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STATUS REPORT

INSURANCE INSTITUTE FOR HIGHWAY SAFETY

Estimated risk of DRIVER DEATH

generally is lower when airbags inflate with less force. On balance, nothing was lost in terms of driver protection when automakers began depowering airbags, beginning with 1998 models. This is the main finding of new Institute research.

Controversy surrounded the 1997 decision by the National Highway Traffic

Safety Administration (NHTSA) to modify airbag compliance tests with unbelted dummies (testing with belted dummies wasn't changed). The modifications, which enable automakers to reduce the inflation power of frontal airbags in many vehicles, were believed to be necessary because of the deaths that had been caused by inflating airbags in low-speed crashes. Reducing the inflation forces was expected to reduce these risks.

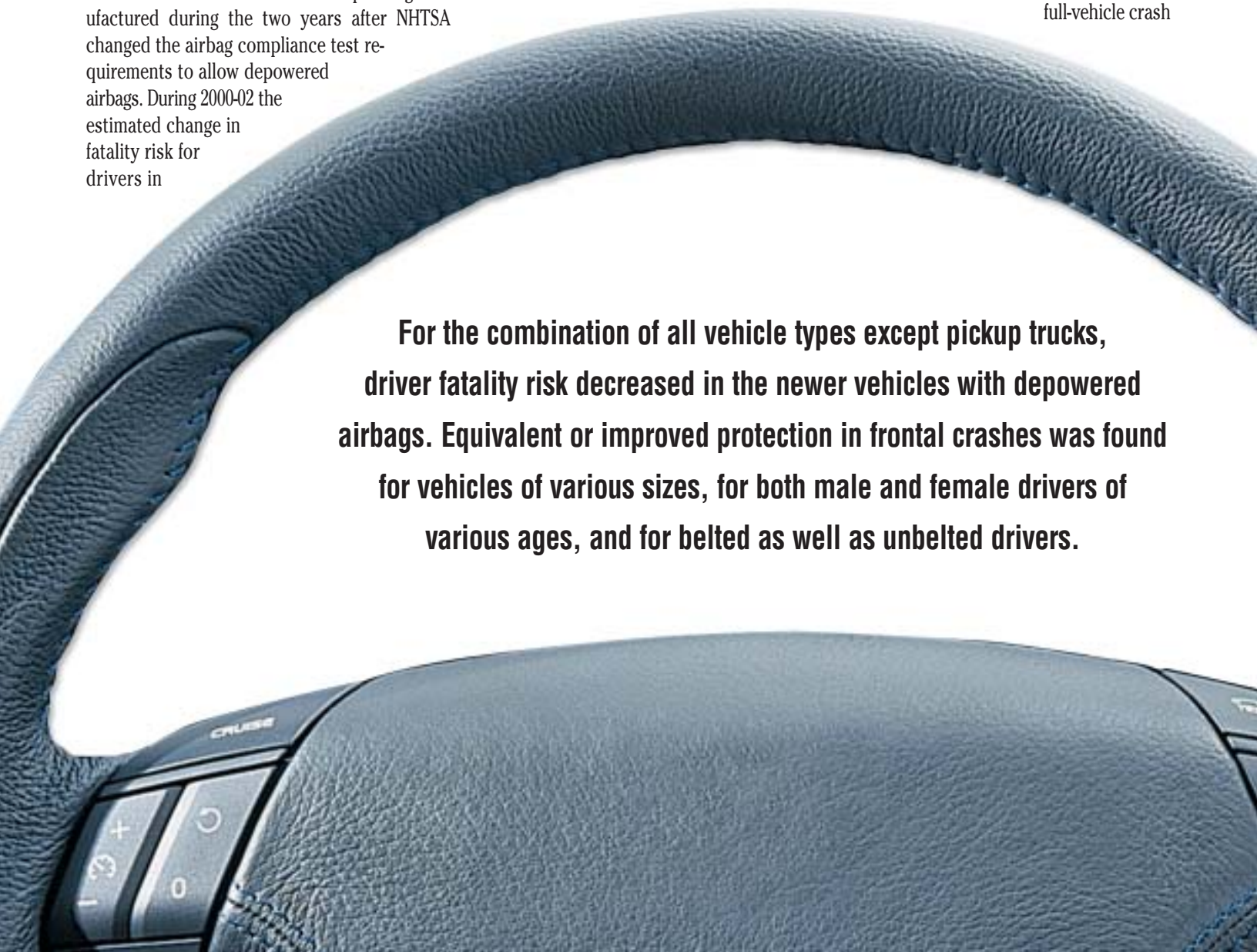
Opponents of the modifications said hundreds of additional deaths could occur because of inadequate airbag protection in crashes at higher speeds. But the Institute supported the changes, pointing to research indicating that inflating airbags were causing deaths among unbelted drivers in high- as well as low-speed crashes. In more recent years, deaths from inflating airbags in low-speed crashes have decreased dramatically (see *Status Report*, April 6, 2002; on the web at www.highwaysafety.org).

A new Institute study of real-world crashes indicates that concerns about reduced driver airbag protection in more serious crashes aren't warranted. Except in pickup trucks, the researchers estimated that the risk of death was lower in passenger vehicles manufactured during the two years after NHTSA changed the airbag compliance test requirements to allow depowered airbags. During 2000-02 the estimated change in fatality risk for drivers in frontal crashes of 1998-99 model passenger vehicles except pickups (cars, SUVs, and minivans) was 11 percent lower than the risk in 1997 models of the same vehicles. The later models met the amended test requirements, while the 1997 models met the older requirements.

In pickup trucks the result was different. The estimated driver fatality risk in 1998-99 models increased 35 percent compared with 1997 models. But even with the result for pickups included with the cars, SUVs, and minivans there was a net 6 percent reduction in fatality risk for all passenger vehicles certified to the amended airbag rule.

"This overall finding should alleviate any doubts about whether NHTSA made the right decision in allowing depowered airbags," says Susan Ferguson, Institute senior vice president for research and an author of the study. "The decision was, and still is, a good one. We need a better understanding of what's going on with pickups, but there has been a net saving of lives from the amended rule."

Until the 1998 model year, airbag compliance test requirements included 30 mph rigid barrier crash tests with unbelted dummies. NHTSA's 1997 rule change allowed automakers to comply by running 30 mph sled tests instead of full-vehicle crash



For the combination of all vehicle types except pickup trucks, driver fatality risk decreased in the newer vehicles with depowered airbags. Equivalent or improved protection in frontal crashes was found for vehicles of various sizes, for both male and female drivers of various ages, and for belted as well as unbelted drivers.

tests into a rigid barrier. The sled tests don't require airbags to inflate as quickly or with as much force as barrier tests. The barrier test requirement later was reinstated, but the test speed was relaxed from 30 mph to 25 mph. The effect has been to allow automakers to equip passenger vehicles since the 1998 model year with airbags that inflate with less power.

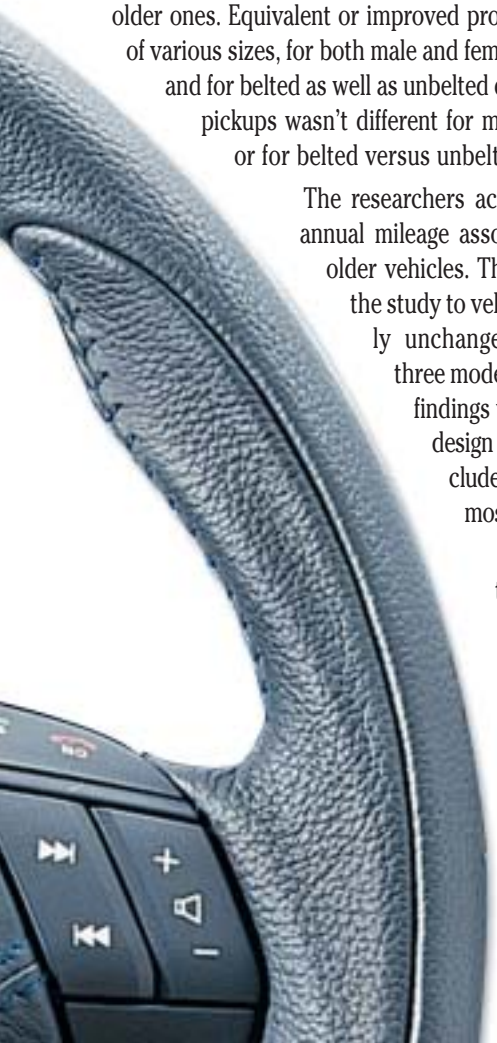
Controversy about the rule change began before it was made and hasn't gone away. Opponents of the change have challenged NHTSA in federal court (see *Status Report*, March 5, 2003; on the web at www.highwaysafety.org).

The crux of the issue is whether conducting rigid barrier crash tests at 30 mph with unbelted dummies means that more people will reap airbag benefits in real-world crashes at higher speeds. Or will the less stringent tests NHTSA began allowing for 1998 and later model vehicles produce airbags that are just as effective in crashes at higher speeds while posing less risk of inflation injury in crashes at lower speeds?

To conduct the study addressing this issue, Institute researchers compared driver deaths per registered vehicle during 2000-02 in frontal crashes of vehicles manufactured in the model year before NHTSA changed the rules for airbag compliance testing (1997) and in the two model years immediately after the change (1998-99). For the combination of all vehicle types except pickups, driver fatality risk decreased in the newer vehicle models compared with the older ones. Equivalent or improved protection was found for cars of various sizes, for both male and female drivers of various ages, and for belted as well as unbelted drivers. The effect in newer pickups wasn't different for men compared with women or for belted versus unbelted drivers.

The researchers accounted for differences in annual mileage associated with newer versus older vehicles. The researchers also limited the study to vehicle models with essentially unchanged structures during the three model years of the study so that findings would largely reflect airbag design changes. The vehicles included in the study represent almost half of all 1997-99 models.

For a copy of "Driver mortality in frontal crashes: comparison of newer and older airbag designs" by E.R. Braver et al., write: Publications, Insurance Institute for Highway Safety, 1005 N. Glebe Rd., Arlington, VA 22201, or email publications @iihs.org.



The driver airbags in these 1998 and 1999 models with depowered airbags offered equivalent or improved occupant protection, compared with 1997 models manufactured before NHTSA changed the rules to allow depowering.

Comprehensive new study lends perspective to debates about fuel economy and crash compatibility

Based on analyses of deaths in passenger vehicles during 1996-2000, the National Highway Traffic Safety Administration (NHTSA) has published an exhaustive report that confirms the overall safety disadvantages of riding in vehicles of lighter weight.

Published late last year amid ongoing policy debates about fuel economy and vehicle compatibility in crashes, the NHTSA report by Charles J. Kahane finds that making all passenger vehicles 100 pounds lighter could cost 1,000 or more lives per year, mostly in crashes of vehicles that already are lightweight. But Kahane points out that the disadvantages of vehicle weight reductions don't necessarily carry though to the heaviest passenger vehicles: "There may have been some weight above 3,870 pounds beyond which overall fatality rates tended to increase, rather than decrease, as weight increased."

Further analyses led Kahane to suggest that reducing the weights of pickups and SUVs weighing more than about 5,000 pounds would be beneficial. Some added deaths would occur in these vehicles because of their reduced weights, but these deaths would be more than offset by reductions in deaths of others on the road who crash with the heavy vehicles.

When Kahane considered only deaths inside vehicles of various sizes (that is, when he didn't factor in deaths of others in crashes with these vehicles), he found the highest driver death rates by far in the lightest cars (11.6 driver deaths per billion miles of travel). The lowest rates are in minivans (2.8 deaths per billion miles), followed by the heaviest cars (3.3). Death rates in pickup trucks follow this pattern. The rate in lighter pickups is higher than in heavier ones (6.8 deaths per billion miles compared with 4.1).

Exception to the pattern: The heaviest SUVs have lower death rates than ones of lighter weight. However, there's an interesting deviation from the pattern of lower death rates in heavier vehicles — the lightest SUVs have lower rates (5.7) than midweight ones (6.7).

The occupant death rate in crashes that don't involve rollover is somewhat lower in midweight SUVS, but the rollover death rate in the lightest SUVs is less than half of the rate in midweight SUVs (1.1 deaths per billion miles compared with 2.7 per billion). In discussing this exception, Kahane points out that lighter SUVs and pickups used to

DRIVER DEATHS PER BILLION MILES BY VEHICLE SIZE, 1996-99 MODELS DURING 1996-2000

Cars 4-door	Curb weight range	Death rate
Very small	1,950-2,274 lbs.	11.6
Small	2,208-2,878 lbs.	7.8
Midsize	2,566-3,567 lbs.	5.3
Large	3,035-4,690 lbs.	3.3
Minivans	3,354-4,819 lbs.	2.8
SUVs 4-door		
Small	2,636-3,437 lbs.	5.7
Midsize	3,476-4,484 lbs.	6.7
Large	4,332-5,899 lbs.	3.8
Pickups		
Lighter	2,625-4,178 lbs.	6.8
Heavier	3,404-5,268 lbs.	4.1

be especially rollover prone but by 1996-99 several new models with improved rollover stability had been introduced.

"Small four-door SUVs of 1996-99 may have been the beginning of a new generation of more stable, less aggressive vehicles with lower fatal crash rates. This trend appears to have continued and expanded since 1999," Kahane says.

Vehicle weight and fuel economy: The overall fuel economy of passenger vehicles on U.S. roads has deteriorated in recent years, largely because of the surge in popularity of bigger, heavier vehicles. This has prompted calls for more stringent fuel economy requirements. At the same time, requiring improved fuel economy could have adverse safety consequences because the vehicles that get the most miles per gallon typically are the lightest and least protective of their occupants in crashes.

NHTSA's new report quantifies the safety cost of downweighting vehicles to meet tougher fuel economy requirements. If the weights of all passenger vehicles were reduced by 100 pounds, on average, the result would be an increase in highway fatalities ranging from about 250 to 1,500 per year — and this increase could approach 3,000 more deaths per year if passenger vehicle weights were reduced by 200 pounds instead of 100.

The biggest share of the increase would be among people riding in the lightest cars. Downweighting only these vehicles by 100 pounds would result in an estimated 226 to 715 more deaths per year. However, downweighting the heaviest SUVs and pickup trucks by 100 pounds might not increase crash deaths. In fact, it could reduce deaths.

These results come as NHTSA considers changing the structure of fuel economy requirements. A problem with the current structure is that auto manufacturers can reduce the weights of their vehicles and/or increase sales of lightweight vehicles to comply with the federal standards. The revisions NHTSA is considering would take into account the recommendations of the National Academy of Sciences, which has urged the agency to index fuel economy requirements to passenger vehicle weight but to level off the index at about 4,000 pounds (see *Status Report*, April 6, 2002; on the web at www.highwaysafety.org).

Indexing means federal fuel economy requirements would be less stringent for a vehicle weighing 4,000 pounds than for one weighing 2,500 pounds. However, leveling off the index means a 6,000 pound vehicle would have to meet about the same requirements as a 4,000 pound vehicle.

ESTIMATED CHANGES IN NUMBERS OF DRIVER DEATHS DURING 1999 IF VEHICLES HAD BEEN 100 POUNDS LIGHTER

Cars 4-door			
Lighter than 2,950 lbs.	+226	to	+715
2,950 lbs. or heavier	+129	to	+303
SUVs, pickups, and vans			
Lighter than 3,870 lbs.	+59	to	+296
3,870 lbs. or heavier	-156	to	+241
All vehicles	+258	to	+1,555

"This approach would accomplish two purposes," Institute chief operating officer Adrian Lund points out. "It would acknowledge the safety disadvantages of downweighting passenger vehicles across the board — the very disadvantages that Kahane quantified in the NHTSA report. At the same time, leveling off the index would encourage auto manufacturers to downweight the heaviest passenger vehicles. This would benefit not only fuel economy but also safety because in a two-vehicle crash the heavier vehicle poses added risks to the people in the other vehicle."

Vehicle weight and crash compatibility: In crashes involving two passenger vehicles of differing weights, two effects are at work. The extra weight of the heavier vehicle reduces the risks for its occupants but also inflicts extra risks on the people in the lighter vehicle. The safety benefits of heavier vehicles to their own occupants diminish as the vehicles get heavier and heavier.

Institute research has shown that the extra weight of vehicles weighing 4,000 pounds or more actually has a small negative effect on society because the additional harm they inflict on people in lighter vehicles in two-vehicle crashes more than offsets the benefits for their own occupants (see *Status Report*, April 26, 2003; on the web at www.highwaysafety.org).

The new NHTSA report supplies evidence of this. The worst safety consequences of downweighting vehicles by 100 pounds would occur in light cars (those already weighing less than about 3,000 pounds) in crashes with SUVs or pickups. In contrast, there would be a net safety benefit in all kinds of two-vehicle crashes if the weights of the heaviest SUVs and pickups (those weighing more than 5,000 pounds) were reduced by 100 pounds.

"So it would serve both safety and fuel economy to downweight these very heavy SUVs and pickups," Lund says.

For a copy of "Vehicle weight, fatality risk and crash compatibility of model year 1991-99 passenger cars and light trucks" by C.J. Kahane, go to www.nhtsa.dot.gov/cars/rules/regrev/evaluate/pdf/809662.pdf.

New rollover ratings reflect dynamic testing, but tests don't affect ratings very much

NHTSA rates 19 SUVs and pickups, all 2004 models

Rollover ratings from the National Highway Traffic Safety Administration (NHTSA) for the first time include information from vehicle handling tests. The fishhook maneuver test simulates a driver overcorrecting after swerving to avoid an obstacle in the roadway at speeds up to 50 mph. This test doesn't replace the static measurements the agency previously used to indicate a passenger vehicle's top-heaviness. Instead the test adds a new element to the agency's rollover rating system.

Since 2001 NHTSA has provided rollover ratings from one to five stars as part of the New Car Assessment Program. Each vehicle's rating, which assesses rollover risk in a single-vehicle crash, was based solely on static measurements — specifically the ratio of a vehicle's track width to twice the height of its center of gravity. Vehicles with high centers of gravity such as SUVs and pickups typically earn fewer stars than vehicles with lower centers of gravity such as passenger cars.

NHTSA estimates that a five-star vehicle has a less than 10 percent chance of rolling over in a single-vehicle crash. A four-star vehicle has a 10 to 20 percent chance, etc.

Under the new rating system, a vehicle can improve its score based on static measurements if it successfully undergoes the fishhook maneuver without tipping up on two wheels. Vehicles are tested with a simulated five-passenger load starting at 35 mph and then in 5 mph increments up to a maximum of 50 mph.

Regardless of tipping, 2004 and later models are rated according to slightly different formulas than those NHTSA used in previous years, before dynamic testing. For this reason, a 2004 model may be assigned a different rating from the 2003 version, even without any design changes.

"The inclusion of dynamic testing in the rollover ratings is an important step, but it hasn't achieved much

ROLLOVER RATINGS 2004 MODELS

Based on static stability factor and dynamic testing

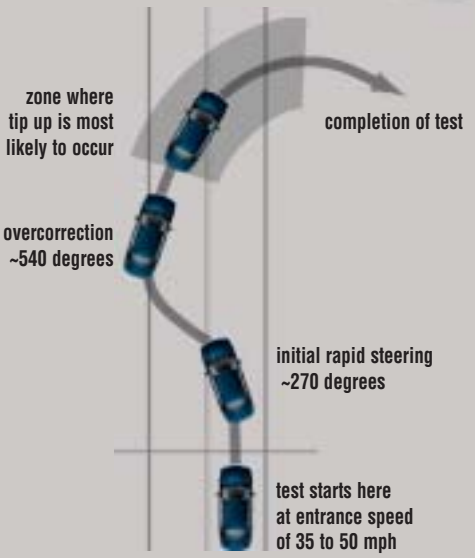
★★★	Chevrolet TrailBlazer 2WD
★★★★	Chevrolet TrailBlazer 4WD
★★★	Buick Rainier 2WD
★★★★	Buick Rainier 4WD
★★★	GMC Envoy 2WD
★★★★	GMC Envoy 4WD
★★★	Oldsmobile Bravada 2WD
★★★★	Oldsmobile Bravada 4WD
★★★★	Chevrolet Silverado 2WD ext. cab
★★★★	Chevrolet Silverado 4WD ext. cab
★★★★	GMC Sierra 2WD ext. cab
★★★★	GMC Sierra 4WD ext. cab
★★	Ford Explorer Sport Trac 2WD (tipped)
★★★	Jeep Liberty 2WD
★★★	Jeep Liberty 4WD
★★★	Toyota 4Runner 2WD
★★★	Toyota 4Runner 4WD
★★★	Toyota Tacoma 4WD (tipped)
★★★★	Volvo XC90

because the test results don't carry enough weight in the rating system to allow vehicles to distinguish themselves from the rest of the pack," says Susan Ferguson, Institute senior vice president for research. "The static measurements of some vehicles place them so solidly in the middle of a star rating that whether they tip up or not their scores aren't likely to be affected. For example, the two-wheel-drive Jeep Liberty and four-wheel-drive Toyota Tacoma are rated the same based on static measurements. The Tacoma tipped up in the fishhook maneuver, but the Liberty didn't. Still these vehicles keep their same three-star ratings."

Almost all of the 2004 SUVs and pickups NHTSA tested earned three or four stars. The exception is the two-wheel-drive version of the Ford Explorer Sport Trac, which earned two stars. Only the Sport Trac and four-wheel-drive Toyota Tacoma extended cab tipped up on two wheels during the test.

In addition to testing 19 SUVs and pickups, NHTSA released rollover results for three cars (Ford Focus wagon, Subaru Outback wagon, and Toyota Echo). None of these cars tipped up during the fishhook maneuver, and each earned a four-star rating. The tests of cars were conducted primarily for comparison. NHTSA doesn't plan to test the majority of cars because most have such high static stability values that there's little likelihood of tipping up in the dynamic test.

FISHHOOK MANEUVER TEST



STATIC STABILITY FACTOR

Ratio of track width to twice the height of center of gravity

STAR RATING SYSTEM BEFORE & AFTER DYNAMIC TESTING

Higher ratio indicates less likelihood of rolling over

Rollover risk in single-vehicle crash	Old rating system: based on static stability factor only	New rollover rating system: Vehicle doesn't tip in dynamic test	Vehicle tips
5 stars: less than 10%	> 1.44	> 1.45	> 1.55
4 stars: 10 to 20%	1.25-1.44	1.18-1.45	1.23-1.55
3 stars: 20 to 30%	1.13-1.24	1.08-1.17	1.11-1.22
2 stars: 30 to 40%	1.04-1.12	1.02-1.07	1.05-1.10
1 stars: more than 40%	< 1.04	< 1.02	< 1.05

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On the inside

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