Status Report

Insurance Institute for Highway Safety | Highway Loss Data Institute

On the right side

10 midsize cars earn good ratings for passenger-side protection

ALSO IN THIS ISSUE

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Front passenger protection in small overlap crashes is the focus of a new IIHS test program. Most midsize cars performed well, but airbag protection was inconsistent.

A new crash test program from IIHS aims to ensure that manufacturers pay attention to the safety of front passengers as well as drivers.

The test was developed after it became clear that some manufacturers were giving short shrift to the right side of the vehicle when it comes to small overlap front crash protection (see *Status Report*, June 23, 2016, at iihs.org). A good or acceptable passenger-side rating will be required to qualify for the Institute's 2018 *TOP SAFETY PICK+* award.

The first test group in the passenger-side small overlap front test program did better overall than vehicles IIHS previously evaluated for research. Ten out of 13 midsize cars tested earn a good rating, while one is acceptable and two earn a marginal rating.

In contrast with a group of 2014-16 model small SUVs tested for research, none of the 2017-18 midsize cars had a poor or marginal structural rating. Instead, the biggest problem in the new group was inconsistent airbag protection in five cars, which could put passengers' heads at risk.

"The midsize cars we tested didn't have any glaring structural deficiencies on the right side," says IIHS Senior Research Engineer Becky Mueller. "Optimizing airbags and safety belts to provide better head protection for front-seat passengers appears to be the most urgent task now."

In recent years, automakers have made important changes to vehicle structures and restraints to earn good ratings in the driver-side small overlap front test.

That test sends a vehicle into a barrier at 40 mph with just 25 percent of the vehicle's front end overlapping the barrier on the driver side. It mimics what happens when the front driver-side corner of a vehicle collides with another vehicle or with an obstacle such as a tree or utility pole. The Institute introduced the small overlap test in 2012, and it has been part of the IIHS awards criteria since 2013.

At first, a majority of models earned poor or marginal ratings in the test, which bypasses most of a vehicle's primary structure and is therefore more challenging than the head-on crash test conducted by the federal government or the moderate (40 percent) overlap test that the Institute has conducted since 1995. To improve performance, manufacturers strengthened the

Passenger-side small overlap front crash ratings for midsize cars

2017 models tested, except where noted

	Overall	Structure	Passenger restraints & kinematics	Passenger injury measures			
				Head & neck	Chest	Hip & thigh	Lower leg & foot
Ford Fusion	G	G	G	G	G	G	G
Honda Accord	G	G	G	G	G	G	G
Lincoln MKZ	G	G	G	G	G	G	G
2018 Subaru Legacy	G	G	G	G	G	G	G
2018 Subaru Outback	G	G	G	G	G	G	G
Hyundai Sonata	G	G	A	G	G	G	G
Mazda 6	G	A	G	G	G	G	G
Nissan Altima	G	G	G	G	G	G	M
Nissan Maxima	G	A	G	G	G	G	G
2018 Toyota Camry	G	G	A	G	G	G	G
Volkswagen Jetta	A	A	M	G	G	G	G
Volkswagen Passat	M	A	M	A	G	G	G
Chevrolet Malibu	M	A	M	A	G	G	A

Good G Acceptable A Marginal M Poor P

Driver restraints and kinematics and driver dummy injury measures are factored into the overall rating. All were good in this group.

occupant compartment and in some cases extended the bumper and added engagement structures (see *Status Report*, Dec. 23, 2014). Many also had to lengthen the side curtain airbags to provide better forward coverage. The changes have paid off: Among 2017 models, two-thirds earn a good rating.

IIHS engineers initially focused on driver-side protection for a simple reason: Every vehicle on the road has a driver, future advances in self-driving cars notwithstanding, but not every vehicle has a passenger. It also was clear that what works for small overlap protection on the left side might not work on the right, since vehicles are to a certain extent asymmetrical.

Once manufacturers solved the small overlap problem on the driver side, the Institute wanted to see them use that know-how on the passenger side as well.

Mueller oversaw the development of a passenger-side test that is virtually identical to the driver-side one, except the vehicle overlaps the barrier on the right side. In addition, instead of just a driver dummy, a passenger dummy also is seated in front.

In June 2016, IIHS published provisional results of passenger-side small overlap tests of small SUVs with good driver-side ratings. In that group, only the 2016 Hyundai Tucson would have earned a good passenger-side rating. Taking into account vehicle "twins," there were nine SUVs in total: two good (the Tucson and its twin, the Kia Sportage), four acceptable, two marginal and one poor.

"When we published that research, we said we were considering adding a passenger-side test to our awards criteria," Mueller says. "Clearly, some manufacturers were paying attention. Many of the cars in this group are equipped with improved passenger airbags that appear to be designed to do well in our test and in an oblique test that the government is considering adding to its safety ratings."

Among the midsize cars, all of which have good driver-side ratings, the Subaru Outback was one of the top performers in the new test. Its good passenger-side rating also applies to its twin, the Subaru Legacy. Their good ratings are notable, given that the 2014 Subaru Forester earned a marginal rating in the earlier tests. The Forester's rating carries forward through the 2018 model year.

In the test of the Outback, the passenger's space was maintained well, with »

(« *from p. 3)* maximum intrusion of 4 inches at the right edge of the toepan. The safety belt and front and side curtain airbags worked together to keep the dummy in place, and measures taken from the dummy showed there would be a low risk of injury in a similar real-world crash.

The Chevrolet Malibu and the Volkswagen Passat earn a marginal passenger-side rating. In both cars, the passenger dummy's head slid off the front airbag and contacted the dashboard. Measures taken from the dummy showed head injuries would be possible in a real-world crash of the same severity.

In the passenger-side small overlap test of the Subaru Outback (left), the passenger dummy's head hit the front airbag and stayed there until rebound. In the Chevrolet Malibu's test (right), the passenger dummy's head went between the front and side curtain airbags and hit the dashboard.

A good or acceptable passenger-side rating in the small overlap front test will be a requirement to qualify for the Institute's 2018 *TOP SAFETY PICK+* award. Manufacturers can submit data from their own passenger-side tests to nominate models for the award.

The Passat is one of five cars with an acceptable, instead of good, structural rating. It had maximum intrusion of 7 inches at the lower door-hinge pillar. In contrast, maximum intrusion in the Passat's driver-side small overlap test was 4 inches in a comparable location.

The vehicle with the most structural damage was the Mazda 6. Intrusion reached 9 inches at the lower door-hinge pillar, compared with 5 inches in the driver-side test. The Mazda 6's airbags and belts worked well together, and the dummies showed no indication of likely injuries, so the car earns a good rating overall.

For other vehicles that manufacturers think can achieve an acceptable or higher passenger-side small overlap rating, IIHS will accept automaker test data in lieu of conducting its own tests. If a model has a good driver-side small overlap rating, automakers may submit video footage and data from a passenger-side test conducted using the IIHS protocol, and Institute staff will evaluate the information and assign a rating. IIHS will conduct occasional audit tests.

The Institute has used that process, known as test verification, to assign other types of ratings under certain circumstances. In the case of the passenger-side small overlap ratings, verification will allow more vehicles to vie for a 2018 *TOP SAFETY PICK+* award than the Institute would have time to test on its own. ■

Helping vehicles 'see' motorcyclists could cut crashes

More than 8,000 two-vehicle crashes with motorcycles could be prevented or mitigated each year by equipping passenger vehicles with front crash prevention, lane maintenance and blind spot detection systems designed to detect motorcycles, a new IIHS study estimates.

Cars, pickups and SUVs are increasingly available with crash avoidance features, which use cameras and sensors to monitor the driving environment and warn the driver or intervene if a possible collision is detected. IIHS and HLDI research has found benefits for front crash prevention, lane departure warning and blind spot detection (see *Status Report*, Jan. 28, 2016, and Aug. 23, 2017, at iihs.org).

Not all front crash prevention and blind spot detection systems are designed to detect motorcyclists. Since conspicuity is a factor cited in many crashes between a passenger vehicle and motorcycle, giving drivers another set of eyes to watch for potential conflicts with less-visible road users could help to save lives and prevent injuries.

To estimate the potential benefits for motorcyclists of passenger vehicle crash avoidance technology, Eric Teoh, the Institute's senior statistician, evaluated two-vehicle crashes between a motorcycle and a passenger vehicle that occurred on U.S. roads during 2011-15. Teoh looked for crashes relevant to three types of crash avoidance technology: front crash prevention, which includes forward collision warning and automatic emergency braking; lane maintenance, which includes lane departure warning and lane-keeping support; and blind spot detection. He used data from the federal government's Fatality Analysis Reporting System and the National Automotive Sampling System – General Estimates System.

Eighty-six percent of the motorcycle crashes involved an injury or fatality. The crashes largely fell into two similar-size categories, regardless of severity: single-vehicle or two-vehicle involving a passenger vehicle. Most of the two-vehicle crashes relevant to front crash prevention involved the front of a passenger vehicle rear-ending a motorcycle. Crashes in which a motorcycle turned into the path of an oncoming passenger vehicle or where a motorcycle traveling in the same direction as a passenger vehicle turned across its path also were counted but didn't happen as frequently as rear-enders.

Teoh estimated that front crash prevention would have been relevant to 4 percent of fatal crashes, 10 percent of nonfatal crashes with injuries and 13 percent of police-reported crashes during the period.

"These crashes represent a major opportunity for front crash prevention systems on passenger vehicles," Teoh says. "As manufacturers refine systems and design future ones, they should include the ability to reliably detect motorcyclists, along with other road users."

Lane departure warning and lane-keeping systems don't rely on detecting other vehicles, only lane markings, so they already can benefit motorcyclists. A sticking point is getting drivers to leave the systems on (see *Status Report*, June 22, 2017).

Crashes relevant to lane maintenance accounted for 4 percent of fatal crashes, 3 percent of nonfatal injury crashes and 4 percent of all police-reported crashes studied. These included head-on and sideswipe crashes in which the passenger vehicle unintentionally left its lane. Same-direction sideswipe crashes in which the passenger vehicle deliberately changed lanes were relevant to blind spot detection and included 1 percent of fatal crashes, 6 percent of nonfatal injury crashes and 6 percent of police-reported crashes.

The three technologies combined have the potential to prevent an estimated 10 percent of fatal two-vehicle motorcycle crashes, 19 percent of nonfatal crashes with injuries and 23 percent of police-reported crashes. Since fewer than half of all motorcycle crashes involve collisions with a passenger vehicle, the technologies have the potential to avoid 4 percent of all fatal motorcycle crashes and 10 percent of all police-reported motorcycle crashes.

Teoh also examined crash types that none of the three current passenger-vehicle crash avoidance technologies would have prevented. Thirty-six percent of fatal two-vehicle crashes, 21 percent of nonfatal injury crashes and 19 percent of police-reported crashes involved a passenger vehicle turning left in front of an oncoming motorcycle.

"Developing or adapting systems to detect an oncoming motorcycle and brake to avoid a left-turn crash would more than quadruple the number of fatal crashes potentially prevented," Teoh says. "Some manufacturers are starting to address this crash configuration."

For motorcycles specifically, developing and equipping them with front crash prevention, lane maintenance and other technologies also would reduce crashes. In rear-end crashes of all severities, the motorcycle was more likely to strike the passenger vehicle than the passenger vehicle was to hit the motorcycle, Teoh found. Among crashes involving two vehicles initially traveling in opposite directions, the motorcycle strayed from its lane more often than the passenger vehicle. Two-thirds of fatal crashes of this type happened as the bike negotiated a curve, compared with only about a third of crashes where the passenger vehicle strayed from its lane.


A passenger vehicle rear-ending a motorcycle is a common type of crash that front crash prevention could address.

Antilock braking systems (ABS) are a crash avoidance technology available on motorcycles now. ABS reduces the rate of fatal crashes by 31 percent, compared with the same motorcycles that don't have ABS (see *Status Report*, May 30, 2013). Some systems are optimized for curves to give riders more stability in emergency situations.

Even if crash avoidance technology is fully realized, some motorcycle crashes still will occur.

"Crash avoidance technology doesn't negate the need for other proven motorcycle safety countermeasures, such as proper helmets and protective gear and universal helmet laws," Teoh points out.

For a copy of "Motorcycle crashes potentially preventable by passenger vehicle crash avoidance technology" by Eric R. Teoh, email publications@iihs.org. ■

Safety board calls for renewed focus on 'national safety issue' of speeding

Speeding is a persistent problem on U.S. roads, contributing to the loss of more than 112,500 lives in crashes from 2005 to 2014, the National Transportation Safety Board (NTSB) reports in a recent examination of the causes of speed-related crashes among passenger vehicles and the countermeasures to prevent them.

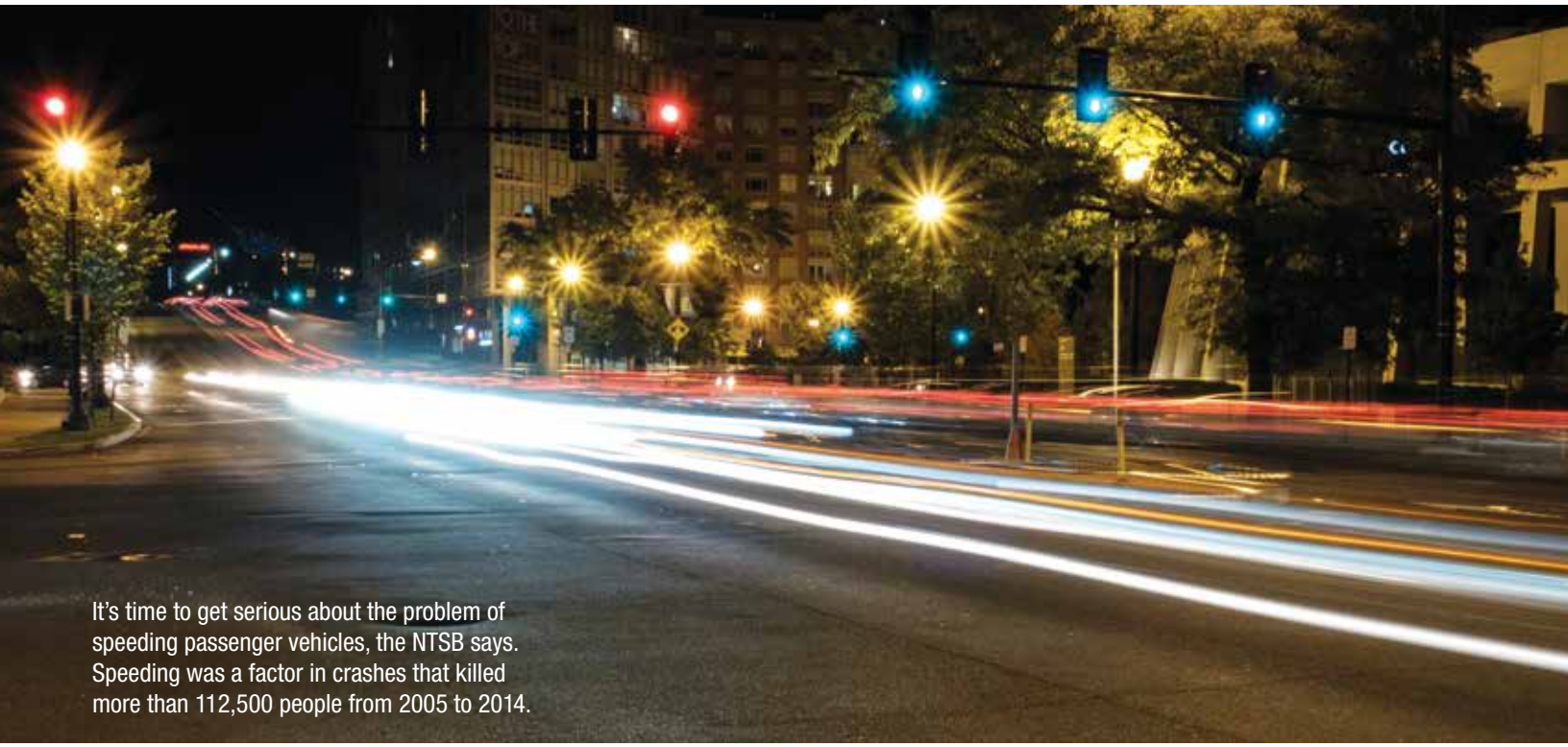
The study, announced in July and released in August, examines underused or ineffectively used countermeasures, including communities' use of automated enforcement and vehicle-based intelligent speed adaptation systems. It includes a most current research," NTSB Chairman Robert L. Sumwalt said in July remarks announcing the study. "Speed kills."

Speed raises crash risk by increasing the likelihood of a vehicle being involved in a crash and increasing the severity of occupant injuries if a crash occurs.

The study defined speeding-related crashes as ones in which a law enforcement officer indicated that a vehicle's speed was a contributing factor. The number of people who died in such crashes during the nine-year study period represents a third of all traffic fatalities — roughly equal to the number who died in alcohol-involved crashes during the same period.

Even though most drivers agree that speeding is a safety risk, they don't feel the same stigma about driving faster than the speed limit as they do about driving while impaired by alcohol, the NTSB noted. Unlike alcohol, there are no nationwide public education programs addressing the dangers of speeding. The NTSB urged the National Highway Traffic Safety Administration (NHTSA) to partner with traffic safety advocates to develop and launch a campaign to raise awareness about the risks of speeding.

"The current level of emphasis on speeding as a national traffic safety issue is lower than warranted and insufficient to achieve the goal of zero traffic fatalities in the United States," the report states. The NTSB advised the U.S. Department of Transportation to track and swiftly implement the department's 2014 Speed Management Program Plan.



It's time to get serious about the problem of speeding passenger vehicles, the NTSB says. Speeding was a factor in crashes that killed more than 112,500 people from 2005 to 2014.

literature survey; analyses of speeding-related crash data; and interviews with national, state and local traffic safety stakeholders. Based on the findings, the NTSB issued 19 safety recommendations to federal agencies, state lawmakers and law enforcement officials to address the problem.

"You can't tackle our rising epidemic of roadway deaths without tackling speeding, and you can't tackle speeding without the

States routinely establish speed limits based on the observed operating speeds on road segments, specifically the 85th percentile speed of free-flowing traffic as outlined in the *Manual on Uniform Traffic Control Devices* from the Federal Highway Administration (FHWA).

Proponents of raising the speed limit often argue that such increases simply bring the law in line with reality, since most

drivers exceed the limit. Once the limit is raised, however, drivers go even faster. A 2016 IIHS study showed that increases in speed limits from 1993 to 2013 in 41 states have cost 33,000 lives in the U.S. (see *Status Report*, April 12, 2016, at iihs.org).

The NTSB notes that there are other ways to set speed limits which take into account crash statistics, and in urban areas, road use by pedestrians and bicyclists. The board called on the FHWA to remove from the traffic manual the guidance that speed limits in speed zones be set within 5 mph of the 85th percentile speed and revise the manual to strengthen protection for vulnerable road users.

To deter speeding and raise public awareness of speeding as a traffic safety issue, high-visibility enforcement is needed, the NTSB says. IIHS research has shown that speed cameras work to get drivers to slow down, and their use leads to long-term changes in driver behavior and substantial reductions in deaths and injuries (see *Status Report*, Oct. 1, 2015).

The NTSB urged states to remove barriers to the use of speed cameras. Only 14 states and the District of Columbia use them, typically with restrictions on the types of roads and locations where they can be deployed. D.C. is the only U.S. jurisdiction that doesn't limit when and where speed cameras are used. As of October, 142 communities had speed camera programs.

Vehicle-based approaches also can help to reduce speeding. Intelligent speed adaptation systems use GPS or cameras that "read" signs to determine the speed limit and warn drivers when they exceed it or in some cases, intervene to limit vehicle speed. Drivers can set adaptive cruise control systems, for example, to stay below a set speed.

The board recommended that NHTSA add intelligent speed adaptation systems to the New Car Assessment Program to encourage consumers to purchase passenger vehicles with advanced safety systems and drive demand. The European New Car Assessment Programme includes speed assist systems as one of the safety features automakers can use to qualify vehicles for a top rating (see *Status Report*, Nov. 20, 2012).

"Reducing speeding-related crashes involving passenger vehicles" is available at www.ntsb.gov/safety/safety-studies/Documents/SS1701.pdf. ■

Red light cameras reduce injury crashes in Chicago

Red light cameras in Chicago have reduced injury crashes by 10 percent and angle injury crashes by 19 percent, a recent analysis of one of the biggest automated enforcement programs in the country shows.

Researchers from Northwestern University conducted the study for the city. They examined 340 approaches at intersections where cameras were installed and looked at the number of crashes before and after the cameras were turned on. By using the number at 236 similar approaches without red light cameras in the city as a control, they estimated the difference in the number of crashes at camera intersections after the cameras were activated with the number that would have been expected without cameras.

The researchers used changes in crashes in neighboring towns to account for potential spillover effects at Chicago intersections without cameras. Red light cameras in some cases have been shown to have safety benefits across a city, even at intersections without cameras.

Along with the decrease in angle injury crashes and overall injury crashes, the researchers found a 14 percent increase in rear-end injury crashes at intersections with cameras. Such increases are sometimes observed when cameras are installed, as more drivers stop to avoid a ticket. However, such rear-end intersection crashes tend to be far less severe than the angle crashes the cameras are designed to prevent.

The study also looked at violations at 152 of the camera-equipped intersections and found that red light camera violations decreased over time. However, the violation analysis didn't include information from noncamera intersections, so it isn't clear whether the decline was due to the presence of cameras or not.

The Chicago study is just the latest to confirm that red light cameras improve safety. A 2016 IIHS study comparing large cities with red light cameras to those without found the devices reduced the fatal red light running crash rate by 21 percent and the rate of all types of fatal crashes at signalized intersections by 14 percent.

Despite this benefit, automated enforcement remains controversial. Many view it primarily as a tool for municipalities to raise revenue, rather than as a safety measure.

As part of their study, the Northwestern researchers interviewed both local and national stakeholders to gauge their opinions about the red light cameras. IIHS was among the groups surveyed.

Although safety advocates and transportation experts viewed the program positively, opinions were more negative among

stakeholders characterized by the authors as "community representatives," a group that included aldermen and representatives of neighborhood organizations. Most believed the cameras' purpose was to generate revenue.

Although IIHS surveys have found widespread support for cameras among the general population (see *Status Report*, April 25, 2013, and July 19, 2011, at iihs.org), the negative opinions cited in the report point to the need for better communication about the Chicago program's purpose and greater transparency about the results.

"Chicago red light camera enforcement: best practices & program road map" by H.S. Mahmassani et al. is available at www.transportation.northwestern.edu/research/report-redlightcameras.html. ■

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