What Older Drivers Need to Know About Automated Vehicle Technology

ANDY KOBLENZ
Executive Vice President | NADA Regulatory Affairs
703.821.7040 | akoblenz@nada.org
“Overall [NHTSA] estimates that, together, [four Level 2 advanced driver assist systems] . . . could potentially address nearly 89 percent of [ ] crashes....”

NHTSA V2V Rulemaking Notice, at 3863
Active safety as the foundation of automated driving

Level 0
No automation
- Driver is in complete control of vehicle

Level 1
Function-specific automation
- Automation of one or more control functions

Level 2
Combined function automation
- Automation of two or more control functions

Level 3
Limited self-driving automation
- Driver able to cede full control of all safety-critical functions under certain conditions

Level 4
High self-driving automation
- Driver able to cede full control of all safety-critical functions for an entire trip

Level 5
Full self-driving automation
- No driver required

Level 2 automation delivers 80% of the benefit for 20% of the cost of full automation

Note: Levels of vehicle automation as defined by NHTSA
PASSenger Car Safety Beyond ADAS: Defining Remaining Accident Configurations as Future Priorities

Martin Östling
Nils Larbäck
Hanna Jeppsson
Autoliv Research
Sweden
Pradeep Pathan
Autoliv India
India

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ABSTRACT

New vehicles are increasingly equipped with a variety of Advanced Driver Assistance Systems (ADASs). As these systems have the potential to prevent accidents, accidents of the future will differ from those of today. Predicting the type and characteristics of these future accidents is therefore essential to current research and development in the occupant restraint and new ADAS fields.

In this study, accident avoidance of 15 ADASs was modelled using simple deterministic rules for each, creating both a conservative and an optimistic route to account for current limitations and future possibilities. The rules were applied to the US National Automotive Sampling System Crashworthiness Data System data from 1995-2015 and verified through the literature. The residual passenger vehicle to passenger vehicle accidents were analysed, treating all accidents and accidents with at least moderate injuries in modern passenger vehicles (model year 2007 and later) separately.

Many accidents were found to be avoided through such systems, and their combined effectiveness ranged from 51% to 97% depending on metric: Electronic Stability Control (ESC), Lane Keep Assist (LKA), and Crossing and Rear End Automated Emergency Braking (AEB) were highly effective, individually preventing over 25% of accidents in the optimistic calculation. Importantly, remaining accidents will have a different distribution across accident types compared to today: rear end collisions will reduce, leaving turning and crossing scenarios to dominate future accidents.

For passenger vehicle to passenger vehicle accidents with at least moderate injuries in modern vehicles, four accident types alone were found to account for 99% of all remaining accidents in the optimistic estimate: Head On, Turn Across Path, Turn Into Path Opposite Direction and Straight Crossing Paths; the latter three are intersection-related and together represent three quarters of all remaining accidents.

The intersection accidents are analysed further for deformation pattern, impact direction, 90% cumulative delta velocity and injured occupant position in order to identify possible new impact conditions to be used when evaluating occupant restraints. The well-established frontal and side impacts will still generate many AIS2+ injuries, while new more oblique impact conditions will also be needed to represent the variety of intersection accidents remaining.

The description of future accidents and impact conditions presented here can serve as a basis for the research and design of future ADASs and occupant restraints. We propose virtual assessment methods with Human Body Models (HBM) based on these impact conditions.

INTRODUCTION

More than six million police-reported motor vehicle accidents occurred in the United States in 2016; of the 37,461 fatalities, 23,714 (63%) were occupants of passenger vehicles [1]. Over recent years, many Advanced Driver Assistance Systems (ADASs) have been introduced to the market, including Automated Emergency Braking (AEB) for rear end collisions and pedestrian impacts and Lane Keeping Assist (LKA), which are estimated to reduce the number of accidents significantly [2-8]. To reduce this number further, additional ADASs, such as AEB for intersections and Evasive Steering Assist (ESA), are under development as a stepwise progression to fully autonomous driving. Society of Automotive Engineers (SAE) describes these steps at five levels [9], where level 0 means no
Potential Reductions in Crashes, Injuries, and Deaths from Large-Scale Deployment of Advanced Driver Assistance Systems

Technologies designed to improve traffic safety by helping drivers avoid crashes may become available to the U.S. vehicle fleet. Some of these technologies provide warnings and rely on the driver to control the vehicle. Other technologies are designed to automatically brake or steer, taking an active approach to help avoid a crash. Increases in the market penetration of these systems and improvements in their functionality and effectiveness could lead to significant reductions in traffic safety. This research brief presents a synthesis of existing information on a selected Advanced Driver Assistance Systems and provides new estimates of the potential benefits of these systems. The research finds that such systems could potentially help prevent based on the characteristics of the crashes and the technologies involved.

Introduction

This research brief reviews recent literature and provides updated statistical estimates regarding the numbers of crashes, injuries, and deaths that could theoretically be addressed by equipping all cars, pickup trucks, vans, and sport utility vehicles (hereafter, collectively referred to as “passenger vehicles”) with selected Advanced Driver Assistance Systems (ADAS). Technologies included in the scope of this brief are designed to prevent or reduce the severity of specific types of crashes, or to help the driver monitor specific conditions. Specific technologies examined include: forward collision warning (FCW), automatic emergency braking (AEB), lane warning (LCW), automatic emergency braking (AEB), lane departure warning (LDW), lane keeping assistance (LKA), adaptive cruise control systems, parking assistance systems, and blind spot warning (BSW) systems. Driver assistance technologies designed primarily for driver convenience (e.g., adaptive cruise control systems, parking assistance systems) are outside the scope of this review. It should be noted that in estimating the numbers of crashes, injuries, and deaths that these technologies could theoretically help prevent or mitigate, this research brief does not attempt to quantify the likely actual real-world reductions in crashes, injuries, and deaths attributable to these technologies.

Forward Collision Warning (FCW) and Automatic Emergency Braking (AEB) Systems

FCW and AEB systems typically use radar, lidar, or cameras to determine the distance between the equipped vehicle and other vehicles/objects directly ahead, and estimate the risk of a collision. In the event of a crash, the systems alert the driver to the potential danger and, if the driver does not take action, the systems automatically apply the vehicle’s brakes. The systems also include a pre-crash function that is able to reduce the severity of the crash. AEB systems reduce the severity of collisions by reducing the speed of the vehicles involved.

Key Findings

The study examined driver behavior, various measures of driving performance, engagement in secondary (non-driving) tasks, driver drowsiness and involvement in safety-critical events. A subset of the most salient results are described below (see full report for complete results).

Secondary task engagement

The results from the VCC data set indicate that the simultaneous use of ACC and LKA systems was associated with a 50% increase in the odds of engaging in any form of secondary tasks compared with when the same drivers were not using the automated system. Drivers using both systems simultaneously also took more frequent and longer glances at non-driving-related tasks and spent less time with their eyes on driving-related tasks.

Understanding the Impact of Technology: Do Advanced Driver Assistance and Semi-Automated Vehicle Systems Lead to Improper Driving Behavior?

Introduction

The ultimate goal of advanced driver assistance systems (ADAS) is to increase traffic safety and driving comfort. Despite their potential safety benefits, there are concerns that in these scenarios, speed control and/or steering are automated, but the driver is drivers may become inactive due to engagement in non-driving-related tasks or become drowsy while driving using these systems.

In this study, the Virginia Tech Transportation Institute leveraged data from two previous naturalistic driving studies (NDS): The Virginia Connected Corridors (VCC) Level 2 Naturalistic Driving Study, in which researchers observed participants driving for one year as they drove their personal vehicles; and the Level 2 Mixed Function Automation (MFA) NDS, during which participants were provided with a study vehicle to drive for one month. These datasets were used to investigate driving behavior while in vehicles that offer simultaneous control of speed (adaptive cruise control (ACC) and steering (lane-keeping assistance (LKA)), both while using the automation and when they were driving manually.

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American Automobile Association Studies

FAC'T SHEET

DECEMBER 2019

UNDERSTANDING THE IMPACT OF TECHNOLOGY: DO ADVANCED DRIVER ASSISTANCE AND SEMI-AUTOMATED VEHICLE SYSTEMS LEAD TO IMPROPER DRIVING BEHAVIOR?

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AAA Foundation.org

AAA Foundation for Traffic Safety
607 14th Street, NW, Suite 201
Washington, DC 20005
202-639-5944

About

Established in 1947 by AAA, the AAA Foundation for Traffic Safety is a non-profit, publicly funded, 501(c)(3) charitable research and educational organization. The AAA Foundation’s mission is to prevent traffic deaths and injuries by conducting research into their causes and by educating the public about strategies to prevent crashes and reduce injuries when they do occur. This research is used to develop educational materials for drivers, pedestrians, bicyclists and other road users. Visit www.AAAFoundation.org for more information.

More Information

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62% of consumers still want help from dealership staff

61% of consumers want help from a product specialist
Greater delivery satisfaction for those who take delivery at dealership.

J.D. POWER
75% of auto-buying consumers said they would not want to buy a vehicle without a dealership involved.

2019 Urban Science/Harris poll
Advanced Driver Assistance Systems (ADAS) have become increasingly prevalent on new vehicles, but the terminology used by automakers to describe them varies widely and so far has focused on marketing strategies.

The common naming outlined is simple, specific, and based on system functionality. The list is meant to aid in reducing driver confusion and define the functions of ADAS in a consistent manner. This is critical to ensure that drivers are aware these systems are designed to assist, not replace an engaged driver.

The list is not meant to replace automaker proprietary system or package names, but rather help identify key functions within those packages and provide clarity to consumers. The list will be continually refined as we work with other stakeholders and as new systems are developed.

### DRIVING CONTROL ASSISTANCE

| **Active Driving Assistance** | Provides steering and brake/acceleration support to the driver at the same time. The driver must constantly supervise this support feature and maintain responsibility for driving. |
| **Adaptive Cruise Control** | Cruise control that also assists with acceleration and/or braking to maintain a driver-selected gap to the vehicle in front. Some systems can come to a stop and continue while others cannot. |
| **Lane Keeping Assistance** | Provides steering support to assist the driver in preventing the vehicle from departing the lane. Some systems also assist to keep the vehicle centered within the lane. |

### COLLISION WARNING

| **Blind Spot Warning** | Detects vehicles in the blind spot while driving and notifies the driver to their presence. Some systems provide an additional warning if the driver activates the turn signal. |
| **Forward Collision Warning** | Detects a potential collision with a vehicle ahead and alerts the driver. Some systems also provide alerts for pedestrians or other objects. |
| **Lane Departure Warning** | Monitors vehicle's position within driving lane and alerts driver as the vehicle approaches or crosses lane markers. |
| **Parking Collision Warning** | Detects objects close to the vehicle during parking maneuvers and notifies the driver. |
| **Rear Cross Traffic Warning** | Detects vehicles approaching from the side at the rear of the vehicle while in reverse gear and alerts the driver. Some systems also warn for pedestrians or other objects. |
A DEALER GUIDE TO

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By 2050, Iowans over 65 will make up nearly 20% of the population. Do you know how best to serve this growing customer base?

When your oldest customers were children, new features in cars included automatic transmission, widespread implementation of windshield wipers, and hydraulic brakes. In contrast, when your youngest customers were children, new technology in vehicles included rear-view backup cameras, Bluetooth integration, and GPS navigation.
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