What We Know About Current Crash Avoidance Technologies

Reaching Zero Crashes: A Dialogue on the Role of Current Advanced Driver Assistance Systems
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Washington, DC

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Executive Vice President & Chief Research Officer
Crashes relevant to 4 crash avoidance systems
FARS and GES, 2004-08

<table>
<thead>
<tr>
<th>System</th>
<th>All</th>
<th>Injury</th>
<th>Fatal</th>
</tr>
</thead>
<tbody>
<tr>
<td>front crash prevention</td>
<td>1,165,000</td>
<td>66,000</td>
<td>879</td>
</tr>
<tr>
<td>lane departure prevention</td>
<td>179,000</td>
<td>37,000</td>
<td>7,529</td>
</tr>
<tr>
<td>side view assist</td>
<td>395,000</td>
<td>20,000</td>
<td>393</td>
</tr>
<tr>
<td>adaptive headlights</td>
<td>142,000</td>
<td>29,000</td>
<td>2,484</td>
</tr>
<tr>
<td>total unique crashes</td>
<td>1,866,000</td>
<td>149,000</td>
<td>10,238</td>
</tr>
</tbody>
</table>
Front crash prevention
Three flavors of automatic emergency braking

Speed reduction in 12 and 24 mph tests

Volvo S60 2 point advanced
Dodge Durango 3 point advanced
Subaru Outback 6 point superior
Rates of rear-end crashes for City Safety vs. other midsize luxury cars and SUVs

![Graph showing rates of rear-end crashes for various luxury cars and SUVs. The graph compares the rates per 1000 insured vehicle years for different models. The highest rates are for Land Rover LR2 and Volvo XC90, with other models showing varying levels of crash rates.](image)
Percent difference in crash rates by crash type, Volvo S60 and XC60 vs. other midsize luxury cars and SUVs
Front crash prevention systems are preventing rear-end crashes

Percent difference in crash rates – with FCP vs without

![Graph showing percent difference in crash rates with and without front crash prevention systems for various car brands and systems. The graph compares warning only and warning with autobrake scenarios.](chart)
Front crash prevention systems are preventing injuries in rear-end crashes

Percent difference in crash rates – with FCP vs without

-100%  -80%  -60%  -40%  -20%  0%  20%  40%

FCA (w/BSM +RCP)  Honda Accord camera (w/LDW)  Honda Accord radar (w/LDW +ACC)  Mercedes-Benz  Volvo  warning only pooled  Acura  Mercedes-Benz  Subaru (w/LDW)  Volvo (w/LDW)  autobrake pooled
Front crash prevention effectiveness is reduced on slippery roads

<table>
<thead>
<tr>
<th>Year</th>
<th>Model</th>
<th>Speed Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Infiniti Q50</td>
<td>7 mph</td>
</tr>
<tr>
<td>2015</td>
<td>Subaru Legacy</td>
<td>6 mph</td>
</tr>
<tr>
<td>2014</td>
<td>Volvo S80</td>
<td>4 mph</td>
</tr>
</tbody>
</table>
Lane departure prevention
Driver use of lane departure warning
Honda vehicles observed in dealer service area

<table>
<thead>
<tr>
<th>Model</th>
<th>percent of vehicles with system activated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accord</td>
<td>40 (n = 139)</td>
</tr>
<tr>
<td>CR-V</td>
<td>33 (n = 6)</td>
</tr>
<tr>
<td>Odyssey</td>
<td>25 (n = 120)</td>
</tr>
<tr>
<td>total</td>
<td>32 (n = 265)</td>
</tr>
</tbody>
</table>

LDW turned on
Lane departure warning systems may be preventing single-vehicle run-off-road and head-on injury crashes

Percent difference in crash rates – with LDW vs without

Honda Accord (w/FCW)
Mercedes-Benz (w/FCW + AEB)
Subaru (w/FCW + AEB)
Volvo (w/FCW + AEB)
Lane departure warning pooled
Buick Lucerne (w/ESC + blind spot)
Effects of lane departure warning systems on sideswipe injury crashes, with no prior lane change

Percent difference in crash rates – with LDW vs without

- Honda Accord (w/FCW)
- Mercedes-Benz (w/FCW + AEB)
- Subaru (w/FCW + AEB)
- Volvo (too little data)
- Lane departure warning pooled
- Buick Lucerne (w/ESC + blind spot)
Forty percent of drivers may not be able to respond to lane departure warnings

Weighted percent of crashes with serious injury or fatality

- lane drifts
- all lane departures
Advanced headlights
Adaptive headlights are preventing crashes
Changes in collision and PDL claim frequency by manufacturer

- Acura
- Mazda
- Mercedes-Benz
- Volvo
- Pooled estimate

-15%
-10%
-5%
0%
5%
10%
15%
Adaptive headlights prevent nighttime crashes
Effect of Mazda AFLS on insurance losses by time of day
Adaptive headlights
Change in claim frequency

-20%
-10%
0%
10%
20%
30%

Acura  Mazda  Mercedes  Volvo

Bodily injury liability

-30%
-20%
-10%
0%
10%
20%
30%

Acura  Mazda  Mercedes-Benz  Volvo

MedPay  PIP
Are crash avoidance technologies preventing insurance claims?
Summary of technology effects on insurance claim frequency
Results pooled across automakers

- Forward collision warning
- FCW with autobrake
- Adaptive headlights
- Lane departure warning
- Side-view assist (blind spot)

<table>
<thead>
<tr>
<th>Technology</th>
<th>Collision</th>
<th>Property Damage Liability</th>
<th>Bodily Injury Liability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward collision warning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCW with autobrake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adaptive headlights</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lane departure warning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side-view assist (blind spot)</td>
<td></td>
<td></td>
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</tbody>
</table>
Front crash prevention systems
Change in collision claim severity

low speed

warning only

warning with autobrake

Mazda (smart city brake support)
Mazda (smart city brake support & FCW)
Volvo City Safety
FCA (with ACC, BSM & RCTA)
Honda Accord camera (with LDW)
Honda Accord radar (with LDW & ACC)
Mercedes
Volvo
Acura
Mercedes
Subaru (with LDW)
Volvo (with LDW)
Front crash prevention systems
Change in collision overall losses

- $100
- $50
- $0
- $50
- $100
- $150

low speed
warning only
warning with autobrake

Mazda (smart city brake support)
Mazda (smart city brake support & FCW)
Volvo City Safety
FCA (with ACC, BSM & RCTA)
Honda Accord camera (with LDW)
Honda Accord radar (with LDW & ACC)
Mercedes
Volvo
Acura
Mercedes (with LDW)
Subaru (with LDW)
Volvo (with LDW)
Adaptive headlights
Change in collision overall losses

Acura
Mazda
Mercedes
Volvo
More information and links to our YouTube channel and Twitter feed at iihs.org
References

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- Effectiveness of forward collision warning and autonomous emergency braking systems in reducing front-to-rear crash rates, Cicchino, J.B., IIHS August 2016
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  - Volume 32, numbers 1, 7, 8, 22, 33
  - Volume 33, numbers 18, 19, 23, 26