INSURANCE INSTITUTE
FOR HIGHWAY SAFETY

# NEWS RELEASE

**April 14, 1999**

## CRASH TEST RESULTS: PROTECTION IMPROVES IN 6 OF 10 NEW VEHICLES; STILL ROOM FOR MORE IMPROVEMENT

ARLINGTON, VA — When automakers redesign their passenger vehicles, more of them than ever are paying attention to aspects of occupant crash protection that go beyond government requirements. In particular, vehicles' structural designs are being improved to do a better job of preventing intrusion into the occupant compartment and preserving the space for occupants to survive.

To assess important aspects of frontal crashworthiness, the Insurance Institute for Highway Safety conducts 40 mph frontal offset crash tests. The most recent test series involves 10 models with wholly new designs or engineering changes that could affect crashworthiness. Three passenger vans, three midsize cars, and four small cars were tested.

**How they rate:** Only 2 of the 10 vehicles tested — Honda Odyssey and Ford Windstar, both passenger vans — earn good overall ratings. Five are rated acceptable, and three are marginal or poor (see attached list for detailed vehicle ratings).

**Which vehicles improved, which didn't:** The Odyssey, Mitsubishi Galant, and Hyundai Sonata performed substantially better in the 40 mph crash test, compared with their predecessor models. The structural performances of the Saab 9-3 and Volkswagen New Jetta also improved, but the Nissan Quest — re-engineered to accommodate a fourth door — performed significantly worse than the three-door version. Structurally the Mazda Protege and Dodge Neon performed about the same as their predecessors.

The Institute's frontal offset crash test into a deformable barrier is especially demanding of vehicle structure. The driver side of the vehicle hits the barrier, so a relatively small area of the front-end structure must manage the crash energy. This

— MORE —

means intrusion into the occupant compartment is more likely to occur than in a full-width test.

"Good structural design is the key to good performance in the offset test," Institute president Brian O'Neill explains. "If a vehicle's front-end structure absorbs and manages the crash energy so the occupant compartment remains largely intact, with little or no intrusion, then the dummy's movement is likely to be controlled, and injury measures are likely to be low. On the other hand, poor structural design means a greater likelihood of poor control of the dummy and high injury measures."


**1999 Mitsubishi Galant rated acceptable for structural integrity. Survival space was maintained well in 40 mph offset test.**


**1995 Mitsubishi Galant rated poor for structural integrity. Survival space wasn't maintained well in 40 mph offset test.**

### Improved structural designs of two new vehicles

The crash test of the 1999 Mitsubishi Galant, compared with its predecessor 1995 model, provides a good example of improved structural design. Photos taken after the offset crashes show how much more space there is around the driver dummy in the redesigned 1999 Galant (above left), compared with the 1995 model (right). "The occupant compartment of the old Galant virtually collapsed in the test," O'Neill says. "There was lots of intrusion. But the new Galant fared a lot better. The occupant compartment held up reasonably well, so the dummy's movement was controlled better than in the old model, and the injury measures were lower."

—— MORE ——

Specific intrusion measurements quantify the Galant's improvement. For example, the width of the driver door opening at the bottom of the window was reduced by 25 centimeters during the crash test of the 1995 Galant, but the reduction was much less — only 5 centimeters — in the test of the 1999 model.

Another good comparison involves the Honda Odyssey. In the 40 mph test of the 1996 model, the instrument panel moved 13 to 15 centimeters rearward, toward the dummy. But after Honda completely redesigned the Odyssey for the 1999 model year, the structural performance improved. Rearward movement of the instrument panel was only 1 or 2 centimeters, for example.

"The way to protect people in serious frontal crashes is to ensure that the space around them isn't compromised. When major intrusion occurs, even the best restraint system cannot prevent injuries. It's the same concept as shipping a fragile object — it doesn't matter how well it's protected by foam or other packaging inside a box, if the box gets damaged or crushed during transit, the object is likely to break. Today more of the vehicles we test have improved structural designs, and their occupant compartments, or safety cages, remain largely intact. This means even in serious crashes the restraint systems should protect the occupants, so fewer people are going to be injured or die in these vehicles," O'Neill also says.

These design improvements aren't happening because any government regulation is demanding them. "It's because nearly every automaker has moved on its own to incorporate an offset test into the development process for new and redesigned models. The manufacturers are doing this because they know many car buyers want the best occupant crash protection they can get," O'Neill points out.

**How the 10 vehicles fared in the 40 mph frontal offset crash test**

Honda Odyssey (passenger van): Overall crash test performance improved from marginal to good overall, compared with the predecessor model. The driver space in the redesigned model was maintained reasonably well. The risk of injury was low, although there was too much steering column movement.

Ford Windstar (passenger van): The front-end engineering changes and addition of a fourth door to the 1999 model appear to have caused a slight deterioration in the frontal offset crash performance. On the other hand, the new Windstar is the only passenger van with optional side airbags that also protect people's heads — a significant addition. The driver space was maintained reasonably well in the crash test, although footwell intrusion contributed to the possibility of lower leg injury, and there was too much steering column movement.

Nissan Quest/Mercury Villager (passenger van): Engineering changes associated with adding a fourth door resulted in worse structural performance in the frontal offset crash test, compared with the predecessor model. The driver space wasn't maintained well, and there was far too much steering column movement.

Mitsubishi Galant (midsize car): Crash test performance improved from poor to acceptable, largely because of much less intrusion into the occupant compartment.

Saab 9-3 (midsize car): Crash test performance improved compared with the predecessor 900 model. The driver space was maintained reasonably well in the new model. However, footwell intrusion contributed to the possibility of lower leg injury, and there was too much steering column movement.

Hyundai Sonata (midsize car): This vehicle improved from poor to acceptable overall. However, the driver space still wasn't maintained well, and footwell intrusion contributed to the possibility of lower leg injuries.

Volkswagen New Jetta/Golf (small car): The 1999 model improved from marginal to acceptable and is the second best performer among small cars the Institute has tested (after the Volkswagen New Beetle).

Mazda Protege (small car): Structural performance was very similar to the predecessor model's. The driver space was maintained reasonably well, although footwell intrusion contributed to the likelihood of lower leg injury.

Dodge/Plymouth Neon (small car): Dummy injury measures for the redesigned 2000 model improved somewhat compared with the predecessor model, but the driver space still wasn't maintained well, and there still was the likelihood of leg injury.

Kia Sephia (small car): The structural performance was somewhat better than the predecessor model's, but the driver space still wasn't maintained well. High measures recorded on the dummy indicate the possibility of a head injury, and there was too much intrusion into the footwell area.

**Institute and government crash tests complement each other**

The Institute's crashworthiness evaluations are based primarily on results from the frontal offset crash test at 40 mph. Each vehicle's overall evaluation is based on three aspects of performance — measurements of occupant compartment intrusion, injury risk measures from a Hybrid III dummy positioned in the driver seat, and analysis of slow-motion film to assess how well the restraint system controlled dummy movement during the test.

The federal government has been testing new passenger vehicles in 35 mph crash tests since 1978. This New Car Assessment Program has been a major contributor to crashworthiness improvements — in particular, improved restraint systems in new passenger vehicles. The Institute's offset test, which involves 40 percent of a vehicle's front end hitting a deformable barrier at 40 mph, complements the federal test involving the full width of the front end hitting a rigid barrier. The government test is especially demanding of vehicle restraint systems but not so much so of vehicle structure. An offset test is more demanding of vehicle structure.

The same 40 mph offset crash test is used to evaluate new cars by the European Union in cooperation with motor clubs and by an Australian consortium of state governments and motor clubs.

**End 4-page release on vehicle crashworthiness**

**4-page attachment: crashworthiness ratings**
**Video news release Wed., 4/14, 1-1:30 pm EDT**
**(C) Galaxy 6/Trans. 9; crash test footage & more**

## Internet: www.highwaysafety.org

# Evaluations

| Small Cars | OVERALL EVALUATION | Frontal Offset Crash Test Performance: Structure/ Safety Cage | Restraints & Dummy Kinematics | Injury Measures: Head/ Neck | Chest | Leg/ Foot, Left | Leg/ Foot, Right | Head Restraint Design | Bumper Performance |
|---|---|---|---|---|---|---|---|---|---|
| A BEST PICK **VOLKSWAGEN NEW BEETLE** 1998-99 models | G | G | A | G | G | G | G | G A (depends on option) | G |
| REDESIGNED DURING 1999 **VW NEW JETTA/GOLF** 1999 models | A | A | A | G | G | A | G | M P (depends on model/option) | G |
| **HONDA CIVIC** 1996-99 models | A | A | G | G | A | A | G | P | A |
| **TOYOTA COROLLA CHEVROLET PRIZM** 1998-99 models | A | A | M | G | G | M | G | A | G |
| **HYUNDAI ELANTRA** 1996-99 models | A | A | A | A | G | G | A | A | A P (depends on model year) |
| **FORD ESCORT MERCURY TRACER** 1997-99 models | A | A | G | G | G | G | P | P | A |
| **SATURN SL** 1995-99 models | A | A | M | G | A | A | G | P | G |
| **NISSAN SENTRA** 1998-99 models | A | M | A | A | G | M | G | M | G |
| REDESIGNED FOR 1999/2000 **MAZDA PROTEGE** 1999 models | A | A | A | G | G | M | P | M | P |
| **DODGE/PLYM. NEON** 2000 models | M | M | M | G | G | P | A | P | A |
| **MITSUBISHI MIRAGE** 1997-99 models | P | M | P | A | G | G | P | A | M |
| REDESIGNED FOR 1998 **KIA SEPHIA** 1998-99 models | P | M | M | P | G | M | M | A M (depends on option) | M |
| Earlier designs: | | | | | | | | | |
| **MAZDA PROTEGE** 1995-98 models | A | A | M | G | G | G | M | P | M |
| **VOLKSWAGEN JETTA/GOLF** 1994-99 models | M | M | A | A | G | P | A | P | G |
| **DODGE/PLYMOUTH NEON** 1995-99 models | P | M | P | G | G | M | P | M | G |
| **KIA SEPHIA** 1996-97 models | P | P | P | G | G | P | P | P | M |

**Go to www.highwaysafety.org:** This list summarizes the crashworthiness evaluations of small cars. The principal component of each vehicle's evaluation is its performance in a 40 mph frontal offset crash test. Details about each vehicle's test performance, including photographs taken during and after the crash, are available online @ www.highwaysafety.org. Or call the Institute for copies.

**G** GOOD **A** ACCEPTABLE **M** MARGINAL **P** POOR

INSURANCE INSTITUTE FOR HIGHWAY SAFETY

The Institute is a nonprofit research and communications organization wholly supported by automobile insurers.
1005 North Glebe Road, Arlington, Virginia 22201. Telephone 703/247-1500. Fax 703/247-1678.
This publication is printed on recycled paper.

# Evaluations

| Midsize 4-Door Cars | Overall Evaluation | Frontal Offset Crash Test Performance: Structure/ Safety Cage | Restraints & Dummy Kinematics | Injury Measures: Head/ Neck | Chest | Leg/ Foot, Left | Leg/ Foot, Right | Head Restraint Design | Bumper Performance |
|---|---|---|---|---|---|---|---|---|---|
| A BEST PICK **FORD TAURUS MERCURY SABLE** 1996-99 models | G | G | G | G | G | G | G | P | G |
| A BEST PICK **CHEVROLET LUMINA** 1995-99 models | G | G | G | G | G | G | G | P | M |
| A BEST PICK **VOLKSWAGEN PASSAT** 1998-99 models | G | G | A | G | G | G | G | M P (depends on option) | G |
| A BEST PICK **VOLVO 850/S70** 1995-99 models | G | A | G | G | G | G | G | G | M |
| A BEST PICK **TOYOTA CAMRY** 1997-99 models | G | G | G | A | G | G | G | A | G |
| REDESIGNED FOR 1999 **MITSUBISHI GALANT** 1999 models | A | A | A | G | G | G | A | M | A |
| **PONTIAC GRAND PRIX BUICK CENTURY/REGAL OLDSMOBILE INTRIGUE** 1997-99 models | A | A | G | A | G | G | A | A P (depends on model/option) | A |
| **NISSAN MAXIMA** 1997-99 models | A | A | A | G | G | M | A | M | G |
| **HONDA ACCORD** 1998-99 models | A | A | G | G | G | G | P | A M (depends on option) | A |
| **SUBARU LEGACY** 1995-99 models | A | A | G | G | G | P | G | M | A |
| RE-ENGINEERED FOR 1999 **SAAB 9-3** 1999 models | A | A | M | A | G | G | A | G | A |
| **TOYOTA AVALON** 1998-99 models | A | A | A | G | G | P | G | A P (depends on option) | A |
| REDESIGNED FOR 1999 **HYUNDAI SONATA** 1999 models | A | M | G | G | G | A | M | A | M |
| **MAZDA MILLENIA** 1995-99 models | A | M | G | G | G | P | G | P | M |

G GOOD  A ACCEPTABLE  M MARGINAL  P POOR

list continues next page

# Evaluations

| Midsize 4-Door Cars (continued) | Overall Evaluation | Frontal Offset Crash Test Performance: Structure/ Safety Cage | Restraints & Dummy Kinematics | Injury Measures: Head/ Neck | Chest | Leg/ Foot, Left | Leg/ Foot, Right | Head Restraint Design | Bumper Performance |
|---|---|---|---|---|---|---|---|---|---|
| **FORD CONTOUR<br>MERCURY MYSTIQUE**<br>1995-99 models | P | M | G | G | G | P | P | M \| P (depends on model/option) | P |
| **CHEVROLET CAVALIER<br>PONTIAC SUNFIRE**<br>1995-99 models | P | P | P | A | G | P | G | P | A |
| **CHRYSLER CIRRUS<br>DODGE STRATUS<br>PLYMOUTH BREEZE**<br>1995-99 models | P | P | M | G | G | P | P | M \| P (depends on model/option) | M |
| Earlier designs: | | | | | | | | | |
| A BEST PICK **FORD TAURUS<br>MERCURY SABLE**<br>1992-95 models | G | G | G | A | G | G | G | P | M |
| **TOYOTA CAMRY**<br>1994-96 models | A | A | G | A | G | A | G | M | M |
| **HONDA ACCORD**<br>1994-97 models | A | A | G | G | G | P | A | M \| P (depends on option) | A |
| **TOYOTA AVALON**<br>1995-97 models | M | M | G | G | G | P | A | P | P |
| **SAAB 900**<br>1995-98 models | M | P | M | G | G | G | A | A | A |
| **VOLKSWAGEN PASSAT**<br>1995-97 models | P | M | P | G | G | P | G | P | M |
| **HYUNDAI SONATA**<br>1995-98 models | P | P | M | G | G | P | G | P | P |
| **MITSUBISHI GALANT**<br>1994-98 models | P | P | P | G | G | P | A | A | P |
| **NISSAN MAXIMA**<br>1995-96 models | P | A | P | M | G | P | P | M | P |

**Go to www.highwaysafety.org:** This list summarizes the crashworthiness evaluations of midsize 4-door cars. The principal component of each vehicle's evaluation is its performance in a 40 mph frontal offset crash test. Details about each vehicle's test performance, including photographs taken during and after the crash, are available online @ www.highwaysafety.org. Or call the Institute for copies.

INSURANCE INSTITUTE FOR HIGHWAY SAFETY

The Insurance Institute for Highway Safety is a nonprofit research and communications organization wholly supported by automobile insurers.
1005 North Glebe Road, Arlington, Virginia 22201. Tel. 703/247-1500. Fax 703/247-1678.
This publication is printed on recycled paper.

# Evaluations

| Passenger Vans | Overall Evaluation | Frontal Offset Crash Test Performance: Structure/ Safety Cage | Restraints & Dummy Kinematics | Injury Measures: Head/ Neck | Chest | Leg/ Foot, Left | Leg/ Foot, Right | Head Restraint Design | Bumper Performance |
|---|---|---|---|---|---|---|---|---|---|
| A BEST PICK **TOYOTA SIENNA** 1998-99 models | G | G | G | G | G | G | G | P | M |
| REDESIGNED FOR 1999 **HONDA ODYSSEY** 1999 models | G | A | A | G | G | G | G | M P (depends on option) | A |
| REDESIGNED FOR 1999 **FORD WINDSTAR** 1999 models | G | A | A | G | G | A | G | A P (depends on option) | A |
| **DODGE GRAND CARAVAN, PLYMOUTH GRAND VOYAGER, CHRYSLER TOWN & COUNTRY** 1996-99 models | M | A | A | G | G | P | P | M P (depends on model/option) | P |
| **CHEVROLET ASTRO, GMC SAFARI** 1996-99 models | P | P | M | G | G | P | G | M P (depends on model/option) | P |
| RE-ENGINEERED FOR 1999 **NISSAN QUEST, MERCURY VILLAGER** 1999 models | P | P | P | A | G | P | A | M P (depends on model/option) | G |
| **PONTIAC TRANS SPORT/MONTANA, OLDSMOBILE SILHOUETTE, CHEVROLET VENTURE** 1997-99 models | P | P | M | P | G | P | P | A M (depends on model/option) | P |
| Earlier designs: | | | | | | | | | |
| A BEST PICK **FORD WINDSTAR** 1995-98 models | G | G | G | G | G | G | G | P | A |
| **MAZDA MPV** 1996-98 models | M | M | M | G | G | M | A | M | P |
| **HONDA ODYSSEY, ISUZU OASIS** 1995-98 Odyssey models, 1996-99 Oasis models | M | P | A | G | G | A | P | M | A |
| **NISSAN QUEST, MERCURY VILLAGER** 1996-98 models | M | A | M | A | G | P | P | M | M |
| **FORD AEROSTAR** 1992-97 models | P | P | M | A | G | P | G | P | P |
| **TOYOTA PREVIA** 1994-97 models | P | M | P | M | G | M | P | A M (depends on option) | P |

**Go to www.highwaysafety.org:** This list summarizes the crashworthiness evaluations of passenger vans. The principal component of each vehicle's evaluation is its performance in a 40 mph frontal offset crash test. Details about each vehicle's test performance, including photographs taken during and after the crash, are available online @ www.highwaysafety.org. Or call the Institute for copies.

G GOOD  A ACCEPTABLE  M MARGINAL  P POOR

INSURANCE INSTITUTE FOR HIGHWAY SAFETY

The Institute is a nonprofit research and communications organization wholly supported by automobile insurers.
1005 North Glebe Road, Arlington, Virginia 22201. Telephone 703/247-1500. Fax 703/247-1678.
This publication is printed on recycled paper.