies indicated that consumers and the media desire comparative safety information on vehicles, a simplified NCAP format to better understand and utilize the crash test results, and would like to see NCAP expanded to include other crash modes, such as side crashes and rollovers. Plans for implementing the findings of these studies are included in the report.

- studies of real-world crashes versus NCAP crash tests. These studies conclude that NCAP test conditions approximate real-world crash conditions covering a major segment of the frontal crash safety problem. NHTSA concludes that there is a significant correlation between NCAP results and real-world fatality risks for restrained drivers. In high speed frontal crashes, fatality risks to restrained drivers of cars that perform well in NCAP may be as much as 30 percent lower than fatality risks to restrained drivers of cars that do not perform well in NCAP.

- a study on the efficacy of allowing manufacturers to choose between the Hybrid III and the Hybrid II crash test dummy. NCAP data were utilized in this study along with an analysis of comments to Federal Register notices on the mandatory use of the Hybrid III crash test dummy in Federal Motor Vehicle Safety Standard (FMVSS) No. 208 and in NCAP. From data analysis and the review of the comments to the two notices, NHTSA has concluded that exclusive use of the Hybrid III in NCAP should begin with MY 1996 vehicles. This is two years earlier than required by the recent amendment to FMVSS No. 208. In addition, NHTSA will immediately, beginning with MY 1994 vehicles, use the Hybrid III exclusively for all seating positions in which the occupant is protected by an air bag. Since air bags are in the vast majority of new passenger cars and are rapidly being introduced into light trucks, and since many manufacturers prefer the Hybrid III, nearly all seating positions will be tested with the more advanced Hybrid III. NHTSA believes these changes fully comply with the Appropriations Committees' requests to expeditiously move toward exclusive use of the Hybrid III.

In the report, NHTSA proposes to achieve the following major NCAP goals:

- reach a larger group of the population with simplified data that will assist consumers in their vehicle purchases.

- expand the collection of safety information by utilizing the additional injury-measuring capabilities of the more advanced Hybrid III dummy.

- expand NCAP to provide comparative side impact information to consumers along with the frontal NCAP information.

- monitor rollover safety activities to determine the potential for providing consumers with comparative information on levels of protection in the rollover crash mode and on vehicle roll stability.

NHTSA also is considering holding a public meeting on NCAP. The public meeting could provide an open forum for consumer groups, media, foreign governments, national and international safety organizations, and motor vehicle manufacturers to discuss the above NCAP goals. Comments would be solicited on the material in this report and opportunities would be given for interested parties to suggest alternative or additional NCAP goals and activities. Such a meeting could be held in 1994.

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Section 1. Introduction

Section 1. Introduction

1.1 Foreword

The FY 1992 Senate and Conference Appropriations Reports required the National Highway Traffic Safety Administration (NHTSA) to implement improved methods to inform consumers of the comparative levels of safety of passenger vehicles as measured in the New Car Assessment Program (NCAP), to examine and study the results of previous model year NCAP results to determine the validity of these test data in predicting actual on-the-road injuries and fatalities, and to address the efficacy of allowing manufacturers to choose between the "high tech" (i.e., Hybrid III test dummy) and "low tech" (i.e., Hybrid II test dummy) dummies for the purpose of NCAP testing. In February 1992, NHTSA presented a report to the Committees with a detailed plan and schedule, describing how NHTSA would comply with these requirements. Activities have been completed and the following report responds to the requirements of the FY 1992 Senate and Conference reports.

1.2 Brief History of the New Car Assessment Program

In 1978, NCAP was initiated with the primary purpose of partially fulfilling one of the requirements of Title II of the Motor

Vehicle Information and Cost Savings Act of 1972. The purpose of this requirement was to provide consumers with a measure of relative crashworthiness of passenger motor vehicles. NHTSA concluded that by using existing technical approaches, safety information on the relative crashworthiness that vehicles provide in frontal crashes could be developed. This provided consumers with important information to aid them in their vehicle purchase decisions. The ultimate goal of NCAP was to improve occupant safety by providing market incentives for vehicle manufacturers to voluntarily design better crashworthiness into their vehicles, rather than by regulatory directives.

In this program, vehicles are subjected to a frontal crash test. The vehicles are towed head-on into a fixed, rigid barrier at 35 mph. Each vehicle carries two instrumented anthropomorphic test devices (dummies) that simulate 50th percentile adult males. These dummies are located in the front driver and front-right passenger seats and are restrained by the vehicle's safety belts and air bags, if available. During the crash, measurements are taken from each dummy's head, chest, and upper legs. These measurements are used to indicate the likelihood of serious injury and, thereby, the relative crashworthiness of the vehicle in a severe frontal impact.

The testing protocol used by NCAP is based on years of development work conducted by NHTSA, the automobile industry, and others to create the test devices and test procedures used in determining compliance with Federal Motor Vehicle Safety Standard (FMVSS) No. 208, "Occupant Crash Protection." This standard requires that certain injury criteria, as measured by the dummies, not be exceeded in a 30-mph frontal crash test. The injury criteria apply to the head (as measured by a composite of acceleration values known as the Head Injury Criterion or HIC), chest (as measured by a chest deceleration value known as chest G), and upper legs (as measured by compressive forces on each of the femur bones). These criteria are used to assess the performance of the vehicles tested in the NCAP.

The NCAP crash tests are conducted at 35 mph in order to provide a level of impact severity sufficiently higher than the FMVSS No. 208 requirement at 30 mph so that differences in frontal crashworthiness performance among vehicles can be more readily observed. Since kinetic energy is proportional to the square of the velocity, there is 36 percent more kinetic energy in a 35-mph crash than one at 30 mph. Another measure of severity in a frontal, fixed barrier test is the total instantaneous change in velocity of the vehicle (known as delta V), including the rebound from the barrier. In the 35-mph NCAP test, the average delta V is 40 mph, including the rebound velocity from the barrier. In a 30-mph test, the average delta V is 33 mph.

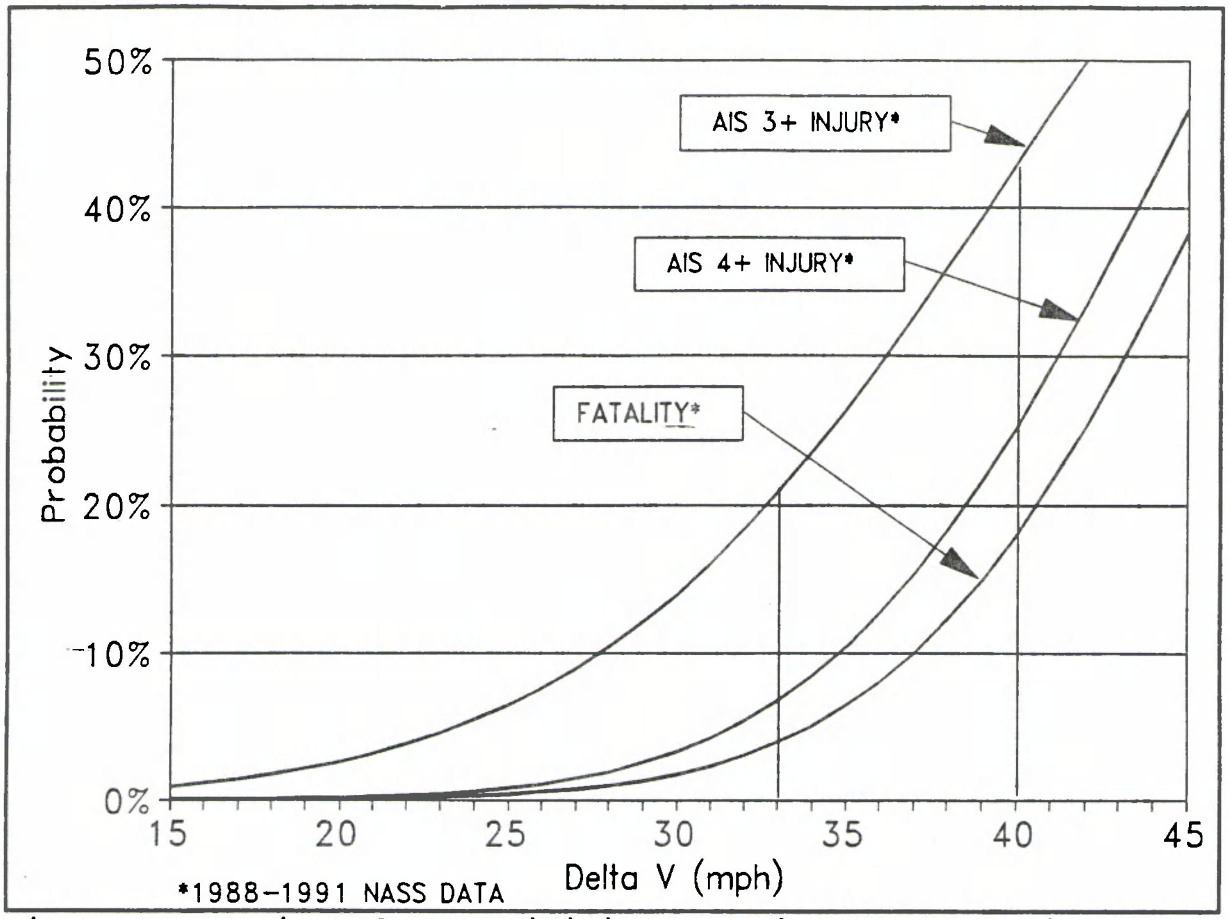

Figure 1. Estimated Probabilities of Injury and Fatality for Restrained Drivers in Frontal Collisions.

From an analysis of the National Accident Sampling System's (NASS) files[1], the relationships of delta V to injury and fatalities have been developed for passenger car drivers restrained by available belt systems (no air bag equipped vehicles are included). These data are shown in Figures 1 and 2.

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[1]The NASS files present detailed characteristics of traffic crashes in the United States. NASS is a sample of police-reported passenger vehicle towaway crashes that yields national estimates. These estimates are associated with both sampling and nonsampling errors.

Curves are given for Abbreviated Injury Scale (AIS)[2] 3 and greater injuries, AIS 4 and greater injuries, and fatalities. AIS 3 injuries are serious but often not life threatening with emergency care. AIS 4 and greater injuries are severe and life threatening. AIS 4 and greater injuries to the head may include severe skull fractures and/or brain injury. AIS 4 and greater injuries to the thorax may include severe damage to the lungs, torn aortas, or massive collapse of the rib structure.

The NASS data indicate that the fatality and injury rates for restrained, front-seat drivers are several times greater in a crash with a 40-mph delta V than in a crash with only a 33-mph delta V (See Figure 1). The NASS files also show that approximately 50 percent of the life-threatening injuries and nearly 80 percent of the fatalities of restrained drivers in frontal collisions occur in crashes with a delta V greater than 33 mph (See Figure 2). As in the real-world crashes, the injury data obtained in the 35-mph crash tests show a much greater injury potential and a much greater spread among the safety performance measures of various vehicles than observed in the 30-mph crash tests.

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[2]The AIS is used to provide a simple numerical method for ranking and comparing injuries by severity. The AIS classifies individual injuries by body region on a 6-point ordinal severity scale ranging from AIS 1 (minor) to AIS 6 (fatal). The AIS scale is a consensus-derived, anatomically based system, developed under the sponsorship of the Association for the Advancement of Automotive Medicine.

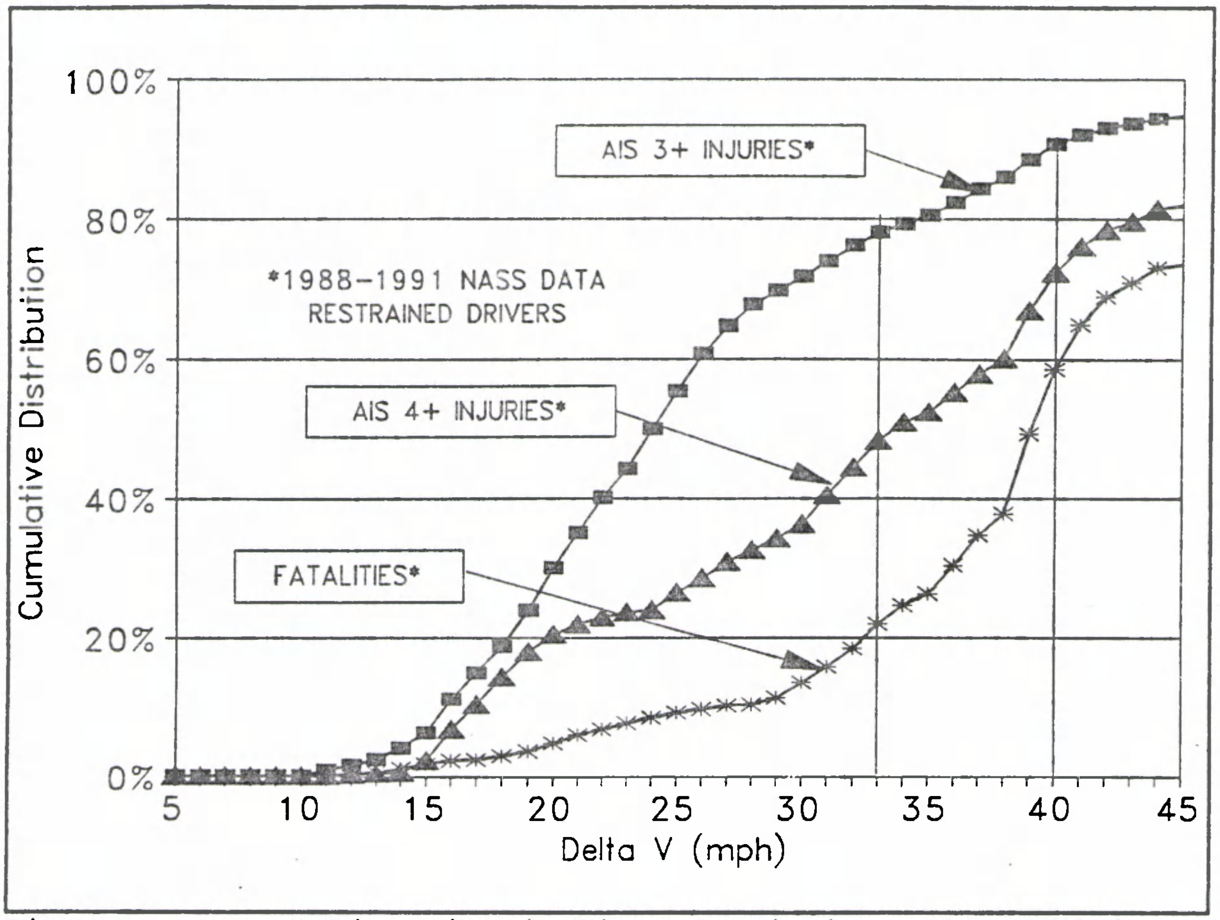

Figure 2. Cumulative Distribution of Injuries and Fatalities for Restrained Drivers in Frontal Crashes.

The first NCAP press release was issued on October 16, 1979. Since that time, more than 440 different passenger cars, light trucks, vans, and sport utility vehicles have been tested. Presently, the tested makes and models of passenger cars represent more than 50 million of the passenger cars on the road today. Notable improvements in occupant safety as measured by the dummy responses have occurred during the history of the program. A summary of these improvements is given in Section 1.4. Based on the study of the correlation of NCAP test results with actual fatality risk which was requested by the Committees

and detailed in Section 3, there have been significant reductions in the fatality risks for restrained drivers of passenger cars involved in severe frontal crashes.

1.3 Review of NHTSA's Plan as Proposed in the February 1992 Report

In the FY 1992 Senate and Conference Appropriations Reports, NHTSA was required to utilize a variety of new methods in presenting NCAP data in order to make the data more easily understandable by consumers and more useful as a market incentive. The Committees proposed that these methods may include publications of lists of vehicle models performing best and worst on different injury criteria, lists of vehicle models with the highest and the lowest HIC, lists of vehicle models in rank order of their performance on NCAP tests, and the historical performance of different automobile manufacturers on NCAP tests. Congress included $150,000 in the FY 1992 budget to be used in the development and promotion of these new marketing techniques.

NHTSA proposed to:

- develop a report of the historical performance of the different automobile manufacturers in NCAP,

- analyze the NCAP data base and determine an appropriate format for presenting the various suggestions for new lists,

- evaluate the potential impact of these presentation methods on the car-buying public and evaluate the vehicle safety needs and choices of the automobile consumers through the use of consumer focus groups,

- enlist the help of media experts to determine improvements in NCAP data presentations.

The report of the historical performance of the different automobile manufacturers in NCAP was completed and delivered to the Committees and then made available to the public in September 1993. A summary of this historical performance report is given in Section 1.4. A copy of the News Release disseminating the report is included as Appendix A.

A simplified NCAP data presentation format has been developed and focus groups have been conducted to evaluate consumer reactions. Details of the focus group studies are given in Section 2 along with the results of the media survey.

In addition to the requirements on consumer information, the Committees also requested a study to analyze the results of NCAP data from previous model years to determine the validity of these

tests in predicting actual on-the-road risk of injuries and fatalities over the lifetime of the models. In an attempt to fulfill the Committees' requirements for this study, NHTSA proposed to:

- continue to examine data contained in NASS, Fatal Accident Reporting System (FARS), and individual state accident files, and

- analyze "hard-copy" (i.e., written) reports of crashes to evaluate and compare on a one-to-one basis the performance of specific models which have been tested in NCAP and also have been involved in high-severity frontal impacts on the highway.

A summary of these studies and the conclusions are presented in Section 3 of this report.

The Committees also required NHTSA to address the efficacy of allowing automobile manufacturers to choose between the "high-tech" (i.e., Hybrid III) and "low-tech" (i.e., Hybrid II) crash-test dummies for the purpose of NCAP testing. NHTSA proposed to:

- analyze the NCAP test data to evaluate and explain the differences between the two dummies and the effect that these differences may have had on the NCAP results, and

- use the analysis of comments to a Notice of Proposed Rulemaking (NPRM) which will require mandatory use of the Hybrid III dummy in FMVSS No. 208 testing in the mid to late 1990's.

These activities have been completed and are presented in Section 4 along with the schedule to phase out the use of the Hybrid II dummy.

1.4 An Update of NCAP Results and a Review of the Historical Performance of Different Auto Manufacturers in NCAP

In the February 1992 report, trends of improved vehicle safety performance as measured by NCAP were provided. Since that report, NCAP tests have been completed on MY 1992 and 1993 vehicles. These two additional years have been included in the trend analysis and are shown in Figure 3. These trends, based on the dummy HIC and chest G responses are shown for all tests of passenger cars that have been conducted through MY 1993. The average values for the dummy response parameters are given for each model year. Also, the averages for the fleet[3] of NCAP-tested passenger cars, as determined from vehicle registrations, are shown for each year. (Note: The file has not yet been

[3]After the first year of NCAP testing, MY 1979, this fleet included approximately two million of the passenger cars on the road. At the conclusion of the MY 1992 NCAP testing, this fleet constituted over 52 million of the registered passenger cars.

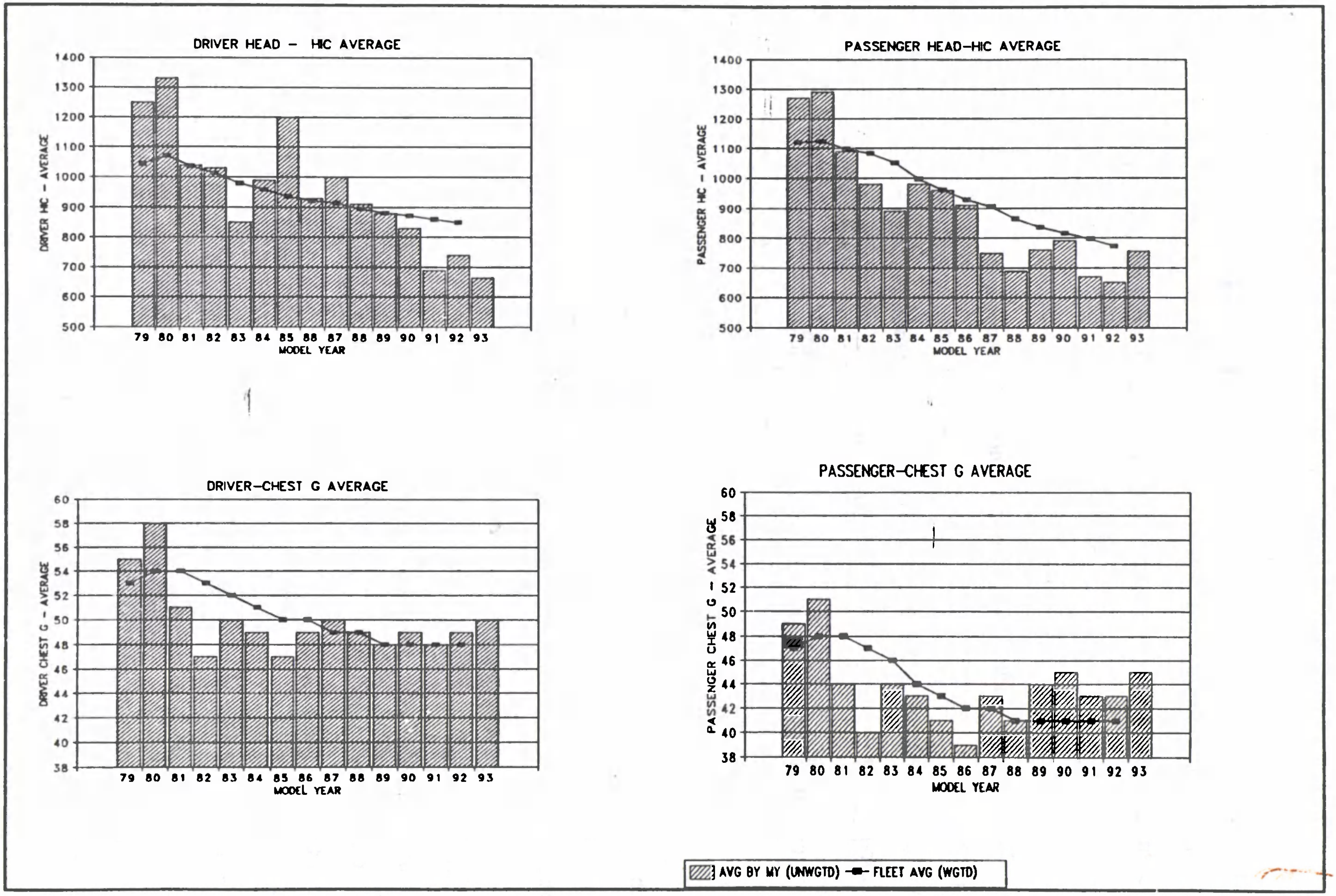

Figure 3. NCAP Dummy Response Trends for Passenger Cars

updated with vehicle registrations for MY 1993. Therefore, weighted values are only available through MY 1992.) As noted in the previous report, significant downward trends are shown for each of the injury parameters.

The Committees had requested in the 1992 Appropriations' report that the historical performance of different motor vehicle manufacturers in NCAP be developed and presented to consumers. NHTSA stated in the February 1992 report that, "A presentation of the historical performance of the different automobile manufacturers will be developed and presented to the focus groups as a consumer information document. This document will, as appropriate, highlight technological developments attributed to each manufacturer." NHTSA completed this document, transmitted it to the Committees, and then released it to the public in September 1993.

In Tables 1 and 2, summary information from this report on the different motor vehicle manufacturers is given. These data include: the number of vehicles which have been tested, the percentage of vehicles which have met FMVSS No. 208 requirements (HIC's not exceeding 1,000, chest G's not exceeding 60, and femur loads not exceeding 2,250) in the higher-speed NCAP tests, and overall average values for the driver HIC, passenger HIC, driver chest G, and passenger chest G. For passenger cars, where adequate data exist, this information also is given for two time

TABLE 1. NCAP - SUMMARY DATA ON PASSENGER CARS

MANUFACTURER	NO. OF CARS TESTED		% MEETING FMVSS NO. 208 CRITERIA			DRIVER HIC AVERAGE			PASSENGER HIC AVERAGE			DRIVER CHEST G AVERAGE			PASSENGER CHEST G AVERAGE		
	MODEL YEARS		MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS		
	ALL	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93
GM	71	33	59	61	58	858	897	812	806	802	811	46	44	48	40	39	42
FORD	51	22	48	19	89	920	1090	693	796	1018	500	52	55	47	44	47	41
CHRYSLER	44	20	48	38	61	969	1111	799	974	1069	853	50	51	48	44	43	45
TOYOTA	29	13	62	62	62	883	910	849	753	853	631	50	50	51	47	48	44
NISSAN	25	15	40	20	53	982	1142	874	939	1301	697	53	58	51	46	50	43
HONDA	28	17	69	50	81	909	1176	736	795	1018	652	49	49	49	41	38	43
VOLKSWAGEN	17	8	19	10	33	1136	1250	945	958	911	1035	53	54	52	45	44	45
MAZDA	12	7	58	0	100	851	1065	750	1012	1445	703	55	60	51	48	49	48
MITSUBISHI	10	7	78	67	83	891	879	897	830	1168	885	54	82	50	44	45	44
PEUGEOT/RENAU	13	4	0	0	0	1908	1957	1793	1866	2011	1577	59	58	60	49	47	52
VOLVO	7	2	88	80	100	742	879	400	700	724	640	41	42	40	39	39	40
HYUNDAI	8	7	25	0	29	888	1000	871	971	2662	729	56	73	53	45	55	44
ISUZU	5	2	0	0	0	1570	1821	1194	1523	1711	1240	47	42	54	48	47	48
SUBARU	8	4	38	25	50	1055	1230	880	988	1293	882	53	54	51	46	49	43
MERCEDES	3	1	33	0	100	984	1078	800	979	1052	833	59	58	60	49	44	58
SAAB	5	3	40	0	87	658	754	594	1029	1304	846	48	55	43	38	40	37
BMW	3	2	33	0	50	1093	1539	870	822	547	898	49	42	52	40	39	40
TOTAL	339	165	50	37	63	967	1101	826	905	1055	746	50	51	49	44	44	44

TABLE 2. NCAP - SUMMARY DATA ON LIGHT TRUCKS, VANS & SPORT UTILITY VEHICLES (LTVS)

MANUFACTURER	NO. OF LTVS TESTED	% MEETING FMVSS NO. 208	DRIVER HIC AVERAGE	PASSENGER HIC AVERAGE	DRIVER CHEST G AVERAGE	PASSENGER CHEST G AVERAGE
		MODEL YEARS	MODEL YEARS	MODEL YEARS	MODEL YEARS	MODEL YEARS
		ALL	ALL	ALL	ALL	ALL
GM	21	29	1274	1215	80	49
FORD	17	44	1124	901	52	47
CHRYSLER	18	44	857	1005	51	45
TOYOTA	12	8	1250	828	55	50
NISSAN	8	38	1080	810	54	48
VOLKSWAGEN	3	0	1507	874	58	49
MAZDA	3	33	1002	857	55	48
MITSUBISHI	8	50	1203	978	52	54
ISUZU	10	10	1282	1207	81	59
SUZUKI	3	33	1214	1548	62	53
TOTAL	101	31	1150	1020	55	49

periods, MY 1979 through MY 1986 and MY 1987 through MY 1993. The phase-in of the automatic occupant protection safety requirements of FMVSS No. 208 began in MY 1987 with a substantial increase in the use of air bags as supplemental restraints, which improved the safety performance of passenger cars.

Significant reductions in average driver HIC and passenger HIC values have occurred in MY 1987 through 1993 passenger cars when compared to MY 1979 through 1986 passenger cars. The average driver HIC values along with these reductions for the 6 major manufacturers are graphically shown in Figure 4.

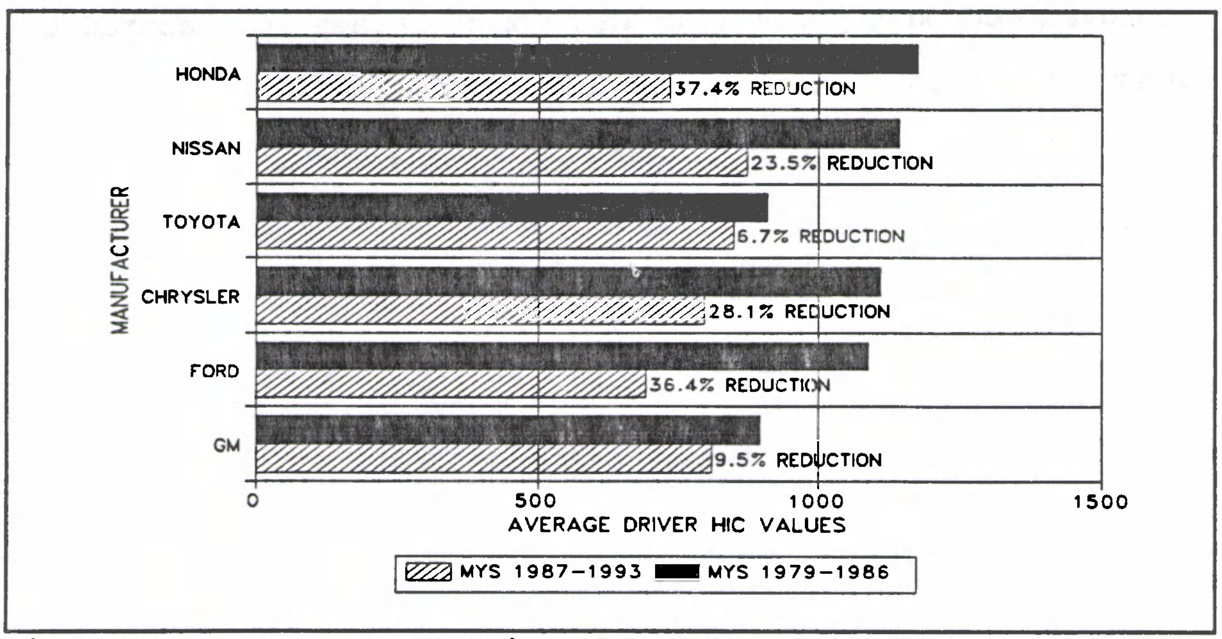

Figure 4. Average NCAP Driver HIC Values with the Percentage Reduction when Comparing MY 1987-1993 Passenger Cars to MY 1979-1986 Passenger Cars.

A much higher percentage of passenger cars are now meeting the requirements of FMVSS No. 208 at the higher NCAP crash speed.

Almost 80 percent of the passenger cars tested in NCAP during 1993 met the FMVSS No. 208 requirements. These historical records and the trends shown in Figure 3, indicate, as stated in the February 1992 report to Congress:

- that the vehicle manufacturers have the knowledge and capability to design passenger cars that provide exceptional safety in the severe 35-mph crash if all restraint systems are used, and

- that with the phase-in requirements of passive restraints beginning with MY 1987, the vehicle manufacturers significantly improved occupant protection in 35 mph crashes as measured by the dummy responses.

Section 2A. Focus Group Study

Section 2A. Focus Group Study and Media Survey

2A.1 Background and Objective

2A.1.1 Background

As mentioned in Section 1, NHTSA utilized $150,000 of the FY 1992 budget to evaluate new marketing techniques that would increase public awareness of NCAP crash test information and ensure that the information presented to the consumer is useful and easy to understand. This evaluation was conducted by using consumer focus groups.

To reiterate, NCAP tests are conducted using all occupant protection equipment provided with the vehicles so that test results demonstrate the relative crash protection provided to front seat occupants. Instruments located on each dummy's head, chest, and upper legs generate measurements that determine the likelihood of serious injury in a frontal collision. Only one vehicle of each make or model is tested. Vehicle models are selected from those that are new, potentially popular, or have been redesigned with new or improved safety equipment such as an air bag. Expensive luxury models are not tested as frequently as more popular models because information about these models is not

requested by many consumers. Domestic and foreign manufacturers are equally represented in the vehicles selected. The cars are purchased from existing dealer inventory, replicating the selection process in which the average consumer purchases a car.

NCAP's test results are grouped for comparisons between vehicles of similar size and weight. The NCAP test results compare a vehicle's level of protection with that of other like vehicles.

Unfortunately, this testing concept and NHTSA's reported results have been difficult for some consumers to understand. In the past NHTSA has reported the test results in a numerical format under the categories of HIC, chest G, and femur loads. Other organizations, such as Consumers Union, have taken the NHTSA results and presented them in a modified format which they believe would be easier for consumers to comprehend. Consumers have used this type of adaptation, but were not sure of the original source of the information even though acknowledgment was given to NHTSA.

NHTSA, as required by the Senate and Conference Reports, has investigated a variety of new methods for presenting NCAP data to make it more immediately informative to the car-buying public. NHTSA is proposing to adopt a variety of promotional efforts to advertise the availability of NCAP crash test results and to

better inform the public of its availability through the Auto Safety Hotline.

2A.1.2 Objectives

In recent years, focus group research projects have provided useful qualitative insights and programmatic direction on a variety of topics that could not be generated with large-scale quantitative surveys or other data-collection techniques unsuited to exploratory behavioral research. Focus groups have provided a practical way to elicit needed information about individuals' perceptions and buying habits.

The NHTSA focus group study had as its objectives to:

- assess vehicle-buyer perceptions, needs, and desires concerning the delivery and presentation of motor vehicle safety-performance data,

- identify the potential uses of NCAP information in vehicle selection, and

- gather preliminary information needed to plan an effective promotional campaign.

This includes the existing frontal-crash test information and assessment of the public's desire for other crash test information, e.g., side-impact performance.

2A.2 Methodology

2A.2.1 Overview

A "focus group" is an informal small-group discussion, led by a trained moderator, designed to elicit feelings and attitudes about a specific topic. Groups usually involve eight to ten people and last up to two hours.

In the spring of 1993, fifteen focus groups--seven of men and eight of women--were conducted in three cities; seven in Washington, DC, four in Dallas, and four in San Francisco. All of the participants had either recently purchased a new car or planned to do so in the near future. The discussion issues were designed to determine how participants regarded the importance of safety in general and of specific safety features in selecting a car; what types of safety information they wanted; and where they would like that information made available.

At the beginning of the sessions, participants discussed how they went about choosing a car, what features they looked for in a new

car, and the importance of safety features and safety information in making a selection. Next, participants read and gave their reactions to two sets of NCAP crash test data presentations. The last part of the session was devoted to reviewing two potential radio public service announcements and two print public service announcements promoting the availability of NCAP safety information.

2A.2.2 Participant Selection

Buyers of New Cars - All groups were composed of drivers who had either bought or leased a new car within the past year or planned to do so within the coming year. Whether this action was imminent or in the recent past, the new-car selection process was of considerable significance to all participants.

Hotline Callers - Most of the groups included at least one or two people who had previously called the NHTSA's Auto Safety Hotline and requested NCAP data.

Gender - Gender-specific groups--seven groups of men and eight groups of women--were used in order to identify any differences in the ways in which men and women in the groups viewed the importance of safety information, or assessed the information in the NCAP test materials. This also permitted identification of gender differences in responses to the advertisements.

Age - Age is also an important variable, but an examination of possible differences in responses by age was not within the scope of this project. People under 25 or over 55 years of age were not included in the groups.

People under 25 were excluded because few people in that age group can afford new cars. People over 55 were excluded to permit comparisons of parents of young children and non-parents of similar ages, since one purpose of the study was to determine whether parents of young children or those just starting to drive go about choosing a car differently from others.

Parental Status - Parents of young children were included to determine if they are more safety-conscious than people buying a new car for themselves. The participant screening process ensured that about half the participants had children under 18 years of age living at home.

Education - Participants represented a range of educational attainment levels. All participants had graduated from high school and most had at least some college or were college graduates. A few had advanced degrees.

Mileage - An effort was made to recruit high-mileage drivers. Because they spend more time in their cars it was assumed that they are more attuned to individual characteristics of the

automobiles they drive. High mileage drivers may be more concerned with certain automobile features. A few low-mileage drivers were included, but most participants drove more than the average number of miles. Men in the groups drove an average 19,500 miles per year, compared to a national average of 16,497 miles; women participants drove an average of 15,200 miles per year, compared to a national average of 9,438. The national average is based on the 1990 National Personal Transportation Survey.

2A.2.3 Participant Recruitment

Participants were recruited through a series of advertisements in local newspapers in the Washington, DC, Dallas, and San Francisco metropolitan areas. Callers who responded to these ads were asked questions included in an NCAP focus group screener.

Hotline callers were recruited by telephone. NHTSA provided lists of people who had previously requested NCAP data through the Auto Safety Hotline from each city. Potential respondents were told that this was a Department of Transportation study, given a brief description of a focus group, and an explanation of the scope of the study.

This procedure was followed to establish the credentials of the recruiters and to encourage Hotline callers to participate.

Interested Hotline callers were asked the questions in the focus group screener. A total of 22 Hotline callers participated in the study.

2A.2.4 Site Selection

In order to ascertain possible geographic differences in attitudes and perceptions relating to automobiles and automobile safety, groups were conducted in three geographic areas of the country: the East, the Southwest, and the West. Washington, DC, Dallas, and San Francisco were selected.

2A.2.5 Moderator's Guide

Each of the groups was led by an experienced moderator. A Moderator's Guide served as an outline for the group discussions. It included four sections:

- introduction, including factors considered when buying a car,

- discussion about a draft NCAP Crashworthiness Chart (NCAP Chart - see Figure 5)

- discussion on the MY 1993 NCAP news release data sheets (NCAP data sheets - see Appendix B), and

- discussion concerning the draft NCAP radio and print advertisements (see Appendix B).

The sessions opened with participants stating their names and the approximate number of miles they drove each year. The moderator then initiated a discussion of the importance of safety in their decision to buy a new car. After the participants became familiar with the NCAP data they were asked to identify effective ways of creating public awareness of the Auto Safety Hotline and the existence of NCAP data.

Participants discussed their opinions of the draft NCAP Chart and its accompanying cover page. A sample of this chart is shown in Figure 5. The discussion was designed to assess the clarity and usefulness of the information on the chart, as well as participants' reactions to the chart format.

NCAP data sheets were discussed next. Respondents discussed the clarity and usefulness of the data sheets both independently and as a supplement to the crash test chart. They also suggested ways to make this information easily available to the public.

Hotline callers discussed their experience with the Hotline in obtaining NCAP information and the usefulness of the information they received.

US Department of Transportation

NEW CAR CRASHWORTHINESS

HOW TO USE THIS CHART

Crash tests measure three principal forces involved in driver and passenger injury: sudden deceleration, impact, and load. To simplify the results on the chart, the measurement of forces against the head and chest were plotted against a curve that measures the likelihood for serious injury. Each car's score indicates how well the car protects its occupants against injury in a 35 mph frontal crash test.

Cars should be evaluated against other cars within their own weight class. If a light car collides head-on with a heavier car at 35 mph, the occupants in the lighter car will experience a greater likelihood of injury than the results of this test indicate.

1-4 High numbers indicate greater potential for serious injury and less protection. For instance, if a car scores 3 on the chart in either the driver or passenger category, there is up to a 50% chance of serious injury. A serious injury is considered to be one requiring immediate hospitalization and may be life-threatening.

1 = 10% or less chance of serious injury
2 = 10% to 25% chance of serious injury
3 = 25% to 50% chance of serious injury
4 = 50% or greater chance of serious injury

o Normally the chance of head injury resulting from sudden deceleration without impact will not be as high as the chance of head injury resulting from impact. However, sometimes the score for sudden head deceleration without impact is the highest score recorded during that crash test. To indicate these non-impact occurrences, the score is denoted by an open circle. Please see Head Injury on the New Car Assessment Program Results for more details.

* There are several types of seat belts being offered in new cars. Shoulder belts that are adjustable are often more efficient and comfortable.

1993 LIGHT PASSENGER CARS
(2000–2499 lbs.)

VEHICLE	TYPE	POSITION	LEVEL OF PROTECTION (The lower the number, the better the protection) 1	2	3	4	FEATURES AIR-BAGS	ADJUSTABLE BELTS*	ANTI-LOCK BRAKES
Geo Storm	2-Dr. HB	Driver	•				•		
		Passenger		o					
Ford Escort	2-Dr.	Driver	•						
		Passenger	•						
Hyundai Excel	4-Dr. Sedan	Driver		•					
		Passenger	•						
Toyota Corolla	4-Dr. Sedan	Driver		•			•	•	OPT
		Passenger	•					•	
Isuzu Stylus	4-Dr. Sedan	Driver		•			•		
		Passenger	•						
Nissan Sentra	4-Dr. Sedan	Driver	•						OPT
		Passenger	•						
Acura Integra	4-Dr. Sedan	Driver	•						OPT
		Passenger	•						
Hyundai Excel	2-Dr. HB	Driver	•						
		Passenger	•						
Saturn SL2	4-Dr. Sedan	Driver		•			•		OPT
		Passenger		o					
Mazda Protege	4-Dr. Sedan	Driver		•					
		Passenger		•					
Toyota Celica	2-Dr.	Driver		•			•		OPT
		Passenger	•						
Hyundai Scoupe	2-Dr.	Driver		•					
		Passenger	•						
Mazda Miata	2-Dr. Conv.	Driver		•			•		OPT
		Passenger	•						

Figure 5. NCAP Crashworthiness Chart

The remainder of the session was spent assessing the effectiveness of two radio public service announcements and two print public service announcements designed to inform the public about the existence and availability of NCAP crash test data. Participants discussed a series of issues about each public service announcement--things they liked, or disliked, whether they thought the public service announcement was effective, and ways of improving it.

2A.2.6 Test Materials

The New Car Assessment Program Cover Page - Participants were given a brief description of the NCAP crash tests and the New Car Assessment Program. Three key points were covered in this section:

- the test consists of a 35 mph head-on crash into a fixed barrier,

- the crash simulates a head-on crash between two vehicles of the same weight, each travelling at 35 mph, and

- vehicle occupants are wearing seat belts.

A description of the draft NCAP Chart was also provided.

The Draft NCAP Chart - The chart used during the focus groups was derived from the HIC and chest Gs obtained in the crash tests. The purpose of the chart was to provide consumers with a quick, simplified, single point of comparison to evaluate the new cars listed.

A scale[4] was selected that related the probability of sustaining an injury to how well a car protected its occupants from receiving such an injury. This scale was called the Level of Protection Scale on the chart and the four points on that scale were equivalent to the increasing chances of severe injury. It was noted on the chart that the lower the number, the better the protection. Cars with a 10 percent or lower probability of severe injury were assigned a #1 level of protection; cars with a 11 to 25 percent probability of severe injury, a #2 level of protection; cars with 26 to 50 percent probability of severe injury, a #3 level of protection, and cars with a 51 percent or greater probability of severe injury received a #4 level of protection.

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[4]This scale is based on injury assessment curves, as given in the Society of Automotive Engineering (SAE) Paper No. 851246, "The Position of the United States Delegation to the ISO Working Group 6 on the Use of HIC in the Automotive Environment," P. Prasad and D. Viano and in the SAE Paper No. 902338, "Assessing the Safety of Occupant Restraint Systems," D. Viano and S. Arepally, and relates HIC and chest G scores to the probability of life-threatening, AIS 4 and greater, injury. (See Section 1 for a discussion of AIS levels.)

Non-impact HIC[5] - Of the two scores for each test car, HIC and chest G, the higher of the two was used to determine the car's rating on the chart's Level of Protection rating. The scores were not added or combined.

When a non-impact HIC score was the higher of the two scores, the chart indicated non-impact HIC with an open circle in the Level of Protection rating. In general, during a vehicle crash, the risk of injury is reduced if contact between the occupant head and interior surfaces is prevented. If a car had a non-impact HIC rating, but the chest G score was higher, and therefore responsible for the car's rating on the Level of Protection scale, the non-impact HIC was not noted.

As a service to the reader, available safety options were included on the chart to identify cars with optional safety features. A note about the availability of different types of seat belts was also provided.

The NCAP Data Sheets - The data sheets contained the crash test scores, as provided in the MY 1993 NCAP news releases. These sheets presented the HIC and chest G scores in tabular form and the HIC scores as a bar graph to illustrate relative likelihood of head injury.

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[5]A non-impact HIC score indicates the dummy's head did not strike any interior surfaces of the vehicle in the crash test.

NCAP Potential Promotional Materials - Two radio public service announcements and two print public service announcements were supplied by NHTSA for testing in focus groups. Their basic message was, "Call NHTSA for free auto safety information."

2A.3 Findings

2A.3.1 General

Desired Features - The moderator opened each discussion with what participants looked for when choosing a new car once they had decided on price and type of car (e.g., a four-door sedan). A number of things were mentioned, the most common being reliability; economic factors such as fuel economy, repair costs, and resale value; and safety. Comfort, interior space, ease of handling, and style were also mentioned.

Safety Features Sought - Safety or specific safety features were regarded as important by all groups, with women somewhat more likely than men to cite safety as one of the features they sought.

Few respondents mentioned crash test results--largely because few knew at the beginning of the focus groups that such information was available. When asked what safety characteristics they want

information about, both men and women mentioned anti-lock brakes the most, followed closely by air bags. At the end of the sessions, however, when participants were asked to rank nine automobile characteristics in order of importance in choosing a car, crash test results ranked number one in importance for women and number three for men, somewhat ahead of anti-lock brakes.

Women with children mentioned that they would look for specific safety features such as child safety locks and child safety seats when buying a car. They also mentioned wanting large, heavy cars for protection in a crash. Some of the men said that while safety was less important than certain other features in cars they drove themselves, it was the most important in cars for their wives and children.

A few participants commented that since all cars had to meet certain safety standards, buyers could take safety for granted and, therefore, could pay more attention to other features such as styling or comfort.

Sources of new car information - Most participants said they talked to other people about cars they were considering. Many said they also did further research. Auto magazines were a popular source of information. Some respondents said they purchased auto magazines only when planning to buy a new car. Other sources mentioned included the library, AAA, *The Car Book,*

The Car Buyer's Guide, newspapers, and popular magazines. A few respondents mentioned that before they buy a car they rent the make and model they are interested in to see if they like it. *Consumer Reports,* insurance agents, and auto magazines were the most popular sources of information.

Availability of information - Most agreed that safety information produced by Federal agencies should be available at automobile dealerships. They felt that automobile dealers should be required by law to furnish such information to prospective customers. It should be noted that respondents were quick to point out that they would mistrust dealers as the source for this kind of information, but they would believe the data to be true if it was made clear it had been provided by a government agency.

Participants also suggested placing a safety rating number on new car stickers, in auto brochures, in owners' manuals, and in auto advertisements. Someone suggested that if no single standard rating could be developed, new-car stickers might carry an 800 number that prospective customers could call for safety information. Insurance companies were also suggested by all the groups as a channel for distributing Federal safety information. Some suggested that the information could be mailed along with premium notices.

Other recommendations for placement of information included; libraries, departments of motor vehicles, post offices, institutions which make car loans (such as banks and credit unions), AAA offices, new car shows, and other public places such as supermarkets, shopping malls, and doctors' offices.

Suggested print outlets included *Consumer Reports*, April issue (dealing entirely with new cars), car safety handbooks, the *Bluebook*, auto magazines, *The Car Book*, and newspapers and popular magazines.

Safety Information Sought - Most participants seriously considered the comparative safety and safety features afforded by different makes and models of cars. They were interested in specific safety features--anti-lock brakes, air bags, safety locks--offered on the different models. They wanted to know about crash rates for different models and about the protection afforded drivers and passengers in a crash. Parents of young children were especially concerned about the safety of back-seat passengers. Some said they checked on recalls of previous years' models.

Weight of the vehicle, strength of construction, and stopping distance after braking were other things participants said they wanted to know.

2A.3.2 Reactions To NCAP Information

NCAP Chart Materials - The chart evoked mixed reactions from the groups. They had no trouble understanding what the chart was about, and they regarded the information as valuable. Women were somewhat more likely than men to say that the information was important and useful. By and large, they liked the chart format, and agreed that the "Levels of Protection" were clear, easy to understand, and easy to use. However, the symbols and the explanatory notes were generally regarded as unclear, too technical, and confusing.

In a discussion of the chart, most respondents said that it gave information about the protection afforded the occupants in a head-on crash by various cars in a given weight class.

The meaning of the symbols was less clear. While participants had no difficulty understanding "Levels of Protection," almost no one understood the significance of the two symbols (a full circle and an open circle) that denoted head injury with and without impact, respectively. Most participants believed that a head injury was not possible unless there was an impact, therefore, "head injury without impact" was confusing. One respondent called the idea "preposterous." Though the groups spent

considerable time trying to work out an explanation for the symbols, in most cases they did not interpret them correctly.

Participants found the information useful, but they felt that this information alone was not an adequate indication of the safety of a car. As several respondents pointed out, the results of this test do not apply to other kinds of collisions. Many respondents said they would use the information to eliminate various cars from consideration, but would not purchase a car merely because it scored well on this particular test.

Although they regarded the level of protection score as an incomplete measure of auto safety, participants felt it was important information. Participants felt that a long, complicated explanation was unnecessary--all they needed to know was the Level of Protection.

In discussing what else they would like to know about the crash tests, some participants asked if the passenger category included back-seat passengers. Others participants wondered if every make and model of car sold in the U.S. is tested by NCAP, or only a sample; and others asked whether each model is tested several times or only once.

Additional Information - While respondents found the information in the chart important and useful, most regarded it as only a

beginning. Most participants felt that although the chart was helpful, it was not a true measure of protection on the highway.

They agreed that head-on collisions are rare in real life, and that a car's performance on the NCAP test tells nothing about how it will fare in other kinds of collisions. Most groups clearly called for information about side-impact and rear-end collisions, which they regarded as the most common. Some also wanted data on corner-to-corner collisions and rollovers.

A few wanted to know about back-seat passenger safety in all kinds of collisions, and they asked what kinds of factors (such as differences in design or construction) made some cars safer than others.

Group members were very concerned about driver and passenger safety in crashes at highway speeds, and between cars of different weights and of different makes and models. They asked if the Federal Government could use existing highway accident statistics to provide information about the relative safety of various makes and models in real-life accidents--preferably in a simple, non-technical form.

There was considerable enthusiasm for the idea of compiling all safety data (highway crash statistics as well as crash test results) into a single, standardized rating system which would

apply to all vehicles, and which could be read and comprehended at a glance by the consumer.

NCAP Data Sheets - The groups discussed the numerical data sheets. Most respondents disliked the data sheets. They found them overwhelming--too confusing, too technical, and too hard to read. Many participants said frankly that they would throw out the tabulated data without even attempting to read it. They found the explanatory note confusing and they had to flip back and forth repeatedly between this note and the data sheets.

Again, participants were confused by the numbers in parentheses (non-impact HIC) on both tabular data sheets and the bar graphs because most did not understand that there could be a head injury without impact.

At first glance, participants liked the bar graph format better than the tabular data. At closer inspection, they became more confused. They did not agree on whether the graph contained the same information as the tabular data; they did not understand the numbers in parentheses; and the footnote, "35 mph barrier crash tests represent a 70 mph closing speed," left most of them at a loss.

Participants were confused by the "Unlikely" and "Possible" headings on the bar chart, and in many cases misunderstood them.

Group members generally agreed that none of the information on the data sheets changed their understanding of the test results presented in the draft NCAP chart.

Most participants said they would not read the data sheets if they also had the chart, which they felt was much easier to understand. They said that the data sheets added nothing to their understanding of the chart.

2A.3.3 Reactions to NCAP Promotional Materials

Participants regarded the message from the promotional materials--that auto safety information is available free from the Federal Government--as important and valuable, something that they and other consumers would want to know about and be informed about. Their comments and criticisms dealt with the effectiveness of the materials in conveying this message, not with the message itself.

They expressed resistance to most product advertising and noted that they would be much more accepting of government-sponsored messages; thus, they emphasized that a reader or listener should be made aware at the outset that the safety information and the public service announcement itself comes from a Federal agency.

There was consensus that three elements should be included in every public service announcement concerning the NCAP program:

- a clear identification of the Federal Government as the source of the public service announcement,

- a prominent statement that the information is free, and

- a conspicuous and easy-to-remember 800 number.

Participants also said they would more likely read or listen to an ad when it was clear something was being offered for free. They suggested that the word "free" be featured prominently in any public service announcement regarding the availability of NCAP's crash test data.

Participants said they do the majority of their radio listening in their cars, and assumed most other people do too. Because it is so difficult to write down a phone number while driving, participants insisted that providing an easy-to-remember, catchy phone number in the radio public service announcements was very important. They also said it would be helpful to display the easy-to-remember 800 number in a conspicuous place on the print public service announcements.

Patterns of response to the materials were fairly consistent across all the groups. All groups strongly suggested emphasizing the fact that the information is free, and again stressed the importance of an easy-to-remember phone number.

2A.4 Conclusions and Recommendations from the Focus Group Study

While women seemed to place somewhat more emphasis on auto safety than men, safety was of major importance for both men and women, both for themselves and for their families. Participants said they spent considerable time and effort in obtaining information about the safety characteristics of cars they were considering for purchase.

Many respondents said they would like a standard rating system that would apply to all new cars sold in this country, based on a combination of standardized crash tests and highway accident data. There was considerable support for requiring that this rating be displayed on all new car stickers.

Recommendations relating to the NCAP tests, presentation of the test results, distribution and placement of this information for use by consumers, and advertising to increase public awareness of the program are listed below and discussed in the study report.

- Continue and expand the NCAP program. Consider conducting additional kinds of crash tests, and include measures of potential injuries to rear-seat passengers.

- Present information on crash tests in a form that is non-technical and as short and simple as possible.

- Prepare a cover page for the NCAP Chart which describes the testing program.

- Retain the NCAP Chart with some changes.

- Send tabulated data (HIC and chest G scores) to anyone who requests information to supplement the "level of protection" ratings in the NCAP Chart.

- Provide NCAP data at a variety of locations frequented by new-car buyers.

- Furnish NCAP data to publishers of magazines and newspapers; those publications commonly consulted by new car buyers cited by participants included: *Consumer Reports*, car magazines, newspapers, and general-interest magazines.

- Maintain up-to-date information concerning consumers' preferred sources of information on the crashworthiness of new cars.

- Develop a partnership program with auto-safety advocates to promote wider use of NCAP test results.

- Explore possible enhancements of NCAP coverage by the press.

- Identify the Federal Government clearly and conspicuously as the source of the information and the public service advertising.

- Emphasize that the safety information provided by NCAP is free.

- Choose an 800 number that is easy to remember, and display it prominently in any promotional materials.

Section 2B. Media Survey

Section 2B. Media Survey

2B.1 Background

Over the past few years, NCAP has lost some of its appeal to the general press. NHTSA has made improvements to the NCAP press release, highlighting impact and non-impact HIC as well as differentiating between dummy contact with and without an air bag. The press releases also contain more explanation concerning interpretation of the test results. However, the media did not respond in a positive manner by giving NCAP more coverage. NHTSA expanded the video tape coverage of the test vehicles. But this did not increase the request level from the television media.

This situation was highlighted within NHTSA as one of the problems that required attention when the FY 1992 Senate and Conference Appropriations Reports required NHTSA to utilize a variety of new methods in making the NCAP information more useful as a market incentive. In its February 1992 NCAP report to the Committees, NHTSA stated that it would initially conduct a survey of the automobile and general media in the Washington, DC, area. The objective of the survey was to determine what improvements can be made to the NCAP information that will motivate the media to promote it. NHTSA recognizes the limitations of this survey,

but it is the beginning of an ongoing response to the needs of the media.

2B.2 Is NCAP Still Newsworthy?

NHTSA's Office of Public and Consumer Affairs conducted a questionnaire guided interview of six of the key reporters that routinely cover automotive safety issues for the National Press Corps based in Washington, DC. The six reporters were selected because, collectively, their work has national exposure. They represent the national wire services, daily newspapers in Detroit, New York City, and Washington, DC, and automotive industry trade publications. Also, these individuals are knowledgeable about the detailed aspects of the NCAP.

The verbal comments from the reporters were collected using an 11 question survey. The survey questions are listed below:

1. How would you rate the newsworthiness of a release of new NCAP results?

2. Do you think the perceived newsworthiness of NCAP results has declined from past years?

3. Do you believe that the NCAP results are taken by your readers/listeners/viewers to be a useful index of an automobile's safety?

4. In your view, do the limitations of the NCAP test procedure as described in the NCAP press release discourage readers from taking the test seriously? (e.g., full frontal crash only; no applicability across weight categories; no demonstrated linkage to real world experience.)

5. Are the purpose and limitations of the NCAP test presented clearly in the current press release text?

6. Are the charts understandable and helpful?

7. There is now little variation between vehicles tested, with most test results coming in well below the thresholds NHTSA identifies as significant -- 1,000 HIC and 60 Gs of chest deceleration. Does this lack of variation make it more difficult for you to produce news stories with an interesting lead?

8. What changes could be made in the presentation of the NCAP data to make the release of each new report a more newsworthy event?

9. NHTSA makes no interpretation of the NCAP test results beyond presenting them in tables and graphs. Should NHTSA go further in highlighting aspects of the tests or in explaining why a test produced a certain result?

10. Should NHTSA explore other forms of NCAP testing, such as side impact or rear impact tests? Would this create significant new public interest?

11. Fatality rates for small cars per number of cars registered are much higher than for large cars. Is NHTSA doing a disservice to people interested in buying a safe car by minimizing the relative danger of smaller vehicles in the current NCAP presentation?

2B.3 Survey Findings and Recommendations

Opinions on the program varied widely. One reporter characterizes the program as a source of misinformation, while another reporter believes that consumers can never get enough information on automobile safety and the NCAP results are used to respond to the many readers who contact him by phone.

In general, the reporters who continuously cover NHTSA and NCAP seem to be quite familiar with the scope and limitations of the program. They have worked out methods of adapting the story to

their own media. But, they are divided on the usefulness of the program. They are looking for more unity, context, and interpretation of the numbers. They want more clarification. They need information that is clear and understandable.

One common theme was that they understand why NHTSA releases the test results in small batches, but it creates some problems for them in comparing, interpreting individual results, and presenting newsworthy information. A wire service reporter said that often she will not write a story on a specific NCAP release, preferring instead to combine it with another release. She does this because she usually presents the story on which car did best and which did worse. She does not think it is fair to make the comparisons in small batches. If she calls attention to the worst car in a batch, she is concerned that everyone in the next batch may be worse than the one she picked on. However, she says she would not want us to hold back on releases of new test results.

A reporter for a trade paper also commented on the small number of vehicles in each press release. But he agreed that the releases should not be withheld or lumped together in larger groups. His readers in the industry require that the numerical test results be immediately reported because they want to see the results as soon as possible for the vehicles they build and those of their competitors. He said his audience is expert enough to

understand all the caveats relating to the program. They are interested in seeing the numbers to gauge their effect on the safety conscious consumers and to make comparisons with other manufacturers' vehicles.

He notes that NHTSA groups pickup trucks, vans, etc., in each release and he thinks it is a good idea because it enables comparisons and enhances understanding.

One reporter suggested that NHTSA make two releases, one for the media and another for the general public in a simplified form. However, he does not pay any attention to the femur loads and chest Gs. He also suggests there should be material made available on trends in the numbers, showing how a given manufacturer had improved a particular model over the years.

On the question of additional interpretation, all reporters agreed it could be useful. There is still a genuine problem that the HIC number is a difficult concept to explain. They understand the need for three pages of extensive explanation and caveats, but it does not make their job easier. They receive complaints from manufacturers constantly about oversimplification or unfairness. The wire service reporter looks for outside interpretation of the figures from various experts to put the results in context.

One reporter suggested that NHTSA hold a press conference to discuss all of the tests and provide some analysis of trends. This could be scheduled for the end of the program each year or planned for releasing the final test results each year. He referred to the news conference held by Jack Gillis, author of *The Car Book*, as an example that the NCAP program can be general interest news as well as a source of controversial automobile safety issues. When asked, most reporters concurred on the value of a news conference summarizing the year's events.

Most of the reporters expressed some curiosity about side impact NCAP or rear impact tests. While they disagreed on whether this would significantly heighten public interest, they did agree that additional test modes would broaden the appeal and desire for the test results.

Nearly all the reporters discount the idea that the variation between vehicles is too low and, therefore, insignificant. They want to report on the differences that exist.

Section 2C. Review and Proposed Implementation of Focus Group and Media Recommendations

Section 2C. Review and Proposed Implementation of Focus Group and Media Recommendations

2C.1 Review of Recommendations

NHTSA has reviewed the recommendations from the focus group participants and the media. The review was conducted to determine which recommendations from both entities would produce the largest increase in consumer usage of the test results while requiring low initial funding. Also, NHTSA sought recommendations that would improve consumer and media interest in the program.

One often-heard recommendation was to make the presentation of the test results simple and easy to understand:

Consumers - *Present information on crash tests in a form that is non-technical and as short and simple as possible.*

Media - *Need information that is clear and understandable.*

This recommendation became the primary goal because it also met NHTSA's main objective - *Something that would produce the largest*

increase in consumer usage of the test results while requiring the least initial funding.

When participants in the focus groups were asked which sources they sought for new car information, the majority responded by listing various publications; i.e., books, magazines, and newspapers. Some stated that they talked to other people about the cars they were considering. But *Consumer Reports* and auto magazines were their most popular sources of information. This confirmed NHTSA's contention that the print media is an important avenue to disseminate NCAP test results. Thus, more emphasis should be directed toward promotional products that can be easily utilized in various types of publications.

Reporters who were surveyed concurred in the recommendation that a news conference should be held at the end of each year's NCAP. This would fulfill many of their needs for access to more information.

The focus group participants felt that head-on collisions are rare in real life, and that a car's performance on the NCAP test tells nothing about how it will fare in other kinds of collisions. Most groups clearly called for information about side-impact and rear-end collisions, which they regarded as the most common. Some also wanted data on corner-to-corner collisions and rollovers.

The participants and the reporters strongly recommended that NCAP should include other modes of crash testing:

> Consumers - *Consider conducting additional kinds of crash tests, and include measures of potential injury to rear seat passengers.*

> Media - *Additional test modes would broaden the appeal and desire for the test results.*

This recommendation requires a major increase in the program's budget. NHTSA has developed a side impact test procedure and is prepared to begin the program when funds are appropriated. Approximately $40 thousand will be required to purchase a vehicle and to conduct each side impact test.

2C.2 Implementation of the Recommendations

In the FY 1994 budget, NHTSA requested and received $250 thousand to implement new NCAP promotional methods and dissemination efforts recommended by the focus groups and the media survey. Based on NHTSA's review of the recommendations, the following efforts have been selected. The breakdown below gives details of these efforts and the anticipated expenditures.

- A consumer brochure will be developed in a computerized format that will permit easy updating. This format will also be adaptable to print media requirements. The brochure will utilize an easy to read and simple presentation technique. It will contain a description of NCAP and the comparative results from the vehicle tests. It will clearly state that these data were developed by the Federal Government and additional information may be obtained by calling a toll free hotline number. This initial development of the brochure will require a one time expenditure of $50 thousand.

- The NCAP brochure will be reproduced for dissemination at strategic consumer locations. In addition to making it adaptable for media publication, NHTSA is deliberating the feasibility of distributing it through existing networks to local and state organizations (Public Health Departments, Departments of Motor Vehicles, Law Enforcement Organizations, etc.), to insurance companies and associations, to consumer groups, and at public events (automobile shows, etc.). Annual cost for this printing and distribution effort will be $110 thousand.

- NCAP promotional efforts will be expanded. The draft public service radio and print media announcements, developed in FY 1993, will be revised based on the focus group comments. Simple public service video press releases will be developed from NCAP test films. These promotional materials will be furnished to

media commonly consulted by new car buyers, as cited by focus group participants, including: *Consumer Reports*, car magazines, newspapers, and other automobile publications. Annual costs for these promotional efforts will be $90 thousand.

- The NCAP news releases will be continued as in past years. However, these releases will use a simplified format based on recommendations by the focus group participants[6]. A copy of the first FY 1994 NCAP news release with the simplified format is included as Appendix C. An automated fax system will be investigated to allow improved response to consumer requests for the simplified data as well as the detailed test results.

- NHTSA also is considering the recommendation that a news conference be held at the end of each year's NCAP. This would fulfill many of the media's needs for access to more information.

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[6]After NHTSA review, some changes have been made to the simplified format that was used in the focus groups. These changes further simplify the data presentation and are based on the combined effects of HIC and chest Gs. In the press releases, NCAP results are reported in a one to five star classification system, with five stars indicating the best crash protection. In addition, NHTSA is considering holding a public meeting to allow further review of this simplified format as well as NCAP future activities. More information on this public meeting is given in Section 5.6.

Section 3. Real-World Correlation with NCAP Test Results

Section 3. Real-World Correlation with NCAP Test Results

3.1 NHTSA's Approach in Comparing NCAP Results to Actual On-the-Road Injury and Fatality Risks

In response to the Committees' request to compare the results of NCAP data from previous model years to determine the validity of these tests in estimating the risks of actual on-the-road injuries and fatalities over the lifetime of the models, NHTSA has continued to examine data contained in individual state files, NASS, and the Fatal Accident Reporting System (FARS). In addition, studies have been conducted of hard-copy accident files to evaluate and compare on a one-to-one basis the performance of specific models which have been tested in NCAP and also have been involved in severe real-world frontal crashes.

3.2 The Use of State Files in Real-World/NCAP Studies

Individual states maintain police-reported accident data files. These files provide the largest existing number of real-world crash events of any file. These files have been examined relative to the study of NCAP correlation to real-world crashes. NHTSA has concluded that, presently, these files have two major shortcomings that have limited their use in this study. First,

injury coding is based only on the police officer's judgment at the scene of the accident and is often not a reliable estimate of the actual severity level of an injury or its threat to life. Secondly, the recorded use of safety belts by the occupants is subject to significant bias since, in most crashes, it is based on a statement by the crash victim and may not be supported by physical evidence. Even with these shortcomings, NHTSA will continue to examine the possible use of these data because their large sample sizes make them useful for statistical analyses.

3.3 The Use of NASS in Real-World/NCAP Studies

NASS contains extensive information on selected real-world crashes. However, the amount of crash information on individual makes and models remains inadequate for studying correlations to NCAP results. The major importance of NASS is the nationally representative detailed information on types and causes of injury, crash speeds, and crash configurations. These detailed data are used to establish and support vehicle and highway safety priorities.

The detailed data in the NASS file were examined to determine how the NCAP test conditions relate to real-world crashes. Two of the more important crash parameters for frontal crashes are the change in velocity (delta V) which occurs during the impact and the impact configuration. As previously noted, the NCAP tests

result in delta Vs of approximately 40 mph and the NCAP crash configuration is a full-frontal barrier impact.

Crash Severity--In Figure 2, Section 1, the distributions of injury and fatality versus delta V as found in the NASS file for restrained drivers in frontal towaway crashes are given. These data indicate that almost 60 percent of the fatalities and approximately 90 percent of the serious injuries for restrained drivers occur below the NCAP delta V of 40 mph. Assuming that NCAP results reflect the relative potential safety that a vehicle provides for belted occupants within 5 mph of the NCAP delta V (i.e., the NCAP data are applicable from 35- to 45-mph delta V), nearly 50 percent of the fatalities occur within this range.

Crash Type--The NCAP test configuration is based on FMVSS No. 208. This configuration is a full-frontal crash into a fixed-rigid barrier. This is approximately the same as two similar vehicles colliding head-on. Such collisions result in extensive damage across the full front of the vehicle and expose the occupants to high forces which must be effectively controlled by the restraint systems and the gradual deformation of the vehicle structure in order to prevent serious or fatal injury.

In Figures 6 and 7, NASS data provide insight into the relationship of real-world crash configurations to this laboratory test condition.

In Figure 6, it is seen that more than 70 percent of the real-world frontal crashes which result in AIS 3 or greater injuries have a direction of force of 12 o'clock or head-on. In Figure 7, it is shown that 54 percent of the frontal crashes have induced or direct damage across the full front of the vehicle and another 27 percent have induced or direct damage which extends two-thirds of the way across the front of the vehicle.

These NASS data indicate that the FMVSS No. 208 and NCAP test configurations reflect closely the real-world frontal crash configurations which result in the largest number of serious injuries and fatalities.

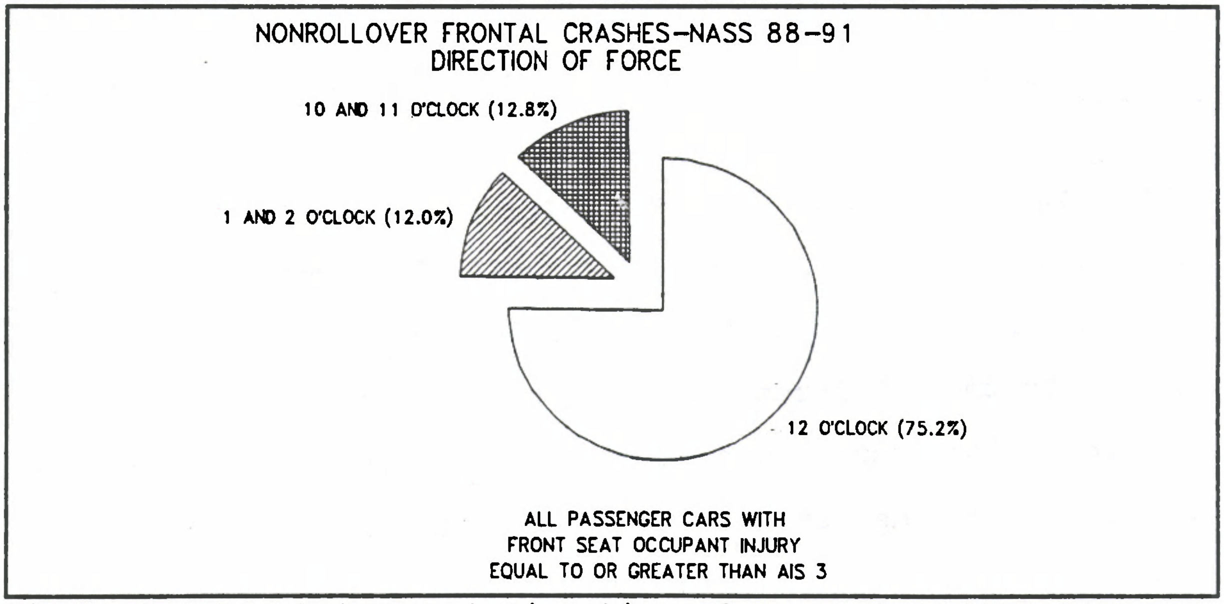

Figure 6. Frontal Impact Direction of Force from 1988-1991 NASS - Retrained and Unrestrained Front Seat Occupants

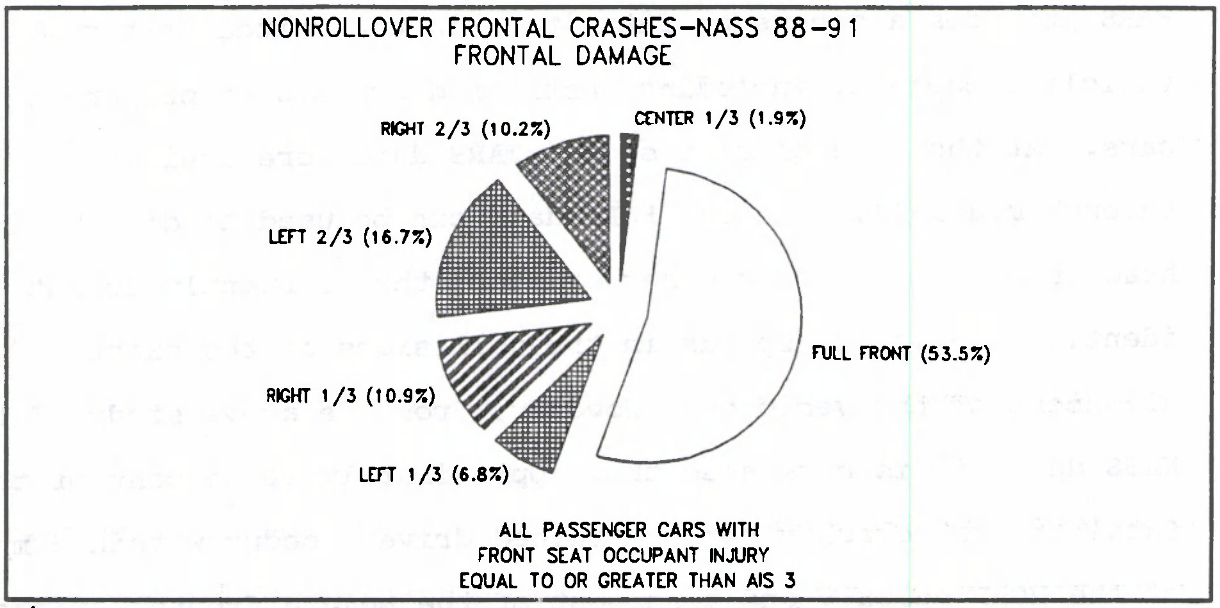

Figure 7. Frontal Impact Damage Pattern from 1988-1991 NASS - Restrained and Unrestrained Front Seat Occupants

3.4 The Use of FARS in Real-World/NCAP Studies

As noted, NASS data are very beneficial in determining the distribution of parameters such as the injury levels, delta Vs and crash configuration in the overall national crash patterns. However, the amount of data on specific vehicle makes and models is insufficient to evaluate the effectiveness of NCAP results in estimating actual on-the-road risk of injuries and fatalities. NHTSA has concluded that the accident data file in which this effectiveness can be reliably studied is FARS and, since FARS is a fatal accident file, this effectiveness can only be studied from the perspective of fatality reduction.

FARS provides a census of fatalities in the United States of vehicle occupants, including restrained drivers of passenger cars. At the time of this study, FARS data were available through mid-1992. Whereas FARS data can be used to distinguish head-on collisions from other crashes, they currently do not identify the impact speeds in the collisions or the exact alignment of the vehicles. However, from the above study of the NASS data, it is estimated that approximately 50 percent of the fatal frontal crashes for restrained drivers occur within 5 mph of the NCAP delta V and that most of the severe frontal crashes involve damage across a large portion of the front of the vehicle (as occurs in NCAP tests). However, there are many major differences between the NCAP controlled laboratory crash tests and real-world, head-on crashes. These include:

- differences between the physical characteristics of the human driver population and the anthropomorphic dummy (the dummy represents a 50th percentile male),

- injury and fatality risk variations due to age and sex, and

- location of the fatal lesions (injury parameters are measured only in the head, chest, and femurs of the dummies in NCAP).

Although the controlled test approximates a sizable portion of the fatal frontal crashes relative to crash severity, there

remains some 50 percent of the real-world events which are more than 5 mph greater than or less than the NCAP delta V. As a consequence, it is inappropriate to expect perfect correlation between NCAP test results and actual fatality risks from the FARS files. However, if there is significant correlation between the two, it suggests that the NCAP scores reflect, to some extent, actual crashworthiness in a range of crashes that goes beyond the specific crash conditions simulated in NCAP tests.

NHTSA's major occupant protection crash standard (FMVSS No. 208) is based on the premise that vehicles which have dummy HICs, chest G values, and femur loads below 1,000, 60, and 2,250 respectively, in 30-mph barrier crash tests will provide improved occupant protection in the real world as compared to vehicles that do not meet these criteria. This premise is accepted by the safety community and motor vehicle manufacturers. From this premise, it may be inferred that low dummy responses in NCAP tests at 35 mph should reflect better than average safety in real-world crashes, regardless of the inherent differences between real-world crashes and NCAP tests. NHTSA has concluded that FARS provides adequate data to determine whether this premise of improved safety with lower dummy responses is valid in the spectrum of real-world frontal crash events.

3.4.1 FARS Analysis: Car-to-Car Frontal Head-on Collisions

An extensive statistical study of FARS has been completed and will be published as a NHTSA technical report and presented at a safety conference[7] in 1994. This study focuses on head-on collisions between two passenger cars (Insufficient NCAP and FARS data are available to include light trucks, vans, and sport utility vehicles in this study). The goal of the analysis is to determine whether cars with high injury scores in NCAP tests had more fatalities than would be expected, given the weights of the cars, and the age and sex of the occupants involved in the crashes. A summary of findings of this statistical study is given in the following paragraphs.

The large diversity of fatality rates in accident data often reflects more on the types of people who drive the cars and how they drive them than the actual crashworthiness of the cars. For example, "high-performance" cars, popular with young male drivers, have an exceptionally high frequency of fatal crashes - because they are driven in an unsafe manner - even though they may be just as "crashworthy" (i.e., provide equal occupant

[7]The report is scheduled to be presented at the 14th International Technical Conference on Experimental Vehicles. This conference, co-sponsored by NHTSA and the host country, brings together the international safety community and world automobile manufacturers approximately every other year to share advancements in technical information and improvements in occupant safety.

protection in a given crash) as other models. The FARS statistical analysis objective was to attempt to isolate the actual crashworthiness differences between cars, removing differences attributable to the way the cars are driven, the ages of the occupants, etc., and then to determine if these crashworthiness differences on the highway correlate with NCAP performance as measured in controlled laboratory tests.

Since NCAP is a frontal-impact test, involving dummies protected by safety belts, this FARS study is limited to frontal crashes involving belted occupants. Only the FARS data for head-on collisions between two passenger cars, each with a belted driver, that resulted in a fatality to one or to both of the drivers, are used. A head-on collision is a special type of highway crash that is ideally suited for studying crashworthiness differences between two cars. Both cars are in essentially the same frontal collision. Whether one of them had a "safe" driver and the other an "unsafe" driver is of little relevance at the moment they collide head on. Which drivers die and which survive will depend primarily on the relative crashworthiness of the two cars, their relative weights, and the ages and sexes (vulnerability to injury) of the two drivers.

Head-on collisions between two passenger cars, with both drivers belted, were identified in the FARS file, through mid-1992. By using the Vehicle Identification Numbers and available vehicle

characteristics information, accurate curb weights of the cars were determined. Applicable NCAP results were then assigned to each relevant passenger car make and model in FARS. A file of 370 head-on crashes was created in which vehicle curb weights, drivers' ages and sexes, and NCAP results are known for each of the 740 passenger cars[8], and both drivers were belted. A total of 427 drivers were fatally injured out of the 740 drivers included in these crashes.

In each of these 370 crashes, at least one of the drivers received fatal injuries. And, in 57 cases, both drivers were killed. As stated, which of the drivers die and which survive will depend primarily on the relative crashworthiness of the two cars, their relative weights, and the ages and sexes (vulnerability to injury) of the two drivers.

In the FARS file, if car 1 and car 2 weigh exactly the same, and both drivers are the same age and sex, the likelihood of a driver fatality in a head-on collision would be expected to be equal in car 1 and car 2. More generally, if car 1 and car 2 have different weights, and their drivers are not necessarily the same

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[8]A major reduction in NCAP driver HIC values has occurred with the introduction of air bags. NHTSA expects that this significant improvement in occupant protection, due to air bags, will result in reduced risks in fatalities and injuries. However, only 3 percent of the 740 passenger cars in this study were equipped with air bags. Therefore, the positive effects of air bag protection are essentially not reflected in this analysis.

age, it is still possible to predict the expected fatality risk for each driver in a head-on collision between these two cars. Factors which establish the relationship between fatality risk and vehicle weight[9], and the drivers' ages and sexes were determined from the accident data.

Given a set of collisions, from this FARS file of 370 head-on crashes, in which car 1 always has lower NCAP scores (see definitions in Table 3) than car 2, the actual fatalities are tallied for the car 1s and the car 2s. The unadjusted actual fatality reduction for cars with the lower NCAP scores is the difference in these actual fatalities. The expected fatalities, based on the adjustments for car weight, age, and sex, are also summed up for the car 1s and the car 2s. The adjusted actual fatality reduction is the difference in actual fatalities relative to the difference in expected fatalities. In the analyses, both the unadjusted and adjusted actual fatality reductions are given to allow a comparison of the effects of these adjustments. Levels of statistical significance are derived for the adjusted fatalities relative to the unadjusted actual fatalities.

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[9]Adjustments for vehicle weights in car-to-car collisions, essentially, are adjustments to reflect the higher delta V that is experienced by the lighter weight car. For example, in a frontal head-on collision between a 2,000 pound car and a 4,000 pound car, the delta V for the lighter car will be twice that of the heavier car.

In Table 3, results of four statistical studies, Cases A, B, C, and D, are given, each of which uses two NCAP parameters, HIC and chest Gs, to distinguish "good" from "poor" performance. In the detailed technical report, HIC, chest Gs, and femur loads from NCAP test results are used in a variety of approaches. While the analyses using femur loads are not shown here, NHTSA wishes to point out that the detailed technical report does show similarly strong correlations between accident data and various combinations of femur loads with other injury measures. In Table 3, the following data for Cases A, B, C, and D are provided;

- average vehicle weight of car 1 and car 2,

- average drivers' age for car 1 and car 2,

- average drivers' HIC and chest G from NCAP for each car,

- the unadjusted fatality risk reductions for car 1 drivers as compared to car 2 drivers,

- the fatality risk reduction for car 1 drivers as compared to car 2 drivers adjusted by car weight and drivers' ages and sexes, and

- the level of statistical significance (one-sided p for the adjusted fatality risk reduction). A value of p equal to or less

than .05 indicates a significant reduction. A value of p less than .01 indicates a high level of statistical significance.

First, in Case A, all 370 events were examined by comparing the fatality risk for drivers of car 1, the car with the lower NCAP injury probability[10], to car 2. This comparison does not assure that vehicles designated as car 1 will have "good" NCAP results (i.e., HIC below 1,000 and chest Gs below 60), only that the drivers of car 1 have a lower maximum injury probability (to the head or chest) than the drivers of car 2. The injury probability is based on classification of NCAP results by utilizing the injury risk function curves as developed by GM and Ford. The drivers received fatal injuries in 199 of the vehicles which met the criterion while 228 fatalities occurred in car 2, the vehicle with the poorer NCAP performance. The expected numbers of fatalities, based on vehicle weight, driver age and sex, are 208 for car 1 and 217 for car 2. These values indicate a reduction in the fatality risk for the drivers of car 1 versus the drivers of car 2. The unadjusted reduction in actual fatality risk was

$$1-(199/228)=12.7 \text{ percent}$$

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[10] In the Society of Automotive Engineering (SAE) Paper No. 851246, "The Position of the United States Delegation to the ISO Working Group 6 on the Use of HIC in the Automotive Environment," P. Prasad and H. Mertz presented an injury risk function curve that relates the probability of an AIS≥4 head injury to HIC. In a 1990 SAE Paper No. 902338, "Assessing the Safety of Occupant Restraint Systems," D. Viano and S. Arepally expanded the application of this curve and provided the equations to calculate the probability of AIS≥4 injury to the head and chest.

and the adjusted reduction in actual fatalities was

$$1-[(199/228)/(208/217)]=8.7 \text{ percent.}$$

Case B in Table 3 provides the results from 170 events in which the drivers of car 1, the "good" performer, received HICs of 1,000 or less and chest Gs of 60 or less in the NCAP tests. That is, in the 35-mph NCAP test, car 1 met the FMVSS No. 208 criteria relative to head and chest requirements, whereas, car 2, the "poor" performer, exceeded one or both of these criteria. Fatalities occurred to 89 of the drivers in car 1 and 111 in car 2. Expected fatalities were 96 and 104, respectively. These values indicate a significant reduction in the unadjusted and adjusted fatality risks. The reduction in actual fatality risk was calculated to be 19.8 percent (unadjusted) and 13.5 percent (adjusted for vehicle weight, driver age, and sex).

For Case C, car 1 continued to be defined as in Case B, but the "poor" performer, car 2, is defined as having drivers' HICs which exceed 1,200 and/or chest Gs which exceed 70 in the NCAP tests. In the FARS data, cars in 104 head-on crashes meet these criteria. In comparison to Case B, Case C eliminates 66 collisions between cars in which the "poor" performer, car 2, had a driver's HIC greater than 1,000 and less than 1,201 and/or a driver's chest G greater than 60 and less than 71, and the "good" performer, car 1, met the FMVSS No. 208 HIC and chest G requirements in the NCAP tests. Fatalities occurred to 50 of the

Table 3. Summary of Real-World NCAP Effects Based on FARS Analysis of Car-to-Car Head-on Collisions

Parameter	Car No.	Case A*	Case B*	Case C*	Case D*
Average Vehicle Weight	1	2837	2920	2941	2944
	2	2802	2769	2769	2761
Average Drivers' Age	1	42.0	43.7	42.2	46.4
	2	42.5	41.1	41.0	43.5
Average Drivers' HIC from NCAP	1	721	747	742	712
	2	1117	1339	1609	1465
Average Drivers' Chest G from NCAP	1	45	46	45	43
	2	53	56	55	59
Reduction in Fatality Risk-Car 1 versus Car 2-Unadjusted FARS Data	1	12.7%	19.8%	29.6%	32.8%
Reduction in Fatality Risk-Car 1 versus Car 2-FARS Data Adjusted by Car Weight, Drivers' Ages and Sex	1	8.7%	13.5%	19.2%	26.7%
Level of Statistical Significance (one-sided p)		.053	.035	.017	.002

*Case A - Car 1 has a lower life-threatening injury risk to the driver than car 2 in NCAP test.

*Case B - Car 1 has a HIC value less than 1001 and a chest G less than 61 in the NCAP test. Car 2 has a HIC value greater than 1,000 and/or a chest G greater than 60 in the NCAP test.

*Case C - Car 1 has a HIC value less than 1,001 and a chest G less than 61 in the NCAP test. Car 2 has a HIC value greater than 1,200 and/or a chest G greater than 70 in the NCAP test.

*Case D - Car 1 has a HIC value less than 901 and a chest G less than 56 in the NCAP test. Car 2 has a HIC value greater than 1,250 and/or a chest G greater than 65 in the NCAP test.

drivers in car 1 and 71 of the drivers in car 2. Expected fatalities were 57 and 65. These events give even more substantial reductions in the unadjusted actual and adjusted fatality risks of 29.6 percent and 19.2 percent, respectively.

In one additional example, Case D, car 1 ("good") is defined as having drivers' HICs not to exceed 900 and chest Gs not to exceed 55 in NCAP. Car 2 ("poor") is defined as having drivers' HICs greater than 1,250 and/or chest Gs greater than 65 in NCAP. A total of 81 events met these requirements. Fatalities occurred to 39 of the drivers in car 1 and 58 of the drivers in car 2. Expected fatalities were 46 and 51. Reductions in the unadjusted and adjusted fatality risks for drivers of car 1 were 32.8 percent and 26.7 percent, respectively.

In summary, data in Table 3 provide an overview of the car-to-car crash events from FARS. For each of the four cases, there is little difference between the average curb weights for car 1 and car 2, the average drivers' ages are very similar, and, as expected, average HICs and chest Gs are very different depending on the definition of "good" and "poor" cars. With the small differences in average curb weights and average drivers' ages, the comparison of the reductions in unadjusted and adjusted fatality risks indicates that the findings are consistent (i.e., For Case A through Case D, there is a continuing trend of

decreasing fatality risks for the drivers of car 1 for both unadjusted and adjusted data.)

The reductions of fatality risk in Table 3 indicate that by making even a rough cut of NCAP vehicle performance, as in Case A, a positive correlation or trend is found between NCAP results and real-world, head-on collisions. These data provide statistically significant evidence that, when dividing the vehicles into traditional "good" and "poor" performers as defined by the HIC and chest G results from NCAP tests, strong correlations are shown between NCAP results and real-world crashes. Restrained drivers are at substantially lower risks of fatality in the "good" car. Depending on the definitions of "good" and "poor" cars, the reductions in fatality risks may be as large as 30 percent.

3.4.2 FARS Analysis: Car-to-Fixed Object Frontal Collisions

Concurrent with the car-to-car analysis, a more generalized study of FARS was conducted to determine if the trend of lower-fatality risks for "good" cars occurred in frontal crashes other than the car-to-car head-on collisions. In this analysis, the number of restrained drivers killed in single vehicle frontal, fixed-object collisions was obtained from FARS for each passenger car with applicable NCAP crash-test results. The fatality rates per

million vehicle years for the restrained drivers in the "good" and "poor" cars as defined, above, in Case B, Case C, and Case D were determined. Since the analysis is now referring to single-car crashes into fixed objects, there is no equivalent Case A.

The results from the three single-car crash studies are shown in Table 4 along with the average vehicle test weight, drivers' HICs, and drivers' chest Gs from NCAP.

Table 4. Summary of Real-World NCAP Effects Based on FARS Analysis of Car-to-Fixed Object Frontal Collisions

Parameter	Group No.	Case B*	Case C*	Case D*
Average Vehicle NCAP Test Weight	1	3183	3183	3150
	2	3197	3180	3202
Average Drivers' HICs from NCAP	1	722	722	676
	2	1315	1614	1435
Average Drivers' Chest Gs from NCAP	1	45	45	44
	2	58	58	62
Reduction in Fatality Rate-Cars in Group 1 versus Cars in Group 2-Actual FARS Data	1	19.2%	21.8%	35.7%

*Case B - Cars in Group 1 have HIC values less than 1,001 and chest Gs less than 61 in the NCAP tests. Cars in Group 2 have HIC values greater than 1,000 and/or chest Gs greater than 60 in the NCAP tests.

*Case C - Cars in Group 1 have HIC values less than 1,001 and chest Gs less than 61 in the NCAP tests. Cars in Group 2 have HIC values greater than 1,200 and/or chest Gs greater than 70 in the NCAP tests.

*Case D - Cars in Group 1 have HIC values less than 901 and chest Gs less than 56 in the NCAP tests. Cars in Group 2 have HIC values greater than 1,250 and/or chest Gs greater than 62 in the NCAP tests.

In this single car crash analysis, it is not feasible to adjust for driver age or vehicle exposure. Unlike the analysis of head-on collisions, this study does not adjust for differences in crash-involvement propensities. As was noted in Table 3, there is, on the average, little difference in the vehicle weights and driver ages of "good" and "poor" NCAP performers. Therefore, the results in Table 4 are from the actual, unadjusted FARS data. These results are a supplement to the statistical findings from the car-to-car, head-on crash analysis and should be compared only to the unadjusted data of the two-car crash analyses. These

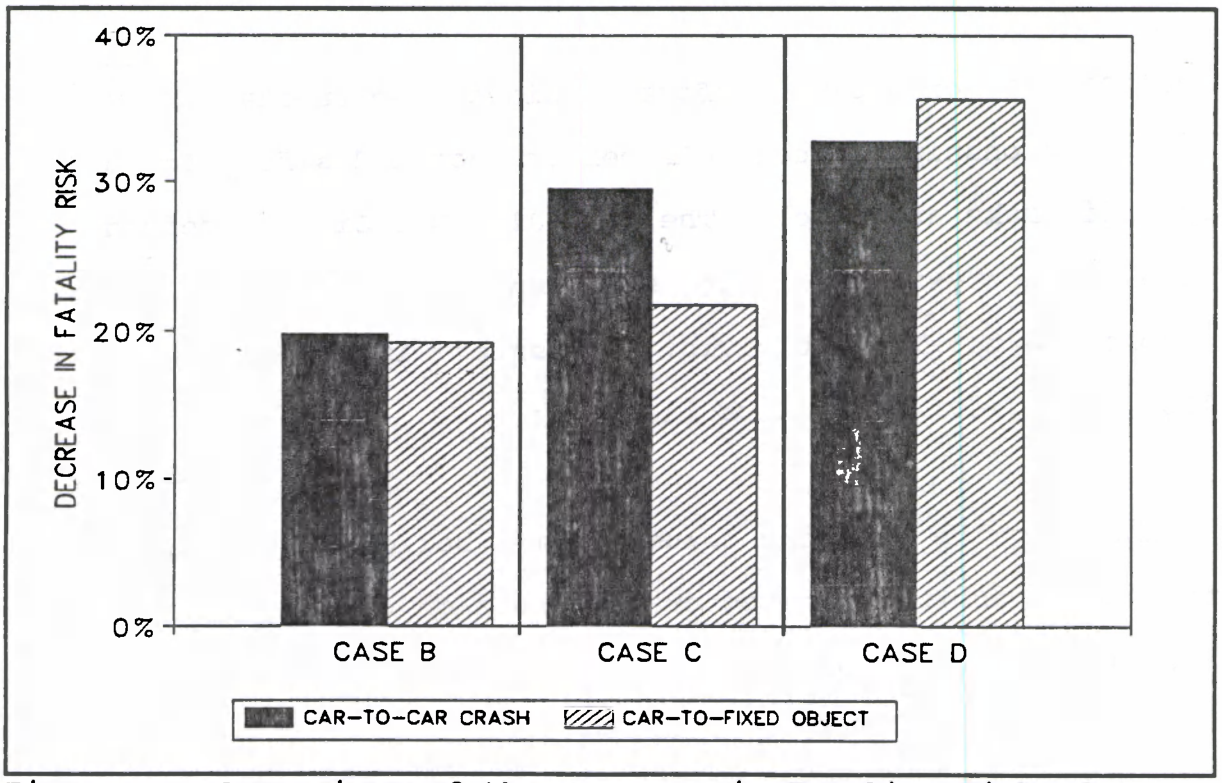

Figure 8. Comparison of the Decrease in Fatality Risks for "Good" Performing Cars in NCAP in Car-to-Car and Car-to-Fixed Object Collisions

comparisons are shown in Figure 8. Similar reductions in fatality risks for the drivers of car 1 are found. The statistical significance of these single car crash results cannot be ascertained because of unknown exposure factors. The results of this single-car crash study should be considered only as an indication as to whether the findings in the above car-to-car analysis may also be applicable to these other frontal crashes. The similar results, as shown in Figure 8, when compared to the car-to-car results continue to indicate a trend between "good" NCAP scores and decreased risks in actual highway accidents.

3.5 Study of a Specific Make and Model

The 1980-83 Honda Civic offers a unique opportunity to examine the relationship between NCAP performance and safety for a specific make and model. The MY 1981 Honda Civic received several safety-related changes to improve its NCAP performance as opposed to the MY 1980 Civic. The safety improvements to the MY 1981 (and later MY) Civics included:

- changing the steering column from a solid shaft to a telescopic shaft to reduce crash forces on the occupant through increased energy absorption and decreased intrusion,

- altering the steering column mounting brackets to reduce steering wheel and column intrusion,

- adding seat structure to reduce occupant submarining, and

- reducing belt spool-out by shortening belt length and adding a plastic collar on the retractor shaft, and by using different belt webbing material with lower elongation properties to keep occupants further away from the impact surfaces by reducing the occupant motion in a crash.

A comparison of NCAP crash-test scores for the MY 1980 and MY 1981 Civics in Table 5 shows the substantial reductions in the injury measures for the head and chest in the 1981 model Civic that resulted due to these improvements.

Aside from these specific, safety-related changes in MY 1981, the MY 1980-83 Civics are basically identical cars (a four year model run). That makes it possible to isolate the actual safety effects of changes related to NCAP from other changes that may occur when a make/model is redesigned.

Table 5. Comparison of Model Years 1980 and 1981 Honda Civic NCAP Test Results

Dummy Injury Parameter	Model Year 1980 Honda Civic	Model Year 1981 Honda Civic	Percent Reduction
Driver HIC	2626	607	77
Driver Chest G	54	41	24
Passenger HIC	1506	492	67
Passenger Chest G	47	35	25

An examination of the accident files was made to determine whether or not there was any statistical support for the proposition that the changes in the crashworthiness of 1981 Honda Civics, motivated by NCAP, were beneficial in the prevention of fatal injuries. A sufficient number of vehicles (MY 1980 and 1981-83 Honda Civics) had been on the roads for a period of time long enough to obtain statistical experience data.

In Table 6, a comparison of fatalities and fatality rates (for restrained front-seat occupants in frontal crashes in Honda Civics) in MY 1980 versus MY 1981-83 Honda Civics from the FARS file is given.

Table 6. Comparison of Model Year 1980 to Model Year 1981-83 Honda Civic Fatality Rates for Restrained Front Seat Occupants in Frontal Collisions-FARS Data (1982-1988)

Parameter	MY 1980 Honda Civic	MY 1981-83 Honda Civic
Exposure in Car Years	818,142	2,394,253
Fatalities (Restrained)	13	21
Restrained Fatality Rate/10,000 Car Years	0.153	.088
Reduction in Fatality Rate for Restrained Occupants in MY 1981-83 Civics	42.4 Percent	

The comparison found a 42 percent reduction in fatalities in the modified Honda Civics. This reduction in the fatality rate for a specific make and model continues to indicate the trend between

"good" NCAP scores and decreased risks in actual highway accidents.

3.6 Concluding Remarks on the Real-World/NCAP Studies

In these studies, NASS data have provided important information in evaluating the relationship of the NCAP test conditions to real-world crashes with the findings that:

- a large percentage of frontal crashes that result in serious injury have a direction of force and a frontal damage pattern similar to those in NCAP and FMVSS No. 208 tests,

- approximately 60 percent of the fatalities for restrained drivers occur below the NCAP delta V of 40 mph, and

- approximately 30 percent of the life-threatening injuries and 50 percent of the fatalities for restrained drivers occur within 5 mph of the NCAP delta V (35 to 45 mph),

These findings indicate that NCAP test conditions approximate real-world crash conditions covering a major segment of the safety problem.

From the FARS files, it has been feasible to determine that there is a significant correlation between NCAP results and real-world fatality risks for restrained drivers. Findings include:

- in car-to-car, head-on collisions between a "good" and a "poor" NCAP performer, reductions in fatality risk of the restrained driver of the "good" car may be as much as 30 percent lower than the fatality risk of the restrained drivers of the "poor" car. Significant reductions in fatality risk are found for a wide variety of definitions of "good" and "poor,"

- in car-to-fixed object crashes, the drivers of the "good" cars have approximately the same reduction in the unadjusted fatality risks as in the car-to-car collisions, and

- the specific case study of the Honda Civic, with an estimated fatality reduction of 42 percent between the "poorly" performing 1980 model and the improved 1981-83 models, supports the detailed statistical findings.

Section 4. The Effects of the Use of Hybrid H and Hybrid HI Test Dunmies in NCAP

Section 4. The Effects of the Use of Hybrid II and Hybrid III Test Dummies in NCAP

4.1 Evaluation of the Efficacy of Allowing Manufacturers to Choose Between the Hybrid III Test Dummy and the Hybrid II Test Dummy for the Purpose of NCAP Testing

In the final rulemaking action on FMVSS No. 208 in 1986, NHTSA concluded that the Hybrid II test dummy (Hybrid II) and the Hybrid III test dummy (Hybrid III) gave equivalent responses in the FMVSS No. 208 crash test environment. This conclusion of equivalency was based on comparable barrier crash testing and laboratory evaluations. Based on this conclusion, NHTSA allowed manufacturers to use either the Hybrid II or the Hybrid III to meet the automatic occupant protection requirements of the standard in the 30 mph crash test. NHTSA followed this regulatory action by allowing optional use of the two dummies in the NCAP tests, at the manufacturer's request. Until MY 1990, based on manufacturers' desires, the exclusive use of the Hybrid II continued in NCAP. Beginning with MY 1990 through MY 1993, about 30 percent (52 of 174) of the NCAP tests have been conducted with Hybrid III dummies.

The 1992 Conference Report requested that NHTSA address the efficacy of allowing motor vehicle manufacturers to choose between the "high tech" (i.e., Hybrid III) and "low tech" (i.e., Hybrid II) dummies for the purposes of NCAP testing. In response to this request, an analysis of the NCAP test data has been completed examining the responses of the two dummies and to estimate the effects on the NCAP results. The results of this analysis are presented in the following section.

4.1.1 Analysis of Hybrid II and Hybrid III Data from NCAP Tests

Tables 7 and 8 contain summaries of data from the MY 1990 through MY 1993 NCAP vehicles. Average results from passenger car tests are given in Table 7. Average results from light trucks, vans, and sport utility vehicle (LTVs) tests are given in Table 8.

In MYs 1990 through 1993, tests were conducted on 114 passenger cars. Hybrid II dummies were used as surrogates for the driver and right front seat passenger in 84 of these tests. Hybrid III dummies were used as surrogates in these seating positions in 25 of these tests. Five cars were tested in which the Hybrid III was used in the driver position and the Hybrid II was used in the right front passenger position. Data in Table 7 indicate that approximately 70 percent of these cars met all the requirements of FMVSS No. 208 (i.e., for head, chest, and upper legs) regardless of which dummies were used.

Table 7. Summary of Hybrid II and Hybrid III Measures in NCAP Passenger Cars (PCs)

Parameter	Hybrid II	Hybrid III
Percent of All PCs Meeting All FMVSS No. 208 Requirements in NCAP Tests	71 (76)	70 (23)
Average Driver HIC for PCs with Air bags	687 (34)	513 (24)
Average Driver Chest G for PCs with Air bags	50 (34)	47 (24)
Average Passenger HIC for PCs with Safety Belts only	734 (79)	821 (20)
Average Passenger Chest G for PCs with Safety Belts only	44 (79)	44 (20)

* Numbers in parentheses indicate number of PCs tested in NCAP where relevant response data were available.

Although, in the NCAP crash test data, no absolute comparisons between the responses of the two dummies can be made[11], some relative information may provide useful insight into the effects of the dummy options. For driver responses, the more relevant information is obtained from the driver air bag-equipped cars. In Table 7, the data indicate that the driver HIC average in the air bag-equipped cars is 34 percent higher in the group of cars with Hybrid II dummies than in the cars with the Hybrid III dummies. For the passenger dummies, restrained only by the belt systems, the HIC average is approximately 12 percent higher in the group of cars with the Hybrid III dummies. Figures 9 and 10 show these data along with the range of response values.

[11]Since structural and restraint characteristics of the group of cars tested with Hybrid IIs are different than those tested with Hybrid IIIs, direct comparisons are not possible.

Similar data are given for light trucks, vans, and sport utility vehicles in Table 8. Only four of these vehicles have been equipped with driver air bags and tested in NCAP. Therefore, the relevant information is limited to belt restrained drivers and passengers.

Table 8. Summary of Hybrid II and Hybrid III Measures in NCAP Light Trucks, Vans, and Sport Utility Vehicles (LTVs)

Parameter	Hybrid II	Hybrid III
Percent of All LTVs Meeting FMVSS 208 Requirements in NCAP Tests	30 (33)	33 (21)
Average Driver HIC for LTVs with Safety Belts only	1143 (34)	1052 (21)
Average Driver Chest G for LTVs with Safety Belts only	55 (34)	56 (21)
Average Passenger HIC for LTVs with Safety Belts only	933 (35)	976 (23)
Average Passenger Chest G for LTVs with Safety Belts only	50 (35)	51 (22)

* Numbers in parentheses indicate number of LTVs tested in NCAP where relevant response data were available.

In Table 8, the data indicate minor variations in the average HICs with differences in values between the two dummies of less than 10 percent. Figures 11 and 12 show these HIC data along with the range of response values.

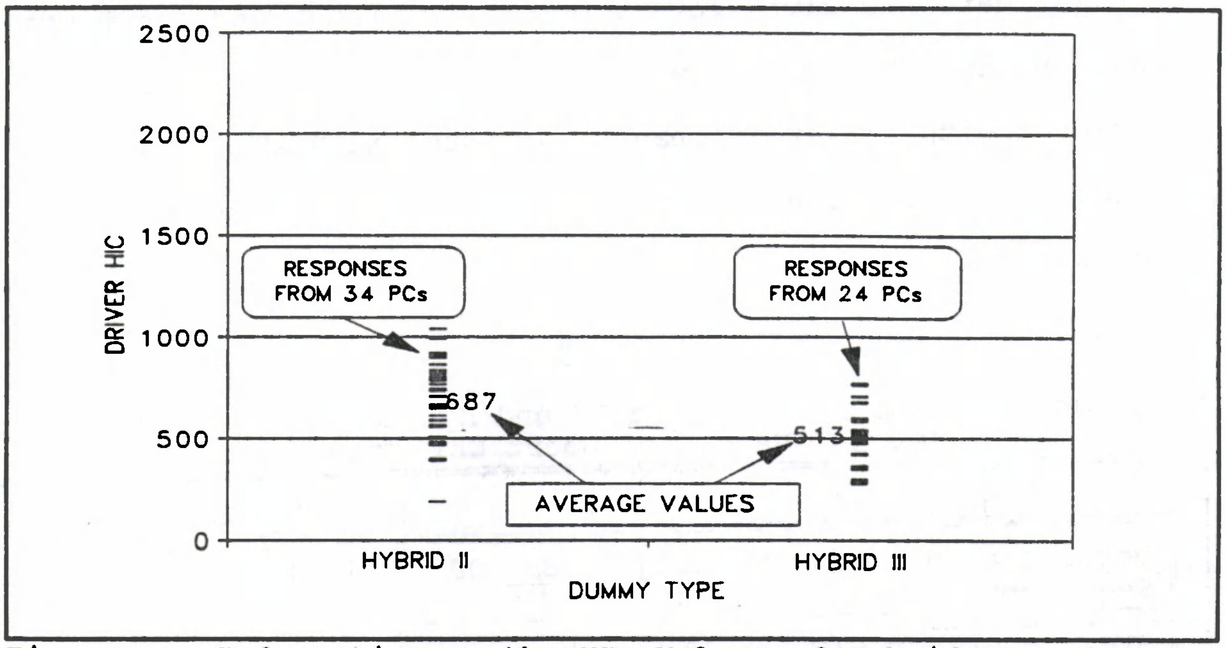

Figure 9. Information on the HIC Values of Hybrid II and Hybrid III Dummies in the Driver Position from NCAP Tests of MY 1990 through 1993 Passenger Cars (PCs) - Air Bags in all Driver Positions

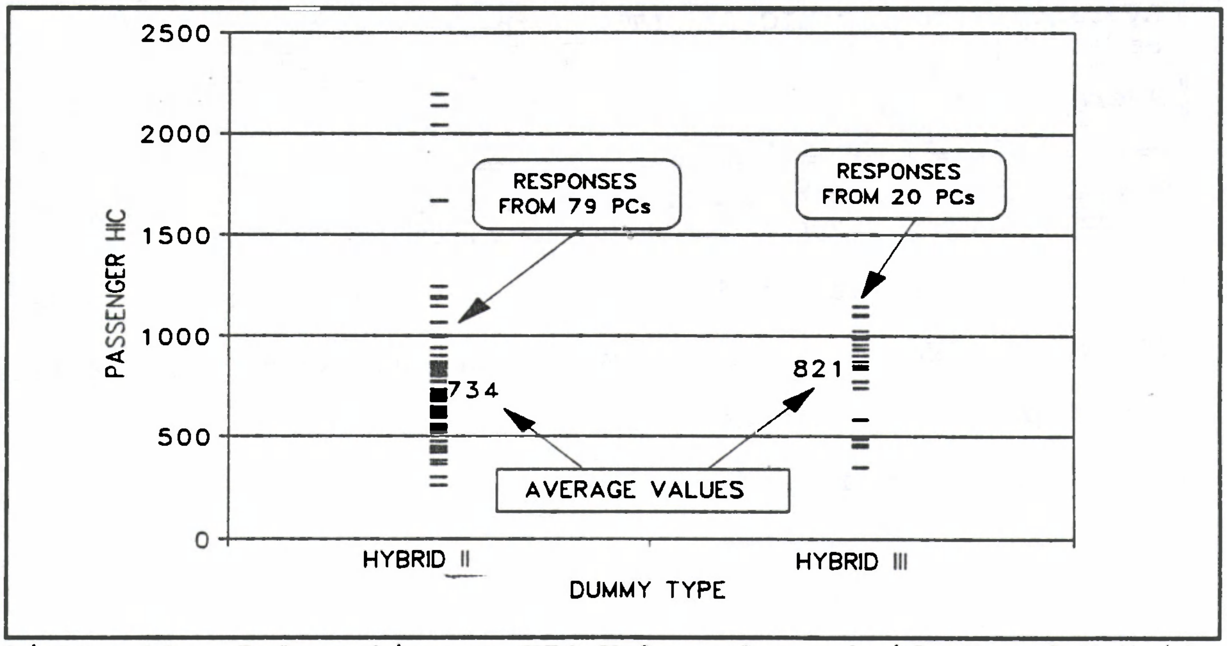

Figure 10. Information on HIC Values for Hybrid II and Hybrid III Dummies in the Right Front Seating Position from NCAP Tests of MY 1990 through 1993 Passenger Cars (PCs) - No Air Bags - Safety Belts only

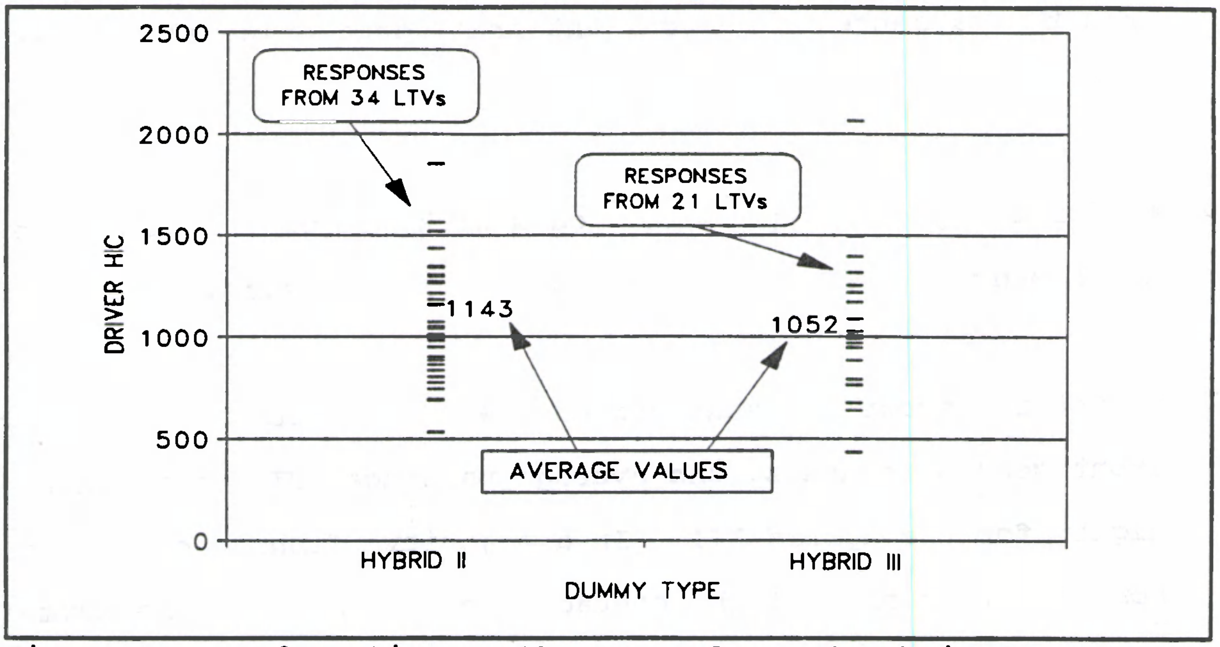

Figure 11. Information on the HIC Values of Hybrid II and Hybrid III Dummies in the Driver Position from NCAP Tests of MY 1990 through 1993 Light trucks, Vans,and Sport Utility Vehicles (LTVs) - No Air Bags - Safety Belts Only

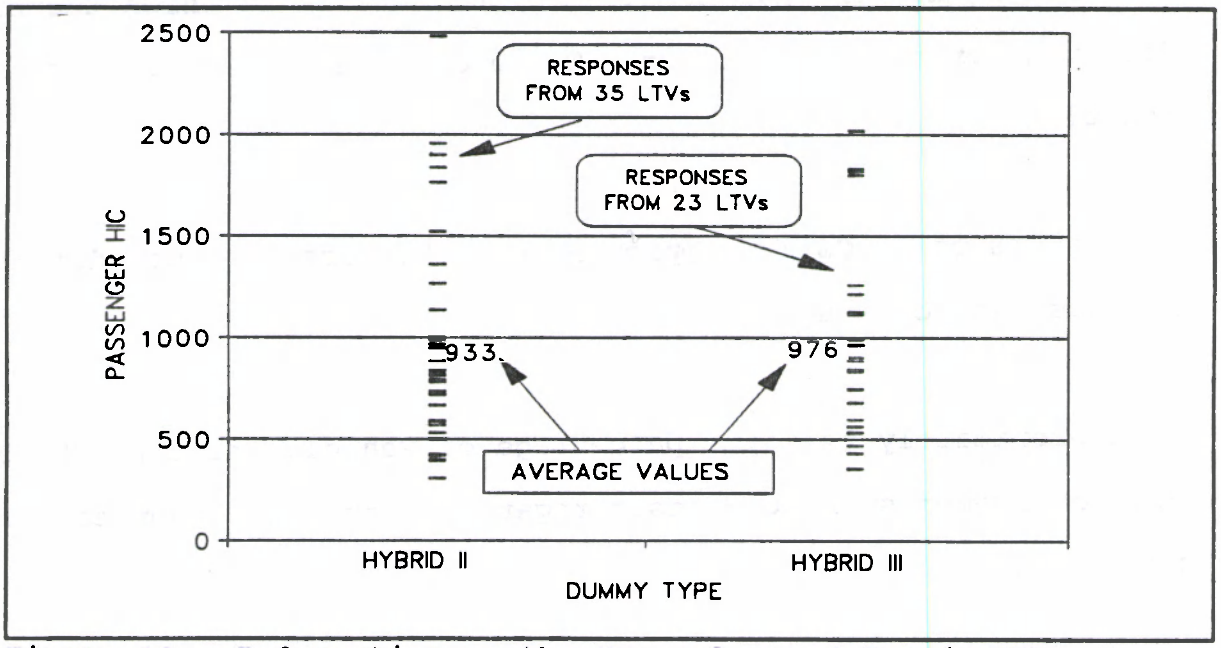

Figure 12. Information on the HIC Values of Hybrid II and Hybrid III Dummies in the Passenger Position from NCAP Tests of MY 1990 through 1993 Light Trucks, Vans, and Sport Utility Vehicles (LTVs) - No Air Bags - Safety Belts Only

From the passenger car and light truck data, general observations are:

- for the group of passenger cars with driver air bags, the average driver HIC values are lower for the Hybrid III,

- for the group of passenger cars with belt restrained right front seat passengers, the average passenger HIC values are higher for the Hybrid III. In a majority of these events, either no contact or only slight contact occurred between the dummy's head and any interior vehicle surface. Some motor vehicle manufacturers contend that the Hybrid III tends to produce higher HIC values than the Hybrid II in dynamic tests in which the head does not contact any surface. These data tend to support that position.

- average chest Gs are approximately the same for both dummies in passenger cars and LTVs, and

- approximately the same percentage of vehicles meet FMVSS No. 208 requirements in NCAP tests regardless of which dummies are used.

It is emphasized that these differences in response values may not necessarily be associated with differences in the designs of the two dummies, but could just as easily be the results of

different characteristics of vehicles and restraint systems. Only one direct comparison is contained in the NCAP tests. The MY 1991 Saturn SL2 model was tested with Hybrid III dummies in the driver and passenger positions restrained by the belt systems. This same car, but a 1992 model, was tested again with a Hybrid III in the driver position and a Hybrid II in the passenger position. The only change to the Saturn from 1991 to 1992 was the addition of a driver air bag. Results of these tests are given in Table 9. This single example shows only small differences between the results of the two passenger dummies. The head of the passenger dummy in each of these tests did not strike any interior vehicle surface.

Table 9. Hybrid II and Hybrid III Results from NCAP Tests of the MY 1991 and 1992 Saturn

Vehicle	Driver*		Passenger**	
	HIC	Chest G	HIC	Chest G
MY 1991 Saturn SL2 with passive belts	918	44	1018	46
MY 1992 Saturn SL2 with driver air bag	705	51	1063	47

* Hybrid III used in driver position for both MY 1991 and 1992 vehicles.
** Hybrid III used in passenger position for MY 1991 vehicle. Hybrid II used in passenger position for MY 1992 vehicle.

NHTSA is convinced that the Hybrid III is the more advanced test device and that any possibility of obtaining conflicting data from the use of the two dummies should be eliminated from NCAP and from FMVSS No. 208 testing by specifying exclusive use of the Hybrid III as soon as possible.

4.2 Review of the Federal Register Notices

NHTSA issued a Federal Register Notice in October 1992 requesting comments on establishing the Hybrid III as the only surrogate testing device to be used in NCAP beginning as early as MY 1994. NHTSA also issued a Notice of Proposed Rulemaking (NPRM) in December 1992 that proposes the mandatory use of the Hybrid III in FMVSS No. 208 beginning September 1, 1996. In these notices, NHTSA stated that:

- the Hybrid III appears to be more representative of human responses in frontal crashes. The Hybrid III represents the state-of-the-art of human simulation. Among other noteworthy advances, the Hybrid III has a more humanlike seated posture, head, neck, chest, and lumbar spine designs that meet biofidelic impact response requirements,

- use of the Hybrid III allows the assessment of more types of potential injury through its ability to monitor almost four times as many injury-indicating parameters as the Hybrid II, and

- use of a single dummy allows for better comparability of test results among vehicles and eliminates potential confusion by the public in understanding and interpreting the test results.

None of the commenters to the notices opposed in principle the exclusive use of the Hybrid III, and several of the commenters expressed unconditional support for its exclusive use. However, some commenters did raise concerns relating to leadtime and biomechanical or technical issues.

Lead time--NCAP imposes no mandatory obligations on the motor vehicle manufacturers. Although most manufacturers conduct crash tests at the NCAP test speed of 35 mph and, in some cases, may have imposed internal performance requirements[12], there are no regulatory requirements for meeting any specific criteria in NCAP. Therefore, the decision of exclusive use of the Hybrid III in NCAP does not impose any regulatory burden on the manufacturers. However, NHTSA also believes that an abrupt change in policy to no longer test with the Hybrid II in NCAP raises fairness issues. These issues relate to the fact that vehicles may have been designed with the Hybrid II, as allowed by NHTSA regulations; manufacturers may be uncertain as to how well their vehicles may perform with the Hybrid III; and NHTSA may not be providing sufficient time for manufacturers to improve their vehicles' performance using the Hybrid III.

For FMVSS No. 208, sufficient lead time will be provided in the final rulemaking to allow manufacturers to assure that their

[12]These internal performance requirements are laudable and, as shown in Section 3, may have led to significant safety improvements in crashes.

vehicles meet the specified criteria with the Hybrid III. To provide this lead-time, NHTSA will not require mandatory use of the Hybrid III until MY 1998. This is a two year extension beyond the MY 1996 date that was proposed in the December 1992 NPRM.

Biomechanical or technical issues--The Hybrid III has been used in 52 NCAP tests and in 62 of the FMVSS No. 208 compliance tests. Results from these tests indicate that there are no biomechanical or technical issues to impede the exclusive use of the Hybrid III, based on the injury criteria currently being measured. Minor issues that were raised by some manufacturers, such as improvements to the current chest deflection measurement device and changes to the ankle design, do not affect the biofidelity of the Hybrid III. These issues will be addressed in future rulemaking actions.

NHTSA has concluded from analysis of the NCAP data and the review and analysis of the comments to the two notices to proceed with exclusive use of the Hybrid III in NCAP beginning with MY 1996 vehicles. This is two years earlier than required by the recent amendment to FMVSS No. 208. In addition, NHTSA will immediately, beginning with MY 1994 vehicles, use the Hybrid III exclusively for all seating positions in which the occupant is protected by an air bag. Since air bags are in the vast majority of passenger cars and are rapidly being introduced into light trucks, when

coupled with manufacturer preference, nearly all seating positions will be tested with the Hybrid III. For example, of the 78 seating positions (39 vehicles) being tested in the MY 1994 NCAP, only 5 will be tested with the Hybrid II. NHTSA believes these changes fully comply with the Appropriations Committees' requests to expeditiously move toward exclusive use of the Hybrid III.

Section 5. The Future for NCAP

Section 5. The Future for NCAP

5.1 Make NCAP Easy to Understand

NCAP has produced extensive frontal crash test information for use by consumers and the media. However, as noted in Section 2, this information has been difficult for some consumers to understand and the media to use.

NHTSA's first step in planning the future for NCAP will be to pursue the goal of reaching a larger group of the population with simplified data that will assist them in making their vehicle purchase decision. NHTSA is proposing to ask for public comment on how to present information to consumers and the media with the hopes of developing a format that is more understandable. The primary element for FY 1994 is a consumer brochure that will be developed in a computerized format. This will permit easy updating. The format will also be adaptable to print media requirements. The brochure will utilize an easy to read and simple presentation technique. It will contain a description of NCAP and the comparative results from the vehicle tests.

5.2 Expand the Usefulness and Power of NCAP

NCAP has evolved into a real catalyst in the automobile market place. Consumer enlightening publications highlight crash test results as an important ingredient to consider in the vehicle selection process. As explained in Section 1, the overall trend of the NCAP test results indicate the favorable influence the program has had on motivating the manufacturers to improve restraint systems, steering assemblies, and structural crash characteristics of many of their products. Section 3 highlighted the significance of these improvements as shown, statistically, in the reduction of fatality risks for restrained occupants in the "good" performing passenger cars. In addition, NCAP continues to be a main source of research and engineering data for use by NHTSA and others in directing research programs and analyzing safety problems. With the exclusive use of the Hybrid III dummy in the NCAP frontal tests, as discussed in Section 4, NHTSA will expand the collection of safety information by utilizing the additional capabilities of the more advanced dummy to measure the potential for lower limb and neck injuries. From these perspectives, the frontal crash testing of NCAP has been and continues to be successful.

The focus group recommendations critically pointed out that NCAP provides information for frontal crashes only. Although the frontal crashes account for the highest percentage of fatalities,

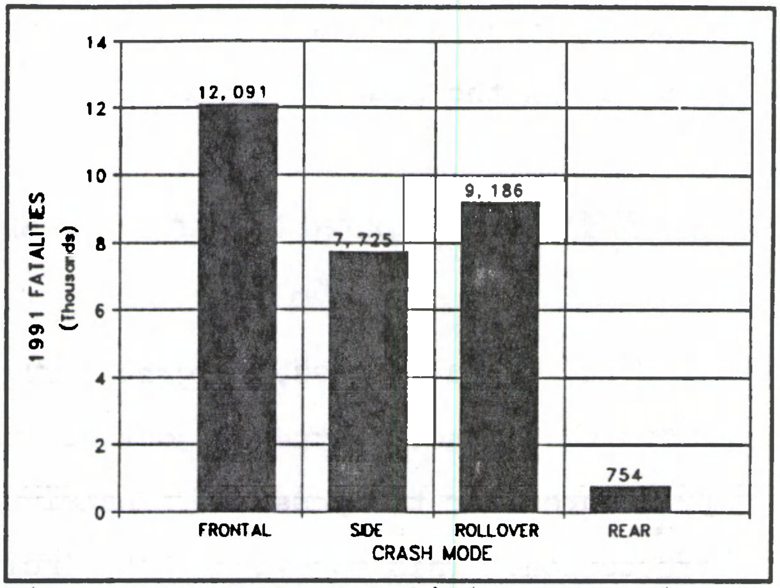

Figure 13. 1991 Fatalities occurring in Frontal, Side, Rollover, and Rear Crash Modes - Passenger Cars and Light Trucks.

as shown in Figure 13, side crashes and rollovers are also very significant crash modes. Almost 8,000 fatalities occurred in side crashes in 1991 and more than 9,000 fatalities occurred in rollover crashes. The focus group study indicates that consumers desire overall safety information on vehicles. In essence, NHTSA needs to expand the crash modes covered by NCAP.

The enactment of the upgraded side-impact protection standard, beginning with MY 1994 passenger cars, has provided the opportunity to expand NCAP into side-impact protection. The expansion of NCAP into side-impact protection has the potential for improving occupant protection significantly above that required in the applicable standard if the vehicle manufacturers, which have been responsive to the frontal NCAP test results, are equally responsive to such a program in side-impact testing. As in the frontal NCAP, a side-impact NCAP would provide an engineering data base which can be used to inform consumers of relative vehicle crashworthiness performance. That data base can

also serve as a basis for further research and additional safety studies in the side-impact area.

5.3 NHTSA is Prepared to Start a Side Impact NCAP

In FY 1992 and FY 1993, Congress provided funds as requested by NHTSA to conduct a study to develop the requirements and procedures for the possible expansion of NCAP into side-impact protection. This two-year study included a pilot crash testing program to determine an NCAP crash severity level, to assure that testing, instrumentation, and test device performance are consistent. The results from this program support the feasibility of a side-impact NCAP which could provide comparative results to consumers. If Congressional funding is provided, side-impact NCAP tests would be conducted on passenger cars and the information would be provided to consumers along with the frontal NCAP information. Initiation of this side-impact NCAP would provide consumers with comparative safety data on two of the most important crash modes.

5.4 Rollover Testing

Research efforts continue in NHTSA to determine the feasibility of determining vehicle crashworthiness performance in the rollover crash mode. These efforts have focussed on evaluating

vehicle structural integrity and restraint system effectiveness during dynamic rollover events. Advanced mathematical modelling techniques have been developed and applied, rollover test devices have been constructed, and several demonstration rollover tests have been conducted. NHTSA will continue to monitor these activities to determine the potential for providing consumers with comparative safety information on levels of protection in the rollover crash mode.

In addition to these crashworthiness rollover activities, NHTSA continues to study the merits of providing consumers with information on the roll stability of passenger cars and light trucks, vans, and sports utility vehicles. NHTSA published an Advanced Notice of Rulemaking on January 3, 1992 and a Planning Document for Rollover Prevention and Injury Mitigation on September 23, 1992. In these documents, potential methods for developing and providing consumer information are discussed. Comments to these documents are being reviewed by NHTSA.

5.5 In Conclusion

The future for NCAP includes several major goals:

• reach a larger group of the population with simplified data that will assist consumers in their vehicle purchases,

- expand the collection of safety information by utilizing the additional capabilities of the more advanced Hybrid III dummy to measure the potential for lower limb and neck injuries,

- expand NCAP into side-impact testing to provide comparative side impact information to consumers along with the frontal NCAP information, and

- monitor rollover safety activities to determine the potential for providing consumers with comparative information on levels of protection in the rollover crash mode and on vehicle roll stability.

5.6 Next Steps

NHTSA is considering holding a public meeting on NCAP. The public meeting could provide an open forum for consumer groups, media, foreign governments, national and international safety organizations, and motor vehicle manufacturers to discuss the above NCAP goals. Comments would be solicited on the material in this report and opportunities would be given for interested parties to suggest alternative or additional NCAP goals and activities. Such a meeting could be held in 1994.

Appendix A

News Release on New Car Assessment Program Historical Trends

U.S. Department of
Transportation

News:

Office of the Assistant Secretary for Public Affairs
Washington, D.C. 20590

FOR IMMEDIATE RELEASE
Monday, September 27, 1993

NHTSA 42-93
Contact: Barry McCahill
Tel. No.: (202) 366-9550

NHTSA RELEASES REPORT ON NEW CAR ASSESSMENT PROGRAM HISTORICAL TRENDS

The National Highway Traffic Safety Administration (NHTSA) today released a report rating the performance, by manufacturer, of cars crash tested over the past 15 years.

According to NHTSA, the overall crash test performance of cars improved significantly between 1987 and 1993, compared to results for cars tested between 1979 and 1986. The safety agency credits the auto manufacturers with building better products and with greater availability of air bags as contributing factors to the improved performance in its 35 mph crash tests. Cars equipped with a driver's side air bag had average head injury scores that were 40 percent lower than cars without this safety equipment.

The safety agency began the New Car Assessment Program (NCAP) in 1979 in response to a Congressional mandate to provide consumers with a measure of relative crashworthiness of passenger motor vehicles. Federal safety standards require all passenger cars to meet injury criteria measured in a 30 mph frontal crash. The NCAP test is performed at 35 mph so that differences between vehicles may be observed more easily. Driver and passenger side crash dummies give data on forces to the head, chest and upper legs.

The Head Injury Criterion (HIC) is a measure of the potential for injury to the head of a car's occupant in a frontal crash, usually when the head contacts a hard object such as the steering column or instrument panel. Someone experiencing a HIC of 500 or less most likely will have little or no head injury. At a HIC of 1000, about 1 in 6 occupants may have either a life-threatening skull fracture or brain damage requiring immediate medical attention. At HICs of 2000 or more, nearly all crash victims experience life-threatening head injuries with a high probability of death or long-term disability.

(more)

Chest injury numbers above 60 indicate that chest injury is possible.

More than 300 passenger cars and 100 light trucks, vans and sport utility vehicles have been tested over the 15-year period. The report lists scores for the 18 manufacturers whose vehicles have been tested, highlighting notable safety improvements.

Copies of the report, "Historical Performance of Different Auto Manufacturers in the New Car Assessment Program Tests," may be obtained by calling (202) 366-9550.

Attached is a chart showing the historical performance by manufacturer.

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TABLE 1. NCAP - SUMMARY DATA ON PASSENGER CARS

MANUFACTURER	NO. OF CARS TESTED		% MEETING FMVSS NO. 208 CRITERIA			DRIVER HIC AVERAGE			PASSENGER HIC AVERAGE			DRIVER CHEST G AVERAGE			PASSENGER CHEST G AVERAGE		
	MODEL YEARS		MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS			MODEL YEARS		
	ALL	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93	ALL	79-86	87-93
GM	71	33	59	61	58	856	897	812	808	802	811	46	44	48	40	39	42
FORD	51	22	48	19	89	920	1090	693	798	1016	500	52	55	47	44	47	41
CHRYSLER	44	20	48	38	81	969	1111	799	974	1069	853	50	51	48	44	43	45
TOYOTA	29	13	82	82	82	883	910	849	753	853	831	50	50	51	47	48	44
NISSAN	25	15	40	20	53	982	1142	874	939	1301	697	53	58	51	48	50	43
HONDA	28	17	88	80	81	909	1178	738	795	1018	652	48	49	49	41	38	43
VOLKSWAGEN	17	8	19	10	33	1138	1250	945	958	911	1035	53	54	52	45	44	45
MAZDA	12	7	58	0	100	861	1065	750	1012	1445	703	56	60	51	48	49	48
MITSUBISHI	10	7	78	67	83	891	879	897	830	1168	885	54	52	50	44	45	44
PEUGEOT/RENAU	13	4	0	0	0	1908	1957	1793	1868	2011	1577	59	58	60	49	47	52
VOLVO	7	2	88	80	100	742	879	400	700	724	840	41	42	40	39	39	40
HYUNDAI	8	7	25	0	29	888	1000	871	971	2662	729	58	73	53	45	55	44
ISUZU	5	2	0	0	0	1570	1821	1194	1523	1711	1240	47	42	54	48	47	48
SUBARU	8	4	38	25	50	1055	1230	860	988	1293	882	53	54	51	48	49	43
MERCEDES	3	1	33	0	100	984	1078	800	979	1052	833	58	58	60	49	44	58
SAAB	5	3	40	0	67	856	754	594	1029	1304	845	48	55	43	38	40	37
BMW	3	2	33	0	50	1093	1539	870	822	547	898	49	42	52	40	39	40
TOTAL	339	165	50	37	63	907	1101	826	905	1055	748	50	51	49	44	44	44

Appendix B

Focus Group Test Material

Public Service Announcements (PSA's)

DATA SHEET #1

1993 NEW CAR ASSESSMENT PROGRAM RESULTS

VEHICLE	TYPE OF PROTECTION	APPROX. CURB WEIGHT (POUNDS)	HEAD INJURY DRIVER	HEAD INJURY PASSENGER	CHEST INJURY DRIVER	CHEST INJURY PASSENGER	ANTI-LOCKING BRAKE SYSTEM AVAILABLE?
PASSENGER CARS:							
Mini (1500 - 1999lbs.)							
[1]GEO METRO 2-DR. HB.	BELTS	1610	860	870	57	39	NO
FORD FESTIVA 2-DR. HB.	MOTORIZED BELTS	1872	ND	(477)	46	42	NO
Light (2000 - 2499lbs.)							
GEO STORM 2-DR. HB.	BELTS + DRIVER AIR-BAG	2250	417	(981)	47	45	NO
FORD ESCORT 2-DR.	MOTORIZED BELTS	2336	(434)	(450)	42	39	NO
HYUNDAI EXCEL 4-DR. SEDAN	BELTS	2278	520	544	52	37	NO
[2]TOYOTA COROLLA 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2286	522	771	62	45	OPT.
ISUZU STYLUS 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2333	580	ND	57	46	NO
NISSAN SENTRA 4-DR. SEDAN	MOTORIZED BELTS	2420	(583)	(681)	46	45	OPT.
ACURA INTEGRA 4-DR. SEDAN	MOTORIZED BELTS	2490	585	(637)	ND	42	OPT.
[1]NISSAN SENTRA 4-DR. SEDAN	MOTORIZED BELTS + DRIVER AIR-BAG	2427	660	(613)	47	44	OPT.
[2]TOYOTA TERCEL 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2130	665	472	52	41	OPT.

Comparisons must be made between vehicles within an approximate weight range of 500 pounds.
CONV. - Convertible HB - Hatchback ND - No Data 1,2,3 - See Note Page
Parentheses ( ) indicate the occupant's head did not contact an interior surface of the vehicle.

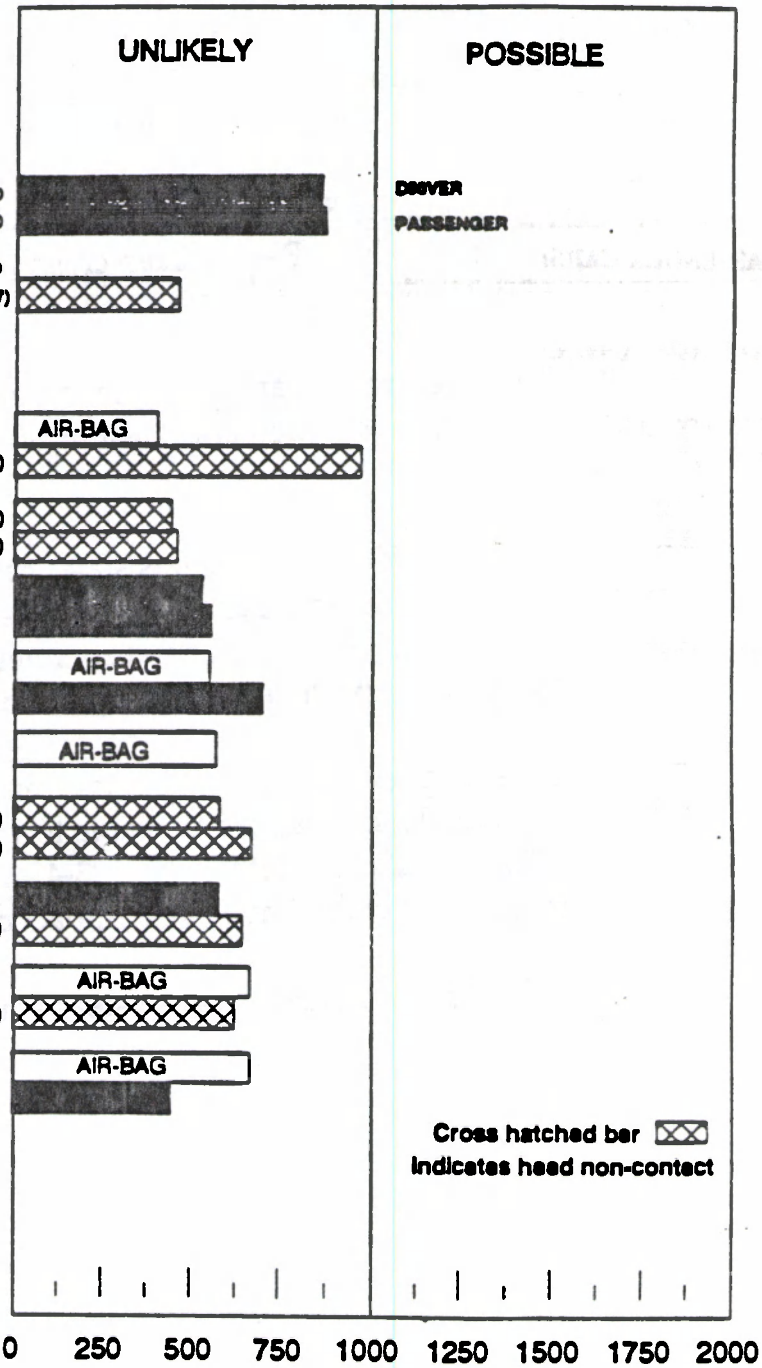
DATA SHEET #2

Head Injury Levels During 35* mph Crash Tests
1993 New Car Assessment Program

Passenger Cars:

	Type Of Protection	APPROX. Curb Wgt.	HEAD INJURY
Mini (1500-1999 lbs.)			
GEO METRO 2-DR. HB.	BELTS	1810	860 870
FORD FESTIVA 2-DR. HB.	MOTORIZED BELTS	1872	ND (477)
Light (2000-2499 lbs.)			
GEO STORM 2-DR. HB.	BELTS + DRIVER AIR-BAG	2280	417 (981)
FORD ESCORT 2-DR.	MOTORIZED BELTS	2336	(434) (466)
HYUNDAI EXCEL 4-DR. SEDAN	BELTS	2278	520 544
TOYOTA COROLLA 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2286	522 771
ISUZU STYLUS 4-DR. SEDAN	BELTS + DRIVER AIR-BAG	2333	560 ND
NISSAN SENTRA 4-DR. SEDAN	MOTORIZED BELTS	2420	(583) (681)
ACURA INTEGRA 4-DR. SEDAN	MOTORIZED BELTS	2490	585 (637)
NISSAN SENTRA 4-DR. SEDAN	MOTORIZED BELTS +DRIVER AIR-BAG	2427	660 (613)
TOYOTA TERCEL 4-DR. SEDAN	BELTS+DRIVER AIR-BAG	2130	446 472

POTENTIAL FOR SERIOUS HEAD INJURY



Comparisons must be made between vehicles within an approximate weight range of 500 pounds.

ND - No Data HB - Hatchback CONV. - Convertible

Parentheses ( ) indicate the occupant's head did not contact an interior surface of the vehicle.

* - 35 mph barrier crash tests represent a 70 mph closing speed.

NCAP RADIO :60

"SURVIVE"

ANNCR: Would your car survive a head-on collision at 35 miles per hour? Would you? Well, now there's a way to find out. Without doing any damage to your car – or your wallet.

For years the Federal government's New Car Assessment Program – NCAP – has been crash testing new automobiles to determine their safety.

These test results are available to you – absolutely free. So you can get detailed crash test information on the car you want to buy.

Federal safety requirements state that all automobiles must pass a 30 mile an hour front-end crash test. With NCAP, we go one step further by testing at 35 miles per hour. This amounts to a 36 percent increase in the potential for injury.

These higher speed, in-depth test results are not available from dealers. They are available to you, free, simply by calling 1-800-123-4567. That's 1-800-123-4567. Call today for test results that could have a real impact on the next car you buy.

NCAP crash testing. We can steer you in the right direction.

NCAP RADIO :60

"ACCIDENT"

ANNCR: If you're in the market for a new car, there's something you should hear.

SFX: CAR JAMS ON BREAKS, VERY LOUD, DRAWN-OUT SKID.

ANNCR: How well new cars perform in the governments high speed crash tests.

SFX: SKID CONTINUES.

ANNCR: But you don't have to discover this accidentally.

SFX: CAR SKID ABRUPTLY ENDS AS CAR SMASHES INTO A PARKED CAR.

ANNCR: Because all of these high speed crash test results are available to you – free. Through the National Highway Traffic Safety Administration's New Car Assessment Program – NCAP.

NCAP is a consumer information program which tests new cars' ability to withstand severe head-on collisions. And, to make this information more useful to you, NCAP tests cars at 35 miles per hour – 5 miles over the Federal safety requirement.

If you'd like to learn more about how the car or cars you're interested in faired in NCAP's tests, call 1-800-123-4567 for your free information booklet.

And discover which new cars can survive accidents – on purpose. Call NCAP today at 1-800-123-4567. NCAP. We wrote the book on new car safety.

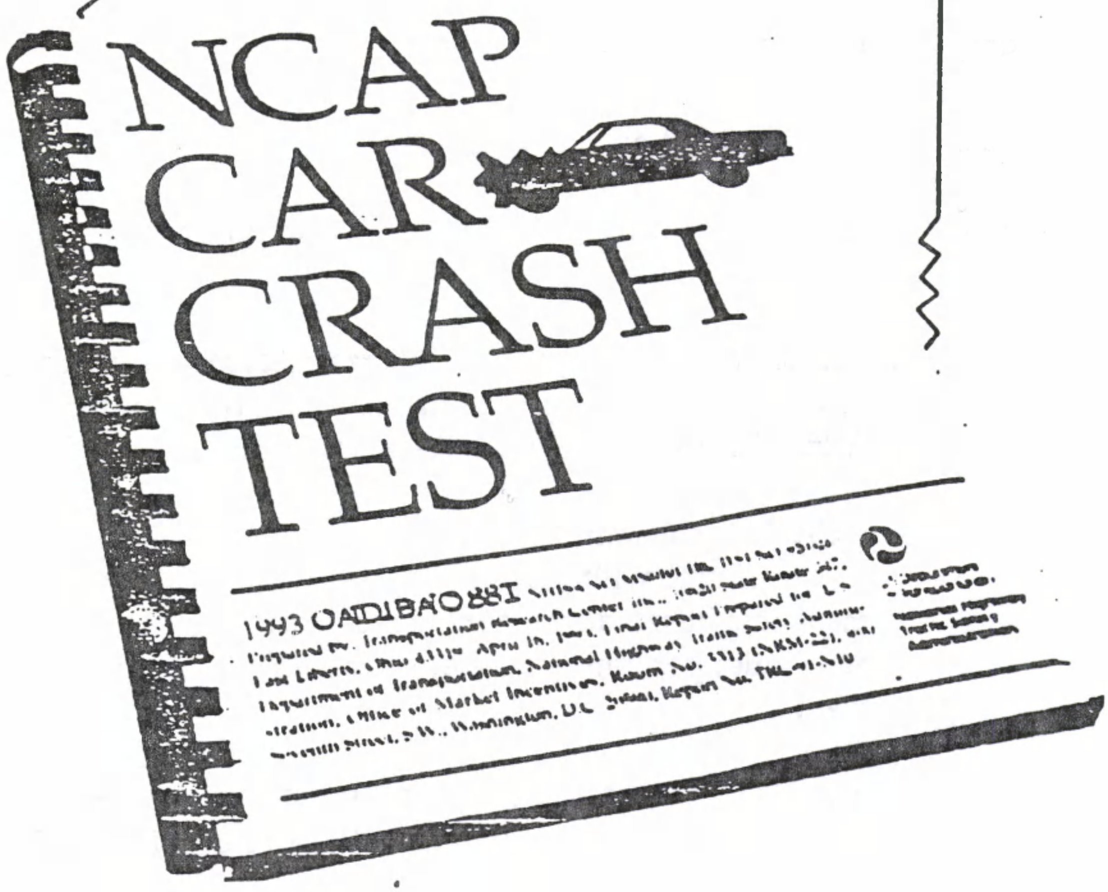
SFX: HONK, HONK.

New car value isn't determined by sticker price and mpg alone any more. For the smart consumer, it's also determined by safety. Which is why the National Highway Traffic Safety Administration began its New Car Assessment Program (NCAP).

This consumer information program tests the crashworthiness of most cars, vans and light trucks. Then, these results are made available to you – free. And since NCAP tests are conducted at 35 mph – 5 miles over Federal safety requirements – these results allow you to make the most detailed collision-safety comparisons possible.

So, if you want to find out more about the car you're going to trust with your life, call for the free crash test results. 1-800-000-0000.

NCAP. We'll Steer You In The Right Direction.



WHAT A NEW CAR STICKER DOESN'T TELL YOU.

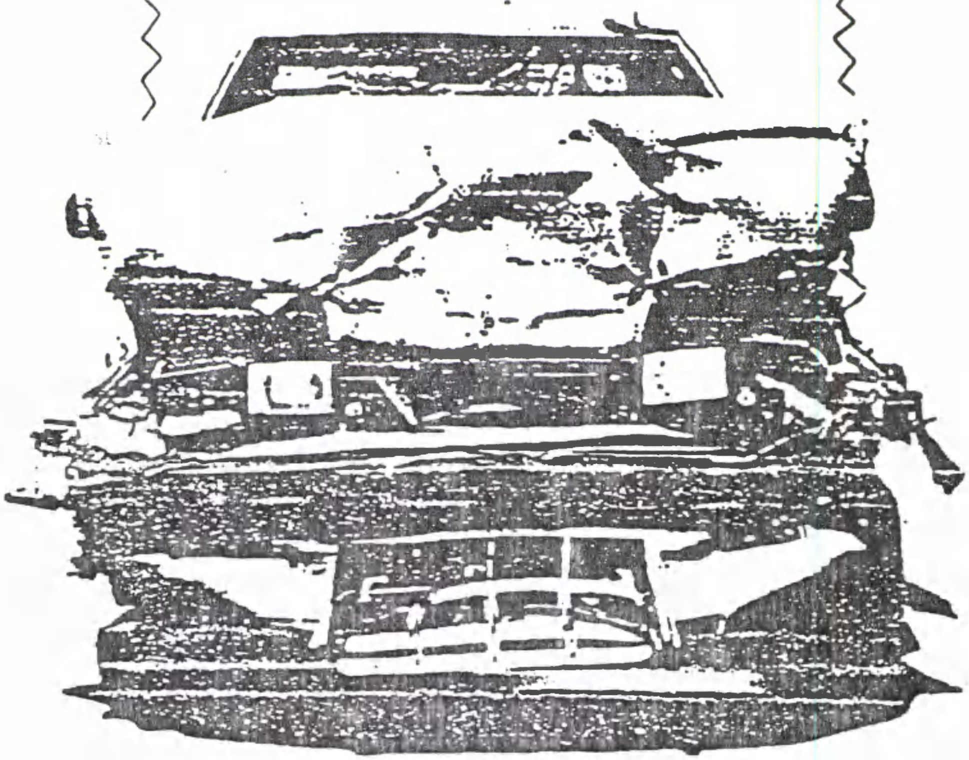
Find out free through the National Highway Traffic Safety Administration's New Car Assessment Program (NCAP).

This consumer information program tests the crash-worthiness of most cars, vans and light trucks. Then, these results are made available to you – free. And since NCAP tests are conducted at 35 mph – 5 miles over Federal safety requirements – these results allow you to make the most detailed collision-safety comparisons possible.

NCAP
CAR
CRASH
TEST

So, if new car safety is important to you, call, 1-800-000-0000 for free crash test results. And discover how safe your new car is – on purpose.

NCAP. We'll Steer You In The Right Direction.



DON'T ACCIDENTALLY FIND OUT HOW SAFE YOUR CAR IS.

Appendix C

NCAP News Release with Simplified Format

FOR IMMEDIATE RELEASE

NHTSA
Contact: Barry McCahill
Tel. No.: (202) 366-9550

NHTSA RELEASES FIRST 1994 CRASH TEST RESULTS IN A NEW FORMAT

The National Highway Traffic Safety Administration (NHTSA) today released the first crash test results for 1994 cars and light trucks using a new "star" scoring system to make the results easier to understand.

According to NHTSA, the format for its New Car Assessment Program (NCAP) responds to consumer demand for reporting information in a way that is less technical and easier to understand. Focus groups of potential car buyers, the news media, callers to the agency's Auto Safety Hotline, the Congress and others have asked NHTSA to simplify NCAP results.

Results are now reported in a range of one to five stars, with five stars indicating the best crash protection for vehicles within the same weight class. Head and chest injury data are combined into a single rating, and reflected by the number of stars, which represents a vehicle's relative level of crash protection in a head-on collision.

Included today are new test results for the **Chevrolet Astro van, Chevrolet Camaro, Mitsubishi Galant 4-door, Chrysler New Yorker 4-door,** and **Dodge Caravan** as well as results for 44 vehicles previously tested by the agency which are valid for the 1994 versions of these vehicles. Results on a total of 83 model year 1994 vehicles eventually will be reported by the safety agency.

NHTSA's crash test procedures remain unchanged, and the results compare frontal crash protection only. The agency crashes vehicles into a fixed barrier at 35 mph, which is equivalent to a head-on collision between two identical vehicles, each moving at 35 mph. Instrumented dummies register forces and impacts during the crash, which are used by NHTSA to predict potential head and chest injuries.

-more-

New Car Assessment Program

How To Use This Chart

Vehicles should be compared against other vehicles in the same weight class. If a light vehicle collides head-on with a heavier vehicle at 35 mph, the occupants in the lighter vehicle could experience a greater chance of injury than the results of this test indicate.

Vehicles are classified by the estimated chance of injury for the driver or passenger, and receive a one to five star rating, with five stars ★★★★★ indicating the best protection.

1994 MINI PASSENGER CARS
(1500 - 1999 lbs. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING
GEO METRO 2-DR. HB.	1610 lbs.	DRIVER	★★★
		PASSENGER	★★★★

BELTS & AIR BAG	BELTS
	✓
	✓

1994 LIGHT PASSENGER CARS
(2000 - 2499 lbs. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
HONDA CIVIC COUPE 2-DR.	2498 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★★	✓	
HYUNDAI EXCEL 4-DR. SEDAN	2278 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★★		✓
HYUNDAI EXCEL 2-DR. HB.	2200 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★★		✓
HYUNDAI SCOUPE 2-DR.	2201 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★		✓
MAZDA PROTEGE 4-DR. SEDAN	2417 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
NISSAN SENTRA 4-DR. SEDAN	2420 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★		✓
NISSAN SENTRA 4-DR. SEDAN	2427 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★		✓
SATURN SL2 4-DR. SEDAN	2481 lbs.	DRIVER	★★★★	✓	
		PASSENGER*	★★★		✓
TOYOTA TERCEL 4-DR. SEDAN	2130 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★★		✓

* HYBRID II DUMMY

1994 COMPACT PASSENGER CARS
(2500 - 2999 lbs. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET CAVALIER 4-DR. SEDAN	2540 lbs.	DRIVER	★★★★		✓
		PASSENGER	★★★★★		✓
FORD TEMPO 4-DR. SEDAN	2674 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★		✓
HONDA PRELUDE 2-DR.	2818 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★★		✓
MITSUBISHI ECLIPSE 2-DR. HB.	2594 lbs.	DRIVER*	★★★★		✓
		PASSENGER*	★★★★		✓
MITSUBISHI GALANT 4-OR. SEDAN	2832 lbs.	DRIVER	NO DATA	✓	
		PASSENGER	★★★★	✓	
SUBARU LEGACY 4-DR. SEDAN	2791 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★		✓

* HYBRID II DUMMY

1994 MEDIUM PASSENGER CARS
(3000 - 3499 LBS. Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
BUICK CENTURY 4-DR. SEDAN	3049 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★		✓
CHEVROLET CAMARO 2-DR. HB.	3408 lbs.	DRIVER	★★★★★	✓	
		PASSENGER	★★★★★	✓	
CHEVROLET LUMINA 4-DR. SEDAN	3155 lbs.	DRIVER*	★★		✓
		PASSENGER*	NO DATA		✓
DODGE INTREPID 4-DR. SEDAN	3254 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★	✓	
FORD TAURUS 4-DR. SEDAN	3256 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★★	✓	
NISSAN MAXIMA 4-DR. SEDAN	3192 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★		✓

* HYBRID II DUMMY

1994 HEAVY PASSENGER CARS
(3500 lbs. & over Curb Weight)

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
ACURA LEGEND 4-DR. SEDAN	3550 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★★	✓	
CHRYSLER NEW YORKER 4-DR. SEDAN	3589 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★	✓	
FORD CROWN VICTORIA 4-DR. SEDAN	3970 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	★★★★★	✓	
LINCOLN CONTINENTAL 4-DR. SEDAN	3710 lbs.	DRIVER*	★★★	✓	
		PASSENGER*	NO DATA	✓	
LINCOLN TOWN CAR 4-DR. SEDAN	4080 lbs.	DRIVER*	★★★★★	✓	
		PASSENGER*	NO DATA	✓	
PONTIAC BONNEVILLE 4-DR. SEDAN	3558 lbs.	DRIVER	★★★★★	✓	
		PASSENGER	★★★	✓	

* HYBRID II DUMMY

1994 SPORT UTILITY VEHICLES

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET BLAZER 4-DR. 4X4	3693 lbs.	DRIVER	★★★		✓
		PASSENGER	★★		✓
CHEVROLET SUBURBAN 4-DR. 4X4	5686 lbs.	DRIVER	★★★★		✓
		PASSENGER	★★★★		✓
FORD EXPLORER 4-DR. 4X4	4164 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
ISUZU RODEO 4-DR. 4X4	4021 lbs.	DRIVER	★★		✓
		PASSENGER	★★★		✓
ISUZU TROOPER 4-OR. 4X4	4294 lbs.	DRIVER	★		✓
		PASSENGER	★★		✓
JEEP CHEROKEE 4-DR. 4X4	3270 lbs.	DRIVER	★★★		✓
		PASSENGER	★★★		✓
JEEP GRAND CHEROKEE 4-DR. 4X4	3746 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★		✓
NISSAN PATHFINDER 4-DR. 4X4	3932 lbs.	DRIVER*	★		✓
		PASSENGER*	★★★		✓
TOYOTA 4-RUNNER 4-DR. 4X4	4114 lbs.	DRIVER*	★		✓
		PASSENGER*	★★★★		✓

* HYBRID II DUMMY

1994 LIGHT TRUCKS

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET C-1500 PU 2-DR.	3838 lbs.	DRIVER	★★★★		✓
		PASSENGER	★★★★★		✓
FORD RANGER PU 2-DR.	3080 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
ISUZU PU 2-DR.	2840 lbs.	DRIVER	★★★		✓
		PASSENGER	★★★★		✓
MITSUBISHI MIGHTY MAX PU 2-DR.	2731 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★		✓
NISSAN PU 2-DR.	2793 lbs.	DRIVER*	★★★		✓
		PASSENGER*	★★★★		✓
TOYOTA PU 2-DR.	2563 lbs.	DRIVER*	★★		✓
		PASSENGER*	★★★★		✓

* HYBRID II DUMMY

1994 VANS

TEST RESULTS BASED ON 35 MPH FRONTAL CRASH			RATING	BELTS & AIR BAG	BELTS
CHEVROLET ASTRO VAN	4078 lbs.	DRIVER	★★★	✓	
		PASSENGER	★		✓
DODGE CARAVAN	3457 lbs.	DRIVER	★★★★	✓	
		PASSENGER	★★★★	✓	
DODGE RAM VAN	4890 lbs.	DRIVER	★		✓
		PASSENGER	★★		✓
FORD AEROSTAR VAN	3670 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★		✓
FORD ECONOLINE VAN	5166 lbs.	DRIVER*	★★★★	✓	
		PASSENGER*	★★★		✓
VOLKSWAGEN EUROVAN VAN	3860 lbs.	DRIVER*	★		✓
		PASSENGER*	★★★		✓

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Public Affairs
5232
NCAP

Mr. Parsons
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