Status Report
Insurance Institute for Highway Safety | Highway Loss Data Institute

Designs that click

Booster manufacturers have mastered good belt fit

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- New Mifold belt-positioning device isn't a booster
- How warning systems affect driver distraction
- Rearview cameras reduce backing crashes

The vast majority of new booster seats earn the top rating of BEST BET in IIHS evaluations, but bad designs that fail to provide good belt fit continue to slip through.

The latest IIHS booster seat ratings show that child seat manufacturers have mastered something that once eluded them: building a seat that provides good safety belt fit for the typical 4-to-8-year-old passenger.

Out of 53 new models evaluated, 48 earn the top rating of BEST BET, meaning they are likely to provide good belt fit for a 4 to 8 year-old in almost any car, minivan or SUV. When the Institute first began rating boosters in 2008, only a quarter of the seats evaluated earned the BEST BET designation (see *Status Report* special issue: booster seats, Oct. 1, 2008, at iihs.org).

Despite this progress, several seats that don't do their job and are rated Not Recommended can still be found on store shelves. They include two brand-new models from Dorel Juvenile.

"Parents looking for a safe option for kids who have outgrown seats with built-in harnesses have more choices than ever," says IIHS Senior Research Engineer Jessica Jermakian. "Unfortunately, we can't declare total victory because manufacturers continue to sell subpar boosters."

Of the 53 new seats, the Cosco Easy Elite and the Cosco Highback 2-in-1 DX — both made by Dorel — are rated Not Recommended. Three other seats, the Britax Parkway SGL in backless mode, the Lil Fan Club Seat 2-in-1 in highback mode and the Peg Perego Viaggio Flex 120 — are rated Check Fit, meaning they may work for some children in some vehicles. The remaining new seats are BEST BETs.

When all currently available boosters, including old models, are taken into account, there are 118 BEST BETs, nine GOOD BETs (seats that provide acceptable belt fit in most vehicles), 27 Check Fit and five Not Recommended. Go to iihs.org/boosters for complete ratings.

There are 53 new models for 2016, including 48 BEST BET boosters, 3 Check Fit and 2 Not Recommended.

BEST BET

Aidia Explorer 2-in-1 (backless mode)
Aidia Explorer 2-in-1 (highback mode)
Aidia Pathfinder (highback)
Aidia Scout (backless)
Baby Trend PROtect Yumi (highback)
Baby Trend PROtect Yumi 2-in-1 (backless mode)
Baby Trend PROtect Yumi 2-in-1 (highback mode)
Britax Frontier Clicktight (highback)
Britax Parkway SGL (highback mode)
Britax Pioneer (highback)
Britax Pinnacle Clicktight (highback)
BubbleBum Pink (backless)
Chicco KidFit Zip (backless mode)
Chicco KidFit Zip (highback mode)
Chicco KidFit Zip Air (backless mode)
Chicco KidFit Zip Air (highback mode)
Evenflo Big Kid (backless mode)
Evenflo Big Kid (highback mode)
Evenflo Platinum SafeMax (highback)
Evenflo SafeMax 3-in-1 (backless mode)
Evenflo SafeMax 3-in-1 (highback mode)
Graco Extend2Fit 3-in-1 (highback)
Graco 4Ever All-in-1 with Safety Surround (backless mode)
Graco 4Ever All-in-1 with Safety Surround (highback mode)
Graco Milestone All-in-One with Safety Surround (highback)
Graco Nautilus 80 Elite (backless mode)
Graco Nautilus 80 Elite (highback mode)
Graco SlimFit 3-in-1 (highback)
Graco TurboBooster (backless mode)
Graco TurboBooster (highback mode)
Graco TurboBooster with ComfortCore (backless mode)
Graco TurboBooster with ComfortCore (highback mode)
Graco TurboBooster LX with Trueshield (backless mode)
Graco TurboBooster LX with Trueshield (highback mode)
Harmony Big Boost Deluxe (backless)
Harmony Dreamtime 2.0 (backless mode)
Harmony Dreamtime 2.0 (highback mode)
KidsEmbrace Fun-Ride Backless Batman (backless)
KidsEmbrace Fun-Ride Spider-Man (backless mode)
KidsEmbrace Fun-Ride Spider-Man (highback mode)
Lil Fan Club Seat 2-in-1(backless mode)
Safety 1st Continuum (highback)
Safety 1st Elite EX 100 Air+ (highback)
Safety 1st EverFit (highback)
Safety 1st Grow and Go Air (highback)
Safety 1st Grow and Go EX Air (highback)
Safety 1st MultiFit (highback)
Safety 1st UltraMax Air 360 (highback)

IIHS BEST BET BOOSTER

BEST BETs provide good belt fit for typical 4 to 8 year-olds in almost any car, minivan or SUV.

GOOD BETs provide acceptable belt fit in most cars, minivans or SUVs.

Not Recomended don't provide good belt fit and should be avoided.

Check Fit have varied results depending on child size and vehicle model.

Check Fit

Britax Parkway SGL (backless mode)
Lil Fan Club Seat 2-in-1(highback mode)
Peg Perego Viaggio Flex 120 (highback)

Not Recommended

Cosco Easy Elite (highback)
Cosco Highback 2-in-1 DX (highback)

No IIHS rating for the Mifold belt-positioning device

Although booster seats are easy to use, caregivers sometimes wish they could be more portable. Lugging one on vacation or around town in case of a taxi ride can be difficult. A few products such as the BubbleBum inflatable booster, which earns a BEST BET from IIHS, have tried to address this issue in recent years.

A new device called the Mifold Grab-and-Go Booster is the latest attempt to solve the problem. It folds up neatly and is small enough to carry in a handbag. However, the Mifold isn't really a booster, despite its name. It is more accurately described as a belt-positioning device.

IIHS rates boosters for their ability to correctly position a vehicle safety belt on a child. However, they have two other important characteristics that are separate from belt fit.

One is that they boost the child up, which changes the angle at which the lap belt holds the child. Among boosters rated by IIHS, the average highback seat raises the child nearly 5 inches, and the average backless booster raises the child 3½ inches.

The other characteristic is that they effectively shorten the seat cushion depth, which allows children to bend their legs comfortably over the edge, making them less likely to slouch. This keeps them in a good position in the event of a crash.

The Mifold has a thin cushion that raises the child only about three-quarters of an inch and doesn't affect the depth of the seat cushion. Instead, the device pulls the belt down to the child. There aren't any data about how this new type of device works with real kids in real crashes. For these reasons, the Mifold isn't comparable to the boosters that IIHS evaluates and isn't included in the ratings. ■

Mifold Grab-and-Go Booster

Booster seats are designed for children who have outgrown harness-equipped restraints. By elevating a child, a booster ensures that a vehicle belt designed for an adult fits properly. Children ages 4-8 are 45 percent less likely to sustain injuries in crashes if they are in boosters than if they are using safety belts alone.

Children should ride in boosters until a vehicle safety belt fits correctly by itself. For some kids, that doesn't happen until age 12 or so. Correct fit means the belt lies flat across a child's upper thighs, not across the soft abdomen, and the shoulder belt crosses snugly over the middle of a child's shoulder.

IIHS began its booster rating program after finding that many seats didn't consistently provide good belt fit. The ratings are based on evaluations of how three-point lap and shoulder belts fit a child-size test dummy seated in the booster on a stationary test fixture. Measurements are taken under four conditions spanning the range of safety belt configurations in passenger vehicles. The evaluations focus on belt fit and don't involve crash tests.

The two new Not Recommended models provide unacceptable lap belt fit.

"Dorel has a long history of producing BEST BETs, and this year alone the company introduced seven of them," Jermakian says. "It's disappointing that they would introduce boosters that don't do their job when they clearly know how to do it right."

This year, the company discontinued three older models that were Not Recommended, but that positive step was essentially canceled out by the new Not Recommended models.

In contrast, another company, KidsEmbrace, responded to the Not Recommended designation of its Fun-Ride Backless Batman seat in 2014 by taking it off the market until this year, when it was redesigned as a BEST BET.

Of the Check Fit boosters, the Britax Parkway SGL is an interesting case. Like the old version, the redesigned seat provides good lap belt fit, but it lacks a clip to position the shoulder belt.

The typical plastic belt clip doesn't look like much, but it plays an important role by adjusting the position of the shoulder belt, which should lie snugly across the middle of the child's shoulder. If it falls off the shoulder or rests on the neck, it won't work as well. An improper fit is uncomfortable and may encourage the child to move the belt to a dangerous position, such as behind the back or under the arm.

Top-rated boosters are available in all different price ranges. Of the boosters introduced this year, the most affordable is the Harmony Big Boost Deluxe, available at Walmart for less than $25. The most expensive is the $330 Graco 4Ever All-in-1 with Safety Surround, a rear-facing infant seat that converts first to a forward-facing child restraint and then to a booster as the child grows. ■

Warning systems neither curb driver distraction nor worsen it

Picture a driver distracted by a passenger's joke or the ping of an incoming text. Oblivious to an obstacle ahead of him, he is pulled back to reality by an alert from his car's collision warning system.

After a few such incidents, would this driver be chastened into paying closer attention to the road? Or would he figure that he could chat or text even more since his trusty car is watching the road for him?

Neither, it turns out. A recent IIHS study based on observations of volunteers driving a Honda Accord with a combined forward collision, lane departure, blind spot and curve speed warning system found that receiving warnings neither discouraged nor encouraged distracting behaviors. That finding held for both teenagers and adults.

"We hypothesized that collision alerts might lead drivers to focus more closely on driving, but that wasn't the case," says the study's author, IIHS Senior Research Scientist David Kidd. "At the same time, fears that warning features might have the opposite effect appear to be unfounded."

To perform the analysis, Kidd looked at random video clips from each driver in two separate observational studies in which participants drove 2006-07 Accords equipped with the prototype warning system. One study included 108 adult drivers, all of whom drove with the warning system after an initial period driving without it. The second study included 40 16-17-year-old drivers, half of whom drove with the warning system after an initial period of driving without it and half who drove without it for the entire length of the study.

Having the warning system activated didn't make drivers more or less likely to engage in secondary behaviors in general or in any specific individual behavior such as talking with a passenger or using a cellphone, Kidd found.

On average, the 108 adult drivers and the 20 teen drivers who drove with the warning system were engaged in at least one secondary behavior in 46 percent of the clips. The most common behaviors were talking with a passenger, personal grooming, talking on a cellphone, and looking at or manipulating a phone or other device. The younger the driver, the more common distracting behaviors were. For example, 57 percent of clips of teen drivers had at least one distracting behavior, while the percentage was 39 percent for 60-70-year-old drivers.

Drivers were more likely to engage in secondary behaviors when the vehicle was traveling below 5 mph or stopped than when the vehicle was traveling over 25 mph. That finding is in line with a previous IIHS study that showed drivers were more likely to engage in distracting behaviors at red lights than in more demanding situations (see *Status Report*, March 31, 2015, at iihs.org).

Warning systems like this front crash prevention feature don't make drivers any more or less likely to engage in distracting behaviors, new research from IIHS shows.

In the current study, the warning system didn't affect the speeds at which drivers engaged in secondary activities.

Although warning systems don't appear to improve driver behavior, they still have a big role to play in reducing crashes caused by distraction (see *Status Report* special issue: distracted driving, Oct. 24, 2014).

"Completely eliminating driver distraction isn't possible," Kidd says. "Warning systems that bring a driver's attention back to the road when a crash is imminent can help keep distraction from turning deadly."

For a copy of "Distracting behaviors among teenagers and young, middle-aged, and older adult drivers when driving without and with warnings from an integrated vehicle safety system" by D.G. Kidd, email publications@iihs.org. ■

Rearview cameras reduce police-reported backing crashes

Mazda CX-3

Rearview cameras, soon to be standard on all new vehicles, can be expected to prevent nearly 1 in 6 police-reported backing crashes, an IIHS study concludes.

The study compared rates of backing crashes for vehicles equipped with optional rearview cameras from four manufacturers with crash rates for the same models without the feature. On average, the cameras cut such crashes by 16 percent. Drivers ages 70 and older appeared to benefit the most.

The study found that rear parking sensors also cut crashes, though results diverged for the two systems studied.

Rear cameras cut backing crashes 40 percent for drivers 70 and older, compared with 15 percent for younger drivers. Older drivers often have trouble turning their heads, making cameras especially useful.

More and more vehicles are being sold with rearview cameras, and all new vehicles under 10,000 pounds must have them by May 2018. The requirement is aimed at reducing backover crashes involving children and other pedestrians (see *Status Report*, May 29, 2014, at iihs.org).

Earlier IIHS research with volunteer drivers showed that rearview cameras dramatically reduce the size of blind zones behind vehicles in which a young child wouldn't be visible. The research showed that cameras are more effective at helping drivers avoid unexpected objects than parking sensors (see *Status Report*, March 13, 2014).

For the latest study, Jessica Cicchino, the Institute's vice president for research, looked at police-reported crashes in 22 states for Buick Lucernes, Honda Pilots and various Mazda, Mercedes-Benz and Subaru models. All except the Lucernes and some Mercedes-Benz models had optional rear cameras. The Lucernes and some Mercedes-Benz vehicles had optional parking sensors.

Using police reports allowed Cicchino to identify crashes in which study vehicles were traveling in reverse. She used vehicle identification numbers to determine which crash-involved backing vehicles were equipped with the cameras or sensors.

For the Pilot and the Subaru models, the presence of the cameras was tied to trim level and discernible from the VINs. That wasn't true of the Buick, Mazda and Mercedes-Benz vehicles. For those, the manufacturers supplied a list of VINs of vehicles with optional backing technologies, which made the study possible.

Information from HLDI's database was used to control for other factors that might also have affected crash rates, including the vehicle's garaging location and driver characteristics.

The rearview cameras reduced the rate of backing crashes per insured vehicle year by 16 percent for all vehicles combined. When looked at by manufacturer, all the camera systems except for the ones on Mercedes-Benz vehicles reduced crashes. The reductions ranged from 14 percent to 23 percent. Mercedes-Benz vehicles equipped with only a camera had a 2 percent increase in backing crashes,

though the change wasn't statistically significant.

The cameras had the biggest benefit for drivers 70 and older. Their backing crash rate fell 40 percent with cameras, compared with 15 percent for drivers younger than 70.

"Older drivers often have difficulty turning their heads, making rear cameras particularly useful," Cicchino says.

Parking sensors cut the Lucerne's backing crash rate by 34 percent but had virtually no effect for the Mercedes-Benz vehicles. Crash rates for Mercedes-Benz models equipped with both cameras and parking sensors were 13 percent lower, but that result also wasn't significant.

Lucerne owners tend to be older than most drivers, and driver age seems to make a big difference in the effectiveness of parking sensors. When Cicchino looked at the Lucerne and the Mercedes-Benz vehicles together, she found the sensors reduced crashes by 36 percent for drivers 70 and older while having virtually no effect for younger drivers.

"Judging distances becomes more difficult with age, so that could make sensors useful to older drivers in a different way from the increased visibility provided by cameras," Cicchino says.

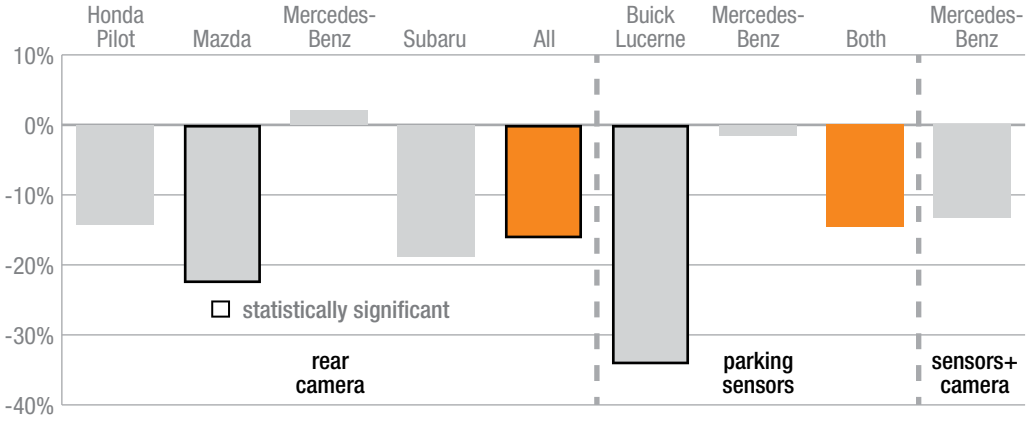
Rear automatic braking could provide an even greater benefit. Unlike the parking sensors studied, which issue warnings when the vehicle gets too close to a vehicle or other object, it doesn't depend on driver response to be effective. IIHS research on front crash prevention has found that systems with autobrake cut more crashes than systems that only issue warnings (see *Status Report*, Jan. 28, 2016).

A limitation of the new study is that many minor backing crashes aren't reported to police because they involve only a single vehicle and often occur in driveways or parking lots. Most of the crashes in the study involved one vehicle backing into another and therefore might not be representative of backing crashes in general.

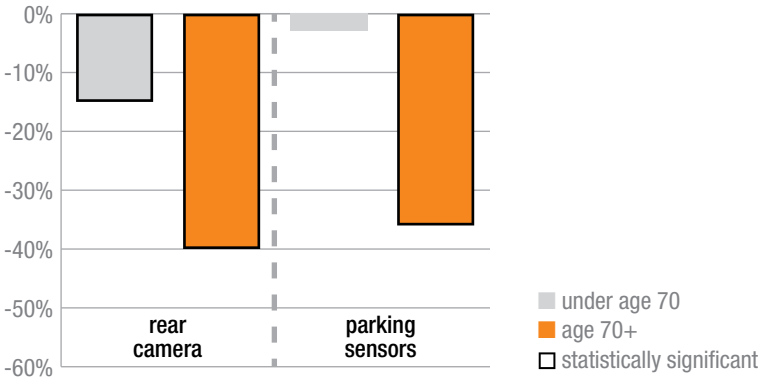
HLDI studies of insurance losses have shown that both rearview cameras and rear parking sensors reduce claim rates for damage to other vehicles. These effects are smaller and not as robust as the benefits identified in the latest IIHS study. That's because the HLDI analyses include all types of crashes, not just backing collisions, which make up a small percentage of the total.

For a copy of "Effects of rearview cameras and rear parking sensors on police-reported backing crashes" by J.B. Cicchino, email publications@iihs.org. ■

Effects of systems on rates of backing crashes per insured vehicle year



Effects of systems on backing crash rates by driver age



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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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PEMCO Insurance
Plymouth Rock Assurance
Progressive Insurance
PURE Insurance
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Rockingham Group
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Samsung Fire & Marine Insurance Company
SECURA Insurance
Sentry Insurance
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