Where We Are with ADAS
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A review of new vehicle launches in the U.S. underscores the growing prevalence of advanced driver assistance systems (ADAS). Advanced driver assistance systems (ADAS) include technologies such as front crash prevention or warning, lane departure warning (LDW), blind spot detection, park assist, back-over prevention, obstacle detection, and automatic emergency braking (AEB). While there is no requirement or mandate from NHTSA that requires that automakers add these features to their vehicles, in March 2016, NHTSA and IIHS announced a commitment of 20 major automakers representing 99 percent of all vehicles sold in the U.S. annually to equipping all vehicles of curb weight less than 10K pounds with automatic emergency braking (AEB) and frontal crash warning (FCW).

Specifically, automakers commit to make AEB standard on virtually all light-duty cars and trucks with a gross vehicle weight of 8,500 pounds or less no later than Sept. 1, 2022, and on virtually all trucks with a gross vehicle weight between 8,501 pounds and 10,000 pounds no later than Sept. 1, 2025. This commitment, as well as consumer demand, is driving more of this technology into the overall vehicle fleet today.

As automakers continue to deliver on commitments to standardize the ADAS features of automatic emergency braking (AEB) and frontal crash avoidance/warning, the vehicle fleet will be transformed, increasing in degrees of automation, ultimately arriving at Levels 4 and 5 of autonomy (see Figure 1).
Many vehicles on the road in the U.S. are still at Level 0, with no automated driving functions. But growth among vehicles with Level 1-2 automation is accelerating. The percentage of vehicles with AEB standard across these 20 automakers grew from just under 30 percent for MY 2017 to over 50 percent for MY 2018 and MY 2019 based on those that reported actual volumes of AEB-equipped vehicles and estimates from Consumer Reports (see Figures 2-4). IIHS/HLDI and other organizations have completed studies to measure the efficacy of the various ADAS systems and have found promising results. For example, a 2016 IIHS study of police-reported rear-end crashes in 22 states found vehicles equipped with forward collision warning (FCW) alone reduced rear-end accidents by 23 percent, while those with AEB cut rear-end accidents by 40 percent.²
Figure 3: Percent of MY18 Vehicles Conforming to AEB Voluntary Commitment

Note: *OE provided only percentage meeting AEB commitment, no vehicle volumes. For vehicles manufactured after September 1, 2016, and before August 31, 2017, and to be sold in the United States. Source: https://www.regulations.gov/docketBrowser?rpp=25&so=DESC&sb=postedDate&po=0&D=NHTSA-2015-0101.

Figure 4: Percent of MY19 Vehicles Conforming to AEB Voluntary Commitment

**NOTE: Consumer Reports’ listed 0% so defaulted to MY2018 share with AEB.
When studying the impact of FCW with AEB across all property-damage liability claims, IIHS found a 14 percent reduction on average in frequency. The National Safety Council estimates over 70 percent of vehicle accidents were a collision with another motor vehicle, and over 33 percent of those are rear end collisions, and AEB has the potential to significantly reduce a good portion of those accidents (see Figure 5 and Figures 6A-B).

**Figure 5: USDOT NHTSA Crashes by First Harmful Event, Manner of Collision, and Crash Severity, 2010 vs. 2015**

**Figure 6A: Type of Motor Vehicle Accident - Percent that were Collision with Other Motor Vehicle by Accident Type**

**Figure 6B: NSC Percent of Motor Vehicle Accidents that were Collision with Other Motor Vehicle**

Source: National Safety Council Injury Facts®
However, analysis of real-world accident data shows many challenges remain before automakers can address every potential accident scenario, at all traveling speeds, in all weather conditions, and in a consistent manner. Each automaker’s ADAS system works differently and often combines different technologies. Additionally, some features take control of a vehicle function, while others provide warning.

And this is just the technology; how each driver responds to the technology will vary as well, with three key challenges of mode confusion, role confusion, and misplaced trust likely to further complicate the path towards full vehicle autonomy. In fact, recent data from a survey conducted by State Farm suggests drivers with ADAS actually take more risks (see Figure 7).

Figure 7: Are Drivers Using ADAS to Support Bad Behavior?

### Are We Driving Dumber in Smarter Cars?

A new survey from State Farm® shows that drivers who have cars with Adaptive Cruise Control or Lane Keeping Assist admit to distracting driving behaviors at a higher rate than those drivers without these features.

Among those with or without ACC or LKA, percentage who said they “frequently” or “sometimes” engage in this behavior while driving.

<table>
<thead>
<tr>
<th>Activity</th>
<th>With ACC</th>
<th>Without ACC</th>
<th>With LKA</th>
<th>Without LKA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading or sending text messages</td>
<td>62%</td>
<td>49%</td>
<td>62%</td>
<td>51%</td>
</tr>
<tr>
<td>Interacting with cell phone apps</td>
<td>56%</td>
<td>42%</td>
<td>54%</td>
<td>44%</td>
</tr>
<tr>
<td>Manually entering a phone number</td>
<td>52%</td>
<td>38%</td>
<td>56%</td>
<td>38%</td>
</tr>
<tr>
<td>Holding phone while talking</td>
<td>60%</td>
<td>50%</td>
<td>63%</td>
<td>51%</td>
</tr>
<tr>
<td>Using video chat on cell phone</td>
<td>39%</td>
<td>19%</td>
<td>42%</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Remember, advanced safety features don’t eliminate the need for drivers to remain attentive at all times!**

Source: https://newsroom.statefarm.com/distracted-driving-advanced-tech/
Because ADAS is not helping to eliminate all accidents, repairers are now having to repair vehicles with many more sensors, cameras, lidar, radar and more electronic components than ever before (see Figure 8). Many of these components are located on the perimeter of the vehicle in order to gauge the vehicle’s surroundings; however, this also means they are highly exposed, even in minor fender benders. 19 percent of all non-comprehensive appraisals included a sensor that was replaced or repaired or R&I’d in Q2 2019 – but that number was double (38 percent) for current model year vehicles in that same period.

Figure 8: Vehicle ADAS Driving Vehicle Complexity
During that same quarter, 1.3 percent of all appraisals included a camera, a number again that was more than double (3.3 percent) for current model year appraisals (see Figures 9A-B).

And while the average cost per replaced sensor fell 2 percent between Q2 2017 and Q2 2019 (from $124 to $121), the average cost per camera rose 11 percent in the same timeframe (from $222 to $247).
The remove and replacement of a camera, sensor, radar or lidar may require re-calibration, depending on the OE and how its system is designed. Unfortunately, calibration requirements can vary dramatically by automaker, damage characteristics or even by individual vehicle and ADAS technology, reinforcing the importance of understanding the OE repair procedures. When a part such as a distance sensor is replaced, additional database labor time of 0.2 to 0.6 hours is commonly added as an entry such as “FRONT BUMPER Add for distance sensor”. In addition to this, some repairs include separate manual entries for calibration, depending on the components damaged or the vehicle repair requirements. The specific parts requiring calibration are not always identified clearly or at all but, not surprisingly, the majority identify a specific ADAS feature such as blind-spot monitoring sensor, distance sensor, camera, parking sensor, lane departure, adaptive cruise control, as well as mechanical parts such as occupant sensors, steering angle sensors and tire pressure monitoring sensors, and finally parts such as headlamps.

In Q2 2019, 2 percent of all appraisals included an additional entry for “calibration”, “re-program”, “flash”, etc., up from 0.9 percent in Q1 2017 (see Figure 10).
There is however a very wide range in these types of fees, with certain entries including not just the cost of calibration, or a fee to “Drive to and from calibration”, but the cost of additional components that may have been found to need replacement during the calibration (see Figure 11).

Figure 11: Fees for Calibration Fall Across Broad Range

<table>
<thead>
<tr>
<th>Average Fee for Calibration Entry (includes flat fees and labor)</th>
<th>Maximum Fee on a Single Appraisal</th>
<th>Std Dev of Fees</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-Q1 $168</td>
<td>$4826 “Window/Module reprogram”</td>
<td>$197</td>
</tr>
<tr>
<td>2017-Q2 $172</td>
<td>$6250 “Reprogram Headlamps at dealer”</td>
<td>$214</td>
</tr>
<tr>
<td>2017-Q3 $177</td>
<td>$4341 “Replace and Recalibrate Lane Ad”</td>
<td>$229</td>
</tr>
<tr>
<td>2017-Q4 $182</td>
<td>$4149 “calibrate and repair”</td>
<td>$223</td>
</tr>
<tr>
<td>2018-Q1 $182</td>
<td>$4270 “recalibrate windshield, clear”</td>
<td>$226</td>
</tr>
<tr>
<td>2018-Q2 $189</td>
<td>$7791 “complete install/tune/calibrate”</td>
<td>$233</td>
</tr>
<tr>
<td>2018-Q3 $196</td>
<td>$5852 “SRS system recalibration and S”</td>
<td>$236</td>
</tr>
<tr>
<td>2018-Q4 $210</td>
<td>$8941 “Replace and program occupant”</td>
<td>$257</td>
</tr>
<tr>
<td>2019-Q1 $217</td>
<td>$6094 “dealer install and calibrate f”</td>
<td>$254</td>
</tr>
<tr>
<td>2019-Q2 $219</td>
<td>$5316 “Dealer Distance Sensor Reprogram”</td>
<td>$236</td>
</tr>
</tbody>
</table>

Source: CCC Information Services Inc.
Certainly, as more vehicles are sold with advanced driver assistance systems such as FCW and AEB, the industry will see fewer accidents overall, among them the most common front-to-rear accidents. However, as ADAS equipped vehicles continue to drive alongside non-ADAS equipped vehicles, and projections from the IIHS and Highway Loss Data Institute (HLDI) show it can take decades before all vehicles on the road are eventually equipped with new technologies – shown by their projections on the various adoption rates of ADAS features among U.S. registered vehicles (see Figure 12). While the majority of vehicles of curb weight 8500 pounds or less after September 1, 2022 manufactured for the U.S. market will minimally come equipped with rear backup assist, AEB and forward collision warning, the net change in the vehicle fleet annually (new vehicles versus those scrapped) remains small.

There will be a significant number of years where we will see a mixed fleet on the roads alongside one another.

A comparison of the age mix of U.S. registered vehicles in use from IHS Automotive to the age mix of vehicles with an auto claim reveal a) the age mix of vehicles for which an auto claim is made tends to be newer overall, and yet b) the pattern of change of the last several years in both the age mix of vehicles in use to auto claims is very similar. Both show the impact of vehicles lasting longer than ever before and record-low scrappage rates resulting in an older vehicle mix overall. And while auto sales in the U.S. have been very strong over the last 4-5 years, those youngest vehicles (the vehicles most likely to come equipped with ADAS) have seen their volume share fall.

Figure 12: IIHS/HLDI Projections – Percent of Registered Vehicles with ADAS Features

The decline in volume share for those vehicles aged 0-3 years however is larger (1.5 percentage points) for auto claims than for vehicles in use (0.6 percentage points) (see Figures 13A-B). With nearly 50 percent of MY2019 vehicles now equipped with ADAS, where ADAS has been shown to reduce the most common time of accident by nearly 50 percent, back of the envelope math suggests the difference in volume share loss is likely best explained by growing ADAS prevalence.

There is much hope that advances in vehicle technology such as ADAS will, over time, lead to fewer accidents, and subsequently fewer people and vehicles to fix. In the near term however, vehicles are being sold with many more sensors, cameras, radar, lidar, etc. and complex material construction than ever before.

The wide variation in technologies used among the OE’s is leading to challenges for repairers, where the importance of understanding exactly what they are dealing with for each and every individual vehicle has become critical. These changes also mean the industry is making major investments in tooling, training, and data to ensure it is equipped to properly return vehicles to pre-accident condition. Near-term challenges abound, and certainly ADAS seems to be another factor driving the trend of fewer but more expensive claims.