Status Report

Insurance Institute for Highway Safety | Highway Loss Data Institute

Structural collapse

Midsize SUVs disappoint in small overlap front crash test

ALSO IN THIS ISSUE

Vol. 49, No. 3
April 8, 2014

The Chevrolet Equinox and its twin, the GMC Terrain, are the only midsize SUVs out of nine evaluated to earn a good rating in the IIHS small overlap front crash test, which continues to challenge manufacturers more than a year and a half after its introduction.

The Equinox and the Terrain qualify for the Institute's highest award for 2014, *TOP SAFETY PICK+*. The Toyota Highlander, a midsize SUV whose acceptable small overlap rating was announced in December, also qualifies. The award is given to vehicles with a good or acceptable small overlap rating, good ratings in four other occupant protection tests, and a rating of basic or higher for front crash prevention.

Three other midsize SUVs in the test group rate poor for small overlap protection, and three are marginal.

"SUVs have gotten much safer over the past few generations, but some are better than others at providing comprehensive front crash protection," says David Zuby, IIHS executive vice president and chief research officer. "When it comes to midsize SUVs, General Motors is showing the way forward. The Equinox and Terrain score well in all components of the small overlap test — structure, restraints and kinematics, and injury measures for four body regions."

The small overlap test replicates what happens when the front corner of a vehicle collides with another vehicle or an object such as a tree or utility pole. In the test, 25 percent of a vehicle's front end on the driver's side strikes a rigid barrier at 40 mph.

The test is more difficult than either the head-on crashes conducted by the National Highway Traffic Safety Administration or the longstanding IIHS moderate overlap test. In a small overlap test, the main structures of the vehicle's front-end crush zone are bypassed, making it hard for the vehicle to manage crash energy. The occupant compartment can collapse as a result.

The Equinox and Terrain were able to overcome this challenge, thanks to modifications on 2014 models to their front structure and door-hinge pillars. In the test, which was conducted on an Equinox but applies to the Terrain as well, the driver space was well-maintained, and the dummy's movement was well-controlled. The dummy's head hit the frontal airbag and stayed there. It would have been a perfect test performance if the side curtain airbag had provided more forward coverage. As it was, there was a gap in the inflated portion, which, in a slightly different crash,

Midsize SUV ratings in small overlap front test

	Overall	Structure	Restraints & kinematics	Dummy injury measures: Head & neck	Chest	Hip & thigh	Lower leg & foot
2014 IIHS TOP SAFETY PICK+ Chevrolet Equinox	G	G	G	G	G	G	G
2014 IIHS TOP SAFETY PICK+ GMC Terrain	G	G	G	G	G	G	G
2014 IIHS TOP SAFETY PICK+ Toyota Highlander	A	A	A	G	G	G	G
Jeep Grand Cherokee	M	M	A	G	G	G	M
Toyota 4Runner	M	P	G	G	G	G	A
Ford Explorer	M	P	M	G	G	G	A
Kia Sorento	P	P	M	G	G	A	P
Mazda CX-9	P	P	P	A	G	G	A
Honda Pilot	P	P	M	G	G	P	M

Good G Acceptable A Marginal M Poor P

The small overlap front crash test stymies most midsize SUVs, with only two out of nine tested — the Chevrolet Equinox and its twin, the GMC Terrain — earning a good rating.

Survival space: The structure of the Chevrolet Equinox (left) held up well, leaving adequate space for the driver. In contrast, the driver space in the Honda Pilot was seriously compromised. In the worst instance of intrusion, the parking brake pedal moved inward more than 16 inches.

Kia Sorento

Five midsize SUVs received a poor rating for structure, the most fundamental aspect of occupant protection. In five vehicles, the dummy's head barely contacted the frontal airbag before sliding off.

Toyota 4Runner

could leave the head vulnerable to hitting the door or intruding objects.

The Honda Pilot was the worst performer in this group. The driver's space was seriously compromised by intruding structure. In the worst instance, the parking brake pedal moved inward 16½ inches. The dummy's head barely contacted the frontal airbag before sliding off the left side, as the steering column moved 5½ inches to the right. Measures taken from the dummy showed injuries to the left hip would be likely in a crash of this severity, and injuries to the left knee and both lower legs would be possible.

A structure that can withstand a crash is the most fundamental aspect of occupant protection. In addition to the Pilot, four other midsize SUVs received a poor rating for structure. One of them, the Mazda CX-9, saw its hinge pillar pushed in 17 inches, bringing the left front wheel even with the dummy's knee. The side airbag didn't deploy, and the door frame ended up so far inside the occupant compartment that the dummy's head struck it after sliding off the frontal airbag. In the Ford Explorer, the door hinge pillar was nearly severed from the door sill.

In five vehicles, the dummy's head barely contacted the frontal airbag before sliding off it. Only the Equinox/Terrain and the Toyota 4Runner tests showed good engagement with the frontal airbag. In the Jeep Grand Cherokee, the dummy's head for the most part stayed on the airbag, but too much give in the safety belt allowed the head to move toward the intruding A-pillar.

For the first time in 2014, a good or acceptable rating for small overlap protection, along with good ratings in the moderate overlap front, side, roof strength and head restraint tests, is a requirement for *TOP SAFETY PICK*. The Equinox, Terrain and Highlander earn the higher accolade of *TOP SAFETY PICK+* because each is available with an optional front crash prevention system.

The Highlander earns an advanced rating for front crash prevention. Its system includes both forward collision warning and an automatic braking function that reduced speeds by more than 5 mph in IIHS tests at 12 and 25 mph. The Equinox and the Terrain have warning systems only, and thus earn a basic rating for front crash prevention. ■

Audi A3

Chevrolet Malibu

Nissan Rogue

Three more vehicles earn *TOP SAFETY PICK*+ award

Automakers continue to make improvements to vehicles throughout their fleets with the aim of garnering more awards from IIHS. Three vehicles recently earned *TOP SAFETY PICK*+ after the manufacturers nominated them for consideration outside the Institute's regular test schedule.

Nissan and Audi kept small overlap front protection in mind as they redesigned the Rogue and the A3, respectively. Chevrolet, meanwhile, made structural modifications to the Malibu to improve small overlap protection without a full redesign. All three earn good ratings in the small overlap test and the Institute's other four crashworthiness evaluations.

In the small overlap test of the 2014 Rogue, a small SUV, the driver's space was maintained reasonably well, and injury measures recorded on the dummy indicated low risk of any significant injuries in a crash of this severity. The dummy's head made good contact with the front airbag, which stayed in position during the crash, and the side curtain airbag deployed to protect the head from contact with side structures.

The new Rogue is an improvement over the previous generation, which was rated marginal in the small overlap test and acceptable in the roof strength evaluation. The new model offers an optional forward collision warning system, which earns it a basic front crash prevention rating.

The old Rogue, manufactured since 2008, is still in production and now sells as the Nissan Rogue Select.

The 2015 A3, a midsize luxury car, held up well in the small overlap test with a minimal amount of intrusion into the driver's space. The dummy's movement was well-controlled, and injury measures taken from the dummy indicated a low risk of injury.

The A3 is available with an optional front crash prevention system that qualifies for an advanced rating from IIHS. The system has automatic braking technology that avoided a crash in the Institute's 12 mph test.

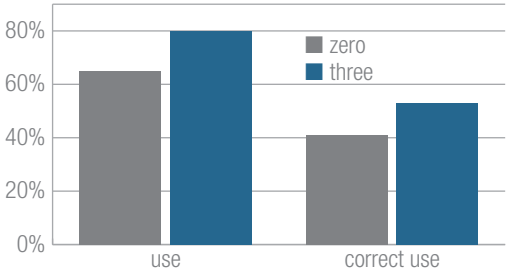
Finally, the 2014 Malibu, a midsize moderately priced car, performed well in the small overlap test after Chevrolet modified its front structure and door sill. The driver's space was maintained well, and injury measures recorded on the driver dummy indicated low risk of any significant injuries. The dummy's head made good contact with the front airbag, which stayed in position during the crash, and the side curtain airbag deployed to protect the head from contact with side structures. In contrast, the 2013 Malibu rated marginal in the test. ■

What makes LATCH easier to use?

Parents reinforce lab findings of key vehicle design features

Making LATCH easier to use — and use correctly — is a goal of an ongoing child safety research program at the Institute. What researchers have uncovered in laboratory and field studies is that parents often struggle to correctly install child restraints using LATCH, and the reason why depends a lot on the location and ease of use of attachment hardware in vehicles. A new IIHS study conducted with the help of Safe Kids Worldwide reinforces prior work indicating that modifying LATCH anchor setups in vehicles could improve child restraint installation rates.

Lower anchor use and correct use rates by number of criteria met



Attachment anchors that are easy to find and access raise the chances that parents will correctly use LATCH to install a child restraint.

LATCH stands for Lower Anchors and Tethers for Children. Intended to make it easier to securely attach child restraints, LATCH has been required in passenger vehicles since the 2003 model year and on child restraints manufactured since 2002. There are two components: lower attachments on child restraints that connect to anchors at the vehicle seat bight, and top tethers on forward-facing restraints that attach to anchors on the vehicle's rear shelf, seat back, floor, cargo area or ceiling. Child restraints can be installed with LATCH or safety belts. Top tethers should be used with all forward-facing child restraints, whether they are secured by safety belts or using the lower anchors.

A 2012 study by the Institute and the University of Michigan Transportation Research Institute pinpointed three main vehicle factors that make the LATCH lower attachments easier to install correctly (see *Status Report*, April 12, 2012, at iihs.org). The two-part study scrutinized LATCH hardware and rear seat designs in a range of vehicles and then had volunteers install different types of child restraints in vehicles representing different LATCH setups.

The three key factors associated with correct lower anchor use were depth, clearance and force. Depth: Anchors should be easy to find without digging around in the seat cushions to locate them. A common problem is that safety belt buckles, plastic housing or vehicle seats obscure or interfere with lower anchors. Clearance: Anchors should be easy to access, with enough space around them to accommodate child restraint lower connectors. Force: Parents should be able to easily clip or snap child restraint connectors onto vehicle anchors. Some LATCH systems require excessive force to attach the lower connectors due to interference from seat cushions or other hardware.

In the latest study, IIHS researchers set out to see if what they'd observed in the lab would play out in the real world with parents who participated in Safe Kids' car seat checkpoints during 2010-12 across the U.S. The findings dovetail.

Drivers arrived at the safety checkpoints with child restraints already installed in their vehicles. Among parents who installed child restraints using only the lower anchors or the safety belt, 78 percent were using the lower anchors and 49 percent were using them correctly. When lower

anchors met the three installation criteria, 80 percent of parents used lower anchors and 53 percent used them correctly. When the lower anchors didn't meet any of the criteria, 65 percent of parents used them and 41 percent used them correctly. Restraints were nearly twice as likely to be attached correctly when installed with the lower anchors rather than with the safety belt (63 percent vs. 34 percent).

Using the lower anchors with forward-facing restraints increased the likelihood that drivers would use the top tether, too. Child restraints installed with lower anchors were twice as likely to be tethered as child restraints secured with safety belts (62 percent vs. 29 percent). The finding is in line with an earlier IIHS observational study of tether use (see *Status Report*, April 25, 2013).

At checkpoints, parents who drove cars were somewhat less likely to use the LATCH lower anchors. This might be because lower anchors are often easier to see and access in minivans, SUVs and pickups. In cars, parents often have to dig around in seat cushions to find lower anchors. Among vehicles at checkpoints, SUVs and minivans were more likely to meet all three lower anchor installation criteria than cars.

After accounting for lower anchor use, tether use and correct use rates were higher when cargo hooks or other confusing hardware easily mistaken for a tether anchor weren't present or when the anchor was located on the rear deck, which is typical in sedans. This finding is in line with an IIHS study released in February indicating that parent volunteers installing child restraints with LATCH were more likely to use top tethers and attach the strap correctly if the attachment anchor was easy to find (see *Status Report*, Feb. 20, 2014). This was most often when anchors were located on the rear deck or at the middle of the seat back as compared with other spots in the vehicle.

Together, these studies confirm that specific vehicle features are associated with use and correct use of LATCH in real-world child restraint installations in a variety of vehicle models. The next step for the Institute is to explore a ratings system to evaluate LATCH setups in the vehicles families drive.

"Our research tells us that there are design changes automakers can make to help parents install child restraints correctly to provide the best protection for children in crashes," says Anne McCartt, Institute senior vice president for research. "One way to encourage manufacturer improvements is to develop a ratings system for LATCH, with the goal of getting more parents to use LATCH and reduce the chances for misuse."

For a copy of "Vehicle characteristics associated with LATCH use and correct use in real-world child restraint installations" by J.B. Cicchino and J. S. Jermakian, email publications@iihs.org. ■

Regulators revive truck recorder rule after legal setback

Federal regulators have rewritten a proposed requirement for electronic logbooks on commercial vehicles in response to a court ruling that had temporarily halted the rulemaking process. The proposal from the Federal Motor Carrier Safety Administration (FMCSA) would require interstate commercial truck and bus companies to install electronic logging devices (ELDs) — previously referred to as electronic onboard recorders — that would automatically track drivers' time behind the wheel and their rest breaks.

In announcing the proposal in March, FMCSA said the rule would reduce hours-of-service violations by making it more difficult for drivers to falsify records. That, in turn, would reduce fatigued driving, preventing an estimated 20 deaths and 434 injuries a year, the agency said.

The proposal revives an effort that hit a roadblock in 2011 when the 7th U.S. Circuit Court of Appeals invalidated an earlier requirement for electronic logging devices for the fleets of truck and bus companies with a record of egregious work-rule violations (see *Status Report*, Oct. 13, 2011, at iihs.org). The court said FMCSA had failed to address a law requiring it to ensure onboard recorders wouldn't be used to harass drivers. The Owner-Operator Independent Drivers Association contended that, rather than using the information from recorders to ensure drivers get adequate rest, companies instead use it to pressure resting drivers to get back on the road.

The proposal includes an explicit prohibition on harassment of a driver by a company using ELD information. It establishes a procedure for filing harassment complaints and creates a maximum penalty of $11,000 for harassment of a driver that leads to an hours-of-service violation or to a sick or tired driver operating a vehicle, compromising safety.

The Institute has long supported onboard recorders for all large trucks, first petitioning for the devices in 1986. Although current hours-of-service regulations allow too much time on the road — up to 11 hours a day — better compliance with even this weak limit would likely reduce the number of tired drivers (see *Status Report*, April 26, 2011, and Jan. 24, 2012). It's not known how many large truck crashes are caused by fatigue, but research has shown that long hours of driving increase crash risk.

A total of 3,514 people died in large truck crashes in 2012. That's 12 percent more than in 2009, when the number was the lowest since the government began collecting fatal crash data in 1975. Seventeen percent of the people who died in truck crashes were truck occupants, 67 percent were people in cars and other passenger vehicles, and 15 percent were pedestrians, bicyclists or motorcyclists.

Meanwhile, another long-awaited rule could soon be coming. The Department of Transportation said in a recent report that the National Highway Traffic Safety Administration may issue a proposal in October to require speed limiters on large trucks. IIHS has supported petitions to mandate the devices (see *Status Report*, Aug. 21, 2010). ■

INSURANCE INSTITUTE FOR HIGHWAY SAFETY
HIGHWAY LOSS DATA INSTITUTE
HIGHWAY SAFETY RESEARCH & COMMUNICATIONS

Status Report

Vol. 49, No.3
April 8, 2014

1005 N. Glebe Road
Arlington, VA 22201 USA
t 703/247-1500
f 703/247-1588

Inquiries/print subscriptions:
StatusReport@iihs.org

Editor: Kim Stewart
Writer: Sarah Karush
Art Director: Steve Ewens

www.iihs.org
iihs.org/rss
youtube.com/IIHS
@IIHS_autosafety
m.iihs.org

The **Insurance Institute for Highway Safety** is an independent, nonprofit scientific and educational organization dedicated to reducing the losses — deaths, injuries and property damage — from crashes on the nation's roads.

The **Highway Loss Data Institute** shares and supports this mission through scientific studies of insurance data representing the human and economic losses resulting from the ownership and operation of different types of vehicles and by publishing insurance loss results by vehicle make and model.

Both organizations are wholly supported by the following auto insurers and funding associations:

MEMBER GROUPS

Acceptance Insurance
ACE Private Risk Services
Affirmative Insurance
Alfa Alliance Insurance Corporation
Alfa Insurance
Allstate Insurance Group
American Family Mutual Insurance
American National Family of Companies
Ameriprise Auto & Home
Amica Mutual Insurance Company
Auto Club Enterprises
Auto Club Group
Auto-Owners Insurance
Aviva Insurance
Bankers Insurance Group
Bituminous Insurance Companies
California Casualty Group
Capital Insurance Group
Chubb & Son
Colorado Farm Bureau Mutual Insurance Company
Commonwealth Mutual Insurance Company of America
Concord Group Insurance Companies
Cotton States Insurance
COUNTRY Financial
CSAA Insurance Group
CSE Insurance Group
Dallas National Insurance Company
Direct General Corporation
Erie Insurance Group
Esurance
Farm Bureau Financial Services
Farm Bureau Insurance of Michigan
Farm Bureau Mutual Insurance Company of Idaho
Farmers Insurance Group of Companies
Farmers Mutual Hail Insurance Company of Iowa
Farmers Mutual of Nebraska
Florida Farm Bureau Insurance Companies
Frankenmuth Insurance
Gainsco Insurance
GEICO Corporation
Georgia Farm Bureau Mutual Insurance Company
Goodville Mutual Casualty Company
Grange Insurance
Hallmark Insurance Company
Hanover Insurance Group
The Hartford
Haulers Insurance Company, Inc.
Horace Mann Insurance Companies
ICW Group
Imperial Fire & Casualty Insurance Company
Indiana Farmers Mutual Insurance Company
Infinity Property & Casualty
Kemper Preferred
Kentucky Farm Bureau Insurance
Liberty Mutual Insurance Company
Louisiana Farm Bureau Mutual Insurance Company
Maryland Automobile Insurance Fund
Mercury Insurance Group
MetLife Auto & Home
Michigan Millers Mutual Insurance Company
MiddleOak
Mississippi Farm Bureau Casualty Insurance Company
MMG Insurance
Mutual of Enumclaw Insurance Company
Nationwide
New Jersey Manufacturers Insurance Group
Nodak Mutual Insurance Company
Norfolk & Dedham Group
North Carolina Farm Bureau Mutual Insurance Company
Northern Neck Insurance Company
Ohio Mutual Insurance Group
Old American County Mutual Fire Insurance
Old American Indemnity Company
Oregon Mutual Insurance
Pekin Insurance
PEMCO Insurance
Plymouth Rock Assurance
Progressive Corporation
QBE Group
The Responsive Auto Insurance Company
Rockingham Group
Safe Auto Insurance Company
Safeco Insurance Companies
Samsung Fire & Marine Insurance Company
SECURA Insurance
Sentry Insurance
Shelter Insurance
Sompo Japan Insurance Company of America
South Carolina Farm Bureau Mutual Insurance Company
Southern Farm Bureau Casualty Insurance Company
State Auto Insurance Companies
State Farm Insurance Companies
Tennessee Farmers Mutual Insurance Company
Texas Farm Bureau Insurance Companies
Tower Group Companies
The Travelers Companies
United Educators
USAA
Utica National Insurance Group
Virginia Farm Bureau Mutual Insurance
West Bend Mutual Insurance Company
Western National Insurance Group
Westfield Insurance
XL Group plc
Zurich North America

FUNDING ASSOCIATIONS

American Insurance Association
National Association of Mutual Insurance Companies
Property Casualty Insurers Association of America