Status Report

Insurance Institute for Highway Safety | Highway Loss Data Institute

Back stop

Rear crash prevention ratings aim to reduce parking lot collisions

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First round of rear autobrake tests sees 2 superior, 4 advanced ratings

Bolstered by IIHS and HLDI research showing that park-assist systems reduce backing crashes, the Institute has launched a program to rate the performance of rear autobrake, which is designed to prevent or mitigate the kinds of everyday low-speed backing crashes that happen in parking lots and garages.

Parking crashes usually don't result in serious injuries, but repair costs can quickly mount, along with the hassle of going without the family vehicle while waiting for the body shop to finish work. The Institute's new ratings will help consumers shopping for a new vehicle identify the ones with technology that can help avoid the annoyance of these everyday mishaps.

Park-assist systems encompass several technologies. Parking sensors issue warning beeps and/or seat vibrations when the equipped vehicle gets too close to another vehicle or object directly behind it, or, in some cases, in front of it. Rear cross-traffic alert warns drivers of approaching vehicles that might cross their path as they back up. Rear autobrake systems detect objects behind a reversing vehicle and may automatically brake if the driver doesn't heed alerts to stop.

Research from IIHS and HLDI indicates that park-assist technologies prevent crashes, and rear autobrake shows the most benefits. General Motors' rear autobrake system is reducing backing crashes reported to police by 62 percent, a new IIHS study has found (see p. 5 story). Rear autobrake systems from GM and Subaru also are reducing the frequency of claims reported to insurers, HLDI reported in August (see *Status Report*, Aug. 23, 2017, at iihs.org).

"Let's face it. Some days we all could use help backing up, whether that's in a garage with pillars that obscure your view, in a crowded mall parking lot or on a busy downtown street," says David Zuby, the Institute's executive vice president and chief research officer.

"The systems we rate in our first batch of tests will help reduce the chances of a backing fender-bender."

IIHS engineers evaluated rear autobrake systems on six popular 2017 model vehicles — the BMW 5 series sedan, Cadillac XT5 SUV, Infiniti QX60 SUV, Jeep Cherokee SUV, Subaru Outback wagon and Toyota Prius hatchback.

How vehicles rate for rear crash prevention

2017 models

SUPERIOR

- Cadillac XT5
- Subaru Outback

ADVANCED

- BMW 5 series sedan
- Infiniti QX60
- Jeep Cherokee
- Toyota Prius

Vehicles can earn up to six points. The top performers in this first round of ratings earn five points when equipped with optional rear autobrake, parking sensors and rear cross-traffic alert. The ratings don't assess occupant safety. They help identify the systems best able to prevent the more common problem of damage-only crashes.

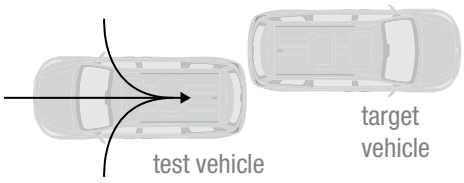
Left: One of the tests in the Institute's new rear crash prevention assessment evaluates a rear autobrake system's ability to stop a reversing car from striking a pole — a common mishap that can lead to pricey damage to bumpers, fenders, lift gates and lights.

Under the three-tier rating scheme, models with optional or standard rear crash prevention systems are rated superior, advanced or basic. Ratings are determined by whether the vehicles have available rear autobrake and, if so, how it performs in a series of car-to-car and car-to-pole tests with different approach angles. The availability of parking sensors and rear cross-traffic alert also is factored in.

The Outback and XT5 earn the highest rating of superior when equipped with »

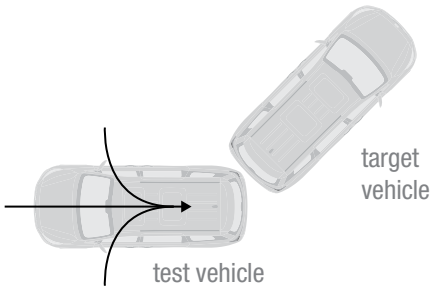
Rear crash prevention test scenarios

Reversing car-to-car 16-inch overlap



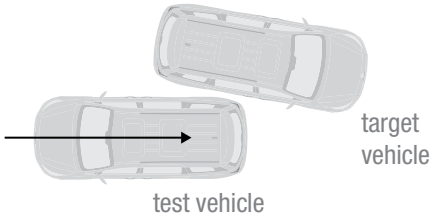
This scenario simulates backing out of a parking space toward a stationary vehicle. Test runs include reversing straight back and from the left and right toward the target. If autobrake fails to prevent a collision, the test vehicle will strike the corresponding portion of the target vehicle bumper with an overlap of 16 inches.

Reversing car-to-car 45-degree angle



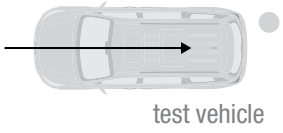
This scenario involves reversing out of a parking space toward a stationary vehicle. Test runs include reversing straight back and from the left and right toward the target. If autobrake fails to intervene, the corner of the test vehicle's bumper will strike the center of the target vehicle bumper.

Reversing car-to-car 10-degree angle



This scenario simulates backing toward the side of an adjacent stationary vehicle. The test involves reversing straight back toward the target vehicle parked at a 10-degree angle to the test vehicle.

Reversing toward fixed pole



This scenario simulates backing into a pole or garage pillar. The test car reverses straight toward a bollard that is aligned midway between the center line and bumper corner.

(« *from p. 3)* optional rear autobrake, parking sensors and rear cross-traffic alert. The Cherokee, 5 series, QX60 and Prius earn an advanced rating with this optional gear.

"There were no surprises here," Zuby says. "The Subaru and GM results are in line with the crash reductions we have seen in real-world police report and insurance loss data."

The new ratings evaluate the rear crash prevention systems' ability to prevent damage in low-speed crashes, not their ability to mitigate injuries in crashes. In that regard, they are more akin to the low-speed bumper tests the Institute once conducted to address vehicle damage in everyday fender-benders (see *Status Report*, June 11, 2009).

Results of the rear crash prevention tests are weighted to reflect data from drive-in claims centers. Rear autobrake carries the most weight because research shows it provides the biggest crash reductions. Parking sensors and rear cross-traffic alert get partial credit. HLDI has found benefits for parking sensors in reducing crashes reported to insurers, while a new IIHS study finds that rear cross-traffic alert is reducing police-reported crashes.

For a superior rating, a vehicle must have a rear autobrake system that can avoid a crash or substantially reduce speeds in many of the test scenarios, which involve multiple runs at about 4 mph. Systems are assigned points based on the number of runs that either avoid or barely hit the target, reducing speeds to less than 1 mph. For advanced, a vehicle must have rear autobrake and avoid a crash or reduce speeds in some of the scenarios. Vehicles that only have parking sensors and/or rear cross-traffic alert earn a basic rating.

The rear autobrake tests are based on a protocol developed by RCAR, an international consortium of insurance-funded research organizations working to reduce the injuries and property damage associated with automobile crashes.

The program follows the front crash prevention ratings IIHS introduced in 2013 to help speed adoption of front autobrake (see *Status Report*, Sept. 27, 2013). Since then, automakers have voluntarily agreed to make front autobrake standard on nearly all new passenger vehicles by Sept. 1, 2022 (see *Status Report*, April 12, 2016).

Rear autobrake isn't as prevalent. The feature is optional on only 5 percent and standard on less than 1 percent of 2018 model passenger vehicles, HLDI estimates. Rear cross-traffic alert is optional on 43 percent and standard on 11 percent of 2018 models. Rear parking sensors are standard on 33 percent and optional on 59 percent of 2018 models. Rearview cameras are standard on 89 percent and optional on 10 percent of 2018 models.

Separate from the new ratings, IIHS ran demonstration tests to illustrate how parking mishaps can add up to pricey repairs. Engineers conducted four low-speed tests with and without rear autobrake, and then tallied the damage as a claims estimator would. Scenarios included the XT5 backing into a pole and the Outback reversing into a 2016 Chevrolet Cruze. When equipped with rear autobrake, the vehicles didn't strike anything, so there was no damage. Without autobrake was a different story.

The XT5 needed an estimated $3,477 in repairs after backing into a pole. Damaged parts included the bumper cover, tailgate, hitch bar, energy absorber, rear body panel, trim and assorted brackets.

When the Outback backed into the Cruze's rear bumper, the estimated damage for both cars came to $1,899 — $1,159 for the Outback and $740 for the Cruze. ■

Park assist helps drivers avoid backing crashes

Backing out of a parking space in a busy lot entails focus and precision — two things harried drivers may lack. Mix in other motorists preoccupied with crossing off their to-do lists, and fender-benders often result. New research from IIHS indicates that a rear automatic braking system bundled with rear parking sensors and a rearview camera can reduce backing crash-involvement rates by more than 75 percent, while a rear cross-traffic alert system alone can reduce them by more than 20 percent.

The two studies are the latest in a series of reports from IIHS and HLDI that show benefits for rear autobrake, rearview cameras and parking sensors (see *Status Report*, Aug. 23, 2017, Nov. 17, 2016, and March 13, 2014, at iihs.org).

"Even though backing up is a routine maneuver, there's a lot of information to process," says Jessica Cicchino, the study's author and the Institute's vice president for research. "Park-assist systems can help with this task if drivers can see what's in the camera display, heed the alerts and respond appropriately. Rear autobrake adds another level of safety because it doesn't rely on drivers to take action to avoid a crash."

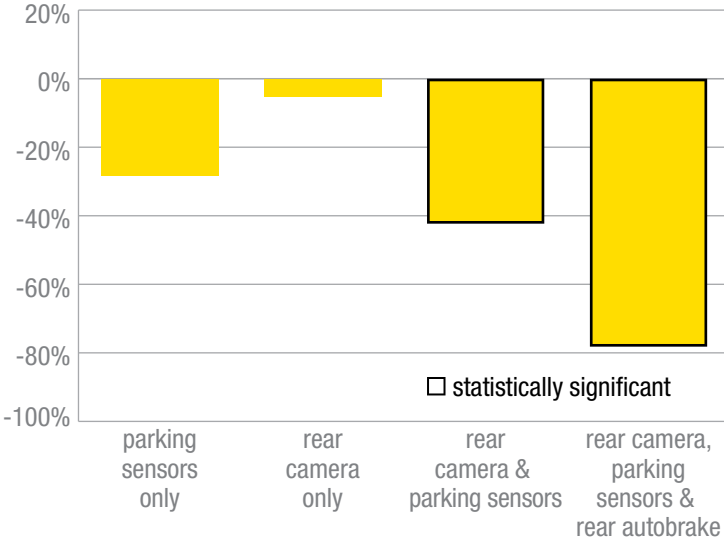
In 2015, about 188,000 passenger vehicles in the U.S. were involved in backing crashes reported to police, accounting for 2 percent of all passenger vehicle crash involvements, data from the National Highway Traffic Safety Administration indicate. The agency only tracks crashes on public roadways, so counting parking lot and private driveway crashes would push the number higher.

Rearview cameras help drivers better see what is behind them when driving in reverse, and parking sensors issue warnings when the vehicle gets too close to another vehicle or object directly behind it. Rear cross-traffic alert warns drivers of approaching vehicles that might cross their path as they back up. Rear autobrake systems detect objects behind reversing vehicles and may automatically brake if, for example, drivers don't heed alerts to stop.

In her study on rear autobrake, rearview cameras and parking sensors, Cicchino looked at late-model General Motors cars and SUVs involved in backing crashes in 23 states during 2012–15. Vehicles included the Cadillac ATS (2013–15 models), CTS (2014–15), Escalade (2015), SRX and XTS (2013–15), as well as the Buick LaCrosse and Regal and the Chevrolet Impala, all 2014–15 models. »

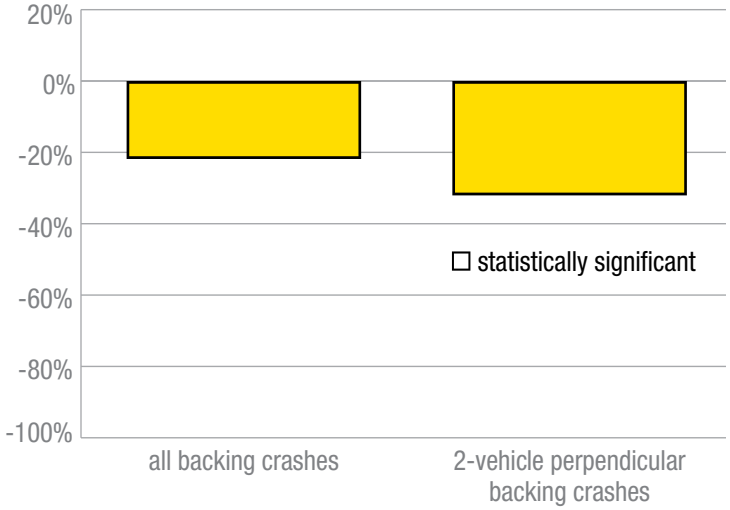
General Motors park assist systems

Percent difference in police-reported backing crash rates



General Motors and Mazda rear cross-traffic alert systems

Percent difference in police-reported backing crash rates



(« *from p. 5)* The GM models studied could have had a rearview camera alone; parking sensors alone; rearview camera plus parking sensors; rear autobrake, rearview camera and parking sensors; or none of these features. Rear autobrake was only available on the Cadillacs. The study controlled for the presence of rear cross-traffic alert, which was on some vehicles with both the rearview camera and sensors and all vehicles with rear autobrake.

Automakers use an array of names for the driver assistance systems described here generically. GM uses the terms Rear Vision Camera, Rear Parking Assist and Rear Automatic Braking for the systems on the specific models IIHS studied. GM began using the term Reverse Automatic Braking with 2017 models.

Cicchino compared backing crash involvements per insured vehicle year of models with and without the featured technologies. An insured vehicle year is one vehicle insured for one year, two vehicles for six months each, etc. She used police reports to identify crashes in which study vehicles were traveling in reverse and vehicle identification numbers and backing feature information provided by GM to identify models with driver assistance systems.

Parking sensors warn drivers if they get too close to another car or object behind or in front of them. Rear autobrake detects objects behind reversing vehicles and may brake if drivers don't heed alerts to stop. Rear cross-traffic alert warns backing drivers of approaching cars.

Cicchino used HLDI data on vehicle exposure and garaging location to control for rated driver age, gender, marital status, insurance risk level, state, calendar year and registered vehicle density. For each technology studied, she also controlled for the effects of the other backing systems on the vehicle.

Nearly two-thirds of the 640 crashes in the first study occurred in a parking lot or on private property. Seventy-one percent involved backing into a moving vehicle, while 21 percent involved hitting a parked vehicle. Only 5 percent of the crashes involved injuries.

Parking sensors alone reduced backing crash-involvement rates by 28 percent, and rearview cameras alone reduced them by 5 percent, but neither of these reductions was statistically significant. A previous IIHS report found that rearview cameras prevented an average of 1 in 6 police-reported backing crashes per insured vehicle year when looking at systems from four manufacturers (see *Status Report*, Nov. 17, 2016).

The combination of a rearview camera and parking sensors reduced backing crash-involvement rates by 42 percent. Rear autobrake reduced backing crash rates by 62 percent beyond the effect for cameras and sensors. Taken together, vehicles with all three systems had 78 percent lower police-reported backing crash rates than vehicles with none of the systems.

"If all passenger vehicles had a rearview camera, parking sensors and rear autobrake systems that perform like the ones on these GM models, we could eliminate 3 in 4 backing crashes reported to police," Cicchino says.

For the second study, Cicchino included the GM models from the first analysis, plus the Chevrolet Suburban and Tahoe, and GMC Yukon, all 2015 SUVs, with optional rear cross-traffic alert. She added Mazda cars and SUVs with the feature, including the 3 and 6 (2014–16), CX-3 and CX-5 (2016), CX-9 (2014–15) and MX-5 Miata Convertible (2016). The study used data from 25 states on 1,044 police-reported backing crashes during 2012–15. (The Mazda analysis excluded 2012 data as the system was introduced on 2014 models.)

All GM vehicles with rear cross-traffic alert also had both the rearview camera and rear parking sensors. On the Mazdas, the rearview camera and rear cross-traffic alert were offered as bundled or separate options. The study controlled for the effects of the other park-assist systems on the vehicles.

When Cicchino averaged the effects between vehicles, she found that backing crash-involvement rates were 22 percent lower among vehicles with rear cross-traffic alert than ones without the feature. In two-vehicle crashes where the backing vehicle hit another one traveling in a perpendicular direction — the most relevant crashes to the technology — crash-involvement rates fell by 32 percent.

"Rear cross-traffic alert is a good complement to rearview cameras, parking sensors and rear autobrake," Cicchino says. "These technologies should help drivers feel more confident when backing up, especially when their view is obstructed by taller vehicles or garage pillars."

Both studies bolster the findings of a recent HLDI analysis of the frequency of insurance claims among GM models equipped with park assist (see *Status Report*, Aug. 23, 2017). Claim frequency is the number of claims filed relative to the number of insured vehicle years. HLDI found a 26 percent reduction in the frequency of claims under property damage liability coverage and a 13 percent reduction in the frequency of claims under collision coverage for Cadillacs equipped with rear autobrake compared with Cadillacs without the feature. HLDI has found benefits for parking sensors from other manufacturers but mixed results for other park-assist systems.

An important difference between HLDI's analysis and Cicchino's studies is that backing crashes can be identified in police reports but not in insurance data. Narrowing the analysis to just the crashes that rear autobrake is designed to address allows for a better picture of how the technology is performing in the real world.

For copies of "Real-world effects of General Motors Rear Automatic Braking, Rear Vision camera, and Rear Parking Assist systems" and "Real-world effects of rear cross-traffic alert on police-reported backing crashes" by J.B. Cicchino, email publications@iihs.org. ■

Panoramic roofs contribute to higher glass claims

Panoramic roofs afford great views of the sky, but affording the cost to replace them if the glass is damaged is another matter. A new HLDI report sheds light on how the high cost of claims associated with these roofs is fueling a rise in glass-claim severities.

Glass losses make up roughly two-thirds of claims filed under comprehensive coverage, which insures against theft or vehicle damage that occurs for reasons other than crashes. While glass claims are common, they only comprise 14 percent of payouts under comprehensive coverage, with approximately $350 spent to settle a glass claim.

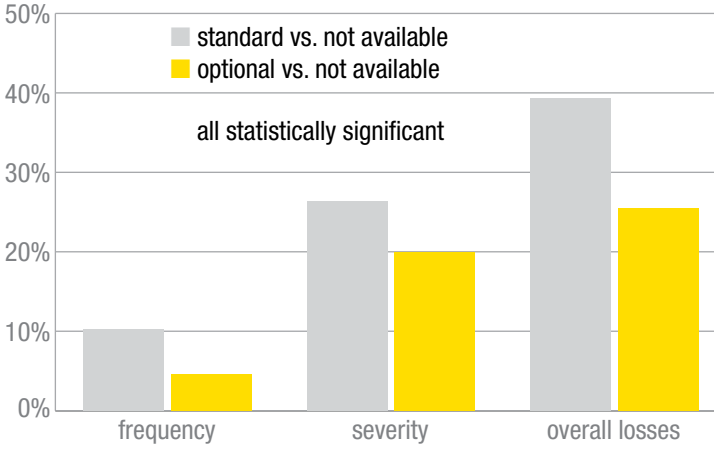
During the past five years, however, glass claims have grown costlier. Since 2010, glass claim severity has risen about 27 percent, or $75, for an average claim. Severity is the total of all payments made on claims divided by the number of claims.

Introduced in the early 2000s, panoramic roofs are becoming more widely available on both luxury and mainstream cars, minivans and SUVs. A quarter of midsize SUVs and more than half of midsize luxury SUVs, for example, have available panoramic roofs, HLDI estimates. Depending on vehicle size, panoramic roofs consist of a single glass panel or multiple panels spanning the roof. In some models, the panes lift and slide open like traditional sunroofs.

HLDI examined the loss experience of the 2014–15 Kia Sorento and the 2016 Kia Sportage to see if panoramic roofs may be contributing to the rise in glass-claim severities. Analysts picked these midsize SUVs to study because information about the availability of a panoramic roof as standard, optional or not available, is tied to a trim level discernible in the vehicle identification number. In addition, these models don't have any windshield-mounted crash avoidance sensors that could affect the cost of glass claims.

Glass losses for Kia SUVs with standard or optional panoramic roofs were significantly higher than Kia SUVs without panoramic roofs. The frequency of glass claims for vehicles with standard panoramic roofs was 10 percent higher than for vehicles without such roofs available. Claim frequency is the number of claims filed relative to the number of insured vehicle years. Glass claim severity was 26 percent higher, and overall losses were 39 percent higher.

Standard panoramic roofs linked to higher glass claims
Percent change in Kia SUV glass losses by roof availability



The frequency of glass claims for Kia SUVs with standard panoramic roofs was 10 percent higher than for Kia models without available panoramic roofs. Glass claim severity was 26 percent higher, and overall losses were 39 percent higher for Kias with standard panoramic roofs versus the same SUVs without them.

"While this may seem like a no-brainer, the study indicates that adding glass to vehicles contributes to increased glass losses," says Matt Moore, senior vice president of HLDI.

For models with optional panoramic roofs, the frequency of glass claims was 5 percent higher, glass claim severity was 20 percent higher, and overall losses were 26 percent higher than for vehicles without available panoramic roofs.

"This is a preliminary look at glass losses for vehicles with panoramic roofs based on a limited sample of vehicles," Moore says. "We'll continue to study the issue on a larger scale as we collect more data."

For a copy of the HLDI Bulletin "Glass losses for Kia SUVs with panoramic roofs," email publications@iihs.org.

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HLDI 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.

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