

**RECOMMENDED ADVANCED DRIVER
ASSISTANCE SYSTEM (ADAS)
TECHNOLOGIES FOR OLDER DRIVERS**



**DAVID W. EBY, NICOLE ZANIER, RENÉE M. ST. LOUIS,
JENNIFER S. ZAKRAJSEK, LISA J. MOLNAR**

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16. Abstract Advanced Driver Assistance System (ADAS) technologies are rapidly being developed and available for new vehicles. ADAS technologies have been proposed as a way for older drivers to maintain safe mobility for longer. What technologies are best for older drivers? Researchers at the University of Michigan Transportation Research Institute (UMTRI) have developed a list of several technologies that they consider to be the best for enhancing the safe mobility of older drivers and drivers of all ages. Based on analyses of research articles about older adults and ADAS technology use, UMTRI's own work on this topic, and expert opinions, the recommendations are based on three criteria: <ul style="list-style-type: none"> • Potential to help overcome declines in abilities that may occur when people age. • Ease of understanding and use. • Potential to prevent crashes. The report describes 12 technologies that are recommended for older drivers along with live links to learn more about these technologies.					
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Recommended ADAS Technologies for Older Drivers

Introduction

ADAS technology is rapidly advancing and changing. How do you decide which technologies you should have in your car? Experts at the University of Michigan Transportation Research Institute (UMTRI) have developed a list of several technologies that they consider to be the best for enhancing the safe mobility of older drivers and drivers of all ages who may be experiencing declines in abilities. This list considered three key criteria and is based on analyses of research articles about older adults and ADAS technology use (Eby et al., 2015), UMTRI's own work on this topic (Eby et al., 2018, 2021), and expert opinions (The Hartford Center for Mature Market Excellence, 2015):

- Potential to help overcome declines in abilities that may occur when people age.
- Ease of understanding and use.
- Potential to prevent crashes.

It is important to remember that all ADAS technologies have limitations on when and where they can operate and on what they can and cannot do. Some are also complicated. Therefore, it is important that you take the time to learn about the capabilities of the ADAS technology and how to use it. There are many resources available on the Internet for doing this. A list of these resources is available at: <https://www.michigan.gov/agingdriver>. You can also talk to a dealership, read the vehicle owner's manual, or talk with family and friends who are familiar with the technologies. The recommended ADAS for older drivers are listed in alphabetical order. The names of each ADAS are live links that can be clicked to direct you to more information about the technology.

Advanced Driver Assistance System Technologies

Automatic crash notification

In the event of a crash, getting help quickly can save lives. Automatic crash notification systems are designed to help emergency services personnel respond more quickly to a crash by alerting emergency services automatically when the vehicle is in a crash and its location. The technology determines that there has been a crash by detecting airbag deployments and changes in motion that occur during crashes. In most systems and operator will try to contact the driver first. If they cannot, then the crash notification is sent. This technology works in the background and does not require any monitoring or intervention by the driver.

Automatic emergency braking

This system constantly monitors the changing distance between objects in front of you and your vehicle's front end. These systems will notify you when your vehicle is approaching an object

and if it determines that you are about to hit a forward object, it will automatically brake for you. Automatic braking systems can help prevent crashes, but in some cases, they may not be able to prevent a collision.

Automatic parallel parking

These systems are designed to help you park in a parallel parking space. Some systems will also help you locate the space. Once you have positioned your vehicle next to the parking space the system will take over the steering part of parking and will give you directions about which gear to be in and using the throttle and brake. You are responsible for everything other than the steering. You should practice using the system in a low-traffic environment until you are familiar with how your system operates.

Adaptive cruise control

Unlike conventional cruise control, adaptive cruise control can both slow down and speed up your car to maintain a set distance between you and the car in front. To operate these systems, you set your speed and the distance you want to maintain in front of your car, and the system will gently throttle and brake to keep your car at those settings. These systems should not be used as collision avoidance systems, as they are not designed to brake hard enough to prevent collisions—you still need to monitor what is going on in front of your vehicle and be prepared to brake if necessary.

Adaptive headlights

Being able to see well at night is hard for everyone, and it can be particularly challenging for people experiencing declining vision. Adaptive headlights help you see better at night by automatically turning the headlights in the direction you are turning so that the curve or corner are better illuminated. There are also adaptive headlights that will automatically turn on the vehicle's high-beams at night and automatically switch them back to regular-beams when traffic approaches. Both types of adaptive headlight systems provide better and more convenient roadway lighting at night.

Back-up camera/Back-up alert

Back-up cameras provide you with a wide view of what is behind your vehicle in both daytime and nighttime. Because of their usefulness while backing-up, back-up cameras have been required on all new passenger cars in the US since 2018. However, back-up cameras that also provide alerts provide even greater benefits. Back-up alert systems use proximity sensors to determine how close you are to obstacles when backing up and will provide you a warning. Depending on the system, the warning may tell you different levels of proximity and the location of the obstacle. Systems may also overlay a track-pattern onto the back-up camera screen that shows where you are backing based on how the steering wheel is turned. Alerts may be sounds, flashing symbols on the screen, or vibrations in the seat or steering wheel. Some systems may also include automatic emergency braking. These camera lenses can get covered in dirt or snow and require occasional cleaning to work properly.

Blind spot warning

Blind spot warning systems monitor the areas next to your vehicle and provide a warning when an object is in your left or right blind spot. Depending on the system, the warning can be a vibration, a sound, and/or an icon that usually located in or near the sideview mirrors. These systems may not detect small or fast moving objects.

Rear cross-traffic alert

Rear cross-traffic alert systems are designed to make backing-up easier and safer. Working with the back-up camera, the system monitors moving traffic, such as cars and people, that are behind you while you are backing up and will warn you when a moving object may cross your path. The warning may be either a sound or a flashing icon on your backup screen. These systems may have difficulty sensing fast moving and small objects and should be used in conjunction with the rear- and side-view mirrors.

Forward collision warning

Forward collision warning systems are designed to help you avoid crashes by detecting the changing distance to the vehicles or other objects in front you and warning you if you about to crash so that you can have more time to brake or steer the car to avoid a crash. Depending on the system, the warning may be a sound, flashing icon, and/or vibration. These systems are not designed to apply the brake for you unless they are combined with an automatic braking system.

Lane departure warning/Lane keeping Assist

Lane departure warning systems help to keep you from drifting out of your lane by providing a warning to you if you begin to cross over a lane line without using your turn signal. Depending on the system, the warning can be a sound, light, and/or vibration. Some vehicles combine the warning system with a lane keeping assist system, which will automatically nudge your vehicle back into the lane. Because both systems work by detecting the painted lines on the road, if these lines are covered in snow or are faded, the systems will likely not work.

Navigation assistance

Navigation assistance systems are designed to help you navigate to destinations that you select by giving you turn-by-turn instructions as you drive. These systems have been available in cars for more than 20 years and the features vary greatly from system to system. These systems work by using global position system (GPS) signals to determine where you are and mapping/routing software to determine the fastest or shortest route to your destination. Navigation directions can be shown on a dashboard screen, projected onto a head's up display, and/or spoken. Some systems may have access to traffic and construction information and can direct you around traffic problems. To maximize the benefits of a navigation assistance system it is recommended that they include both visual and spoken instructions and have access to real-time road closures, crashes, and other traffic problems. You should consult the owner's manual to learn about the specific features of your navigation assistance system.

Voice activated control

Voice activated control systems allow you to use specific spoken commands to control certain technologies in your car, allowing you to be able to keep your hands on the wheel. For example,

you might be able to set your AC by just saying “Set the temperature to 72 degrees”. Typically, these systems work by first pressing a button that is usually located on the steering column, that lets the car know you are speaking to it. Then there is a set of commands or phrases that you can use to control technologies. Voice recognition software interprets what you are saying and then automatically changes the controls.

References

Eby, D.W., Molnar, L.J., Zhang, L., St. Louis, R.M., Zanier, N., & Kostyniuk, L.P. (2015). *Keeping Older Adults Driving Safely: A Research Synthesis of Advanced In-Vehicle Technologies*. Washington, DC: AAA Foundation for Traffic Safety.

Eby, D.W., Molnar, L.J., Zakrajsek, J., Ryan, L., Zanier, N., St. Louis, R.M., Stanciu, S., LeBlanc, D., Kostyniuk, L.P., Smith, J., Yung, R., Nyquist, L., DiGuseppi, C., Li, G., Mielenz, T.J., & Strogatz, D. on behalf of the LongROAD Research Team. (2018). Prevalence, attitudes, and knowledge of in-vehicle technologies and vehicle adaptations among older drivers. *Accident Analysis & Prevention*, **113**, 54-62.

Eby, D.W., Kostyniuk, L.P., Molnar, L.J., Zakrajsek, J., Zanier, N., St. Louis, R.M., Smith, J., Yung, R., Nyquist, L., DiGuseppi, C., Jones, V., Li, G., Mielenz, T.J., & Strogatz, D., on behalf of the LongROAD Research Team. (2021). *Advanced Driver Assistance System Technologies among Older Drivers: Changes in Prevalence, Use, and Perceptions Over 3 Years of the AAA LongROAD Study. (Research Brief.)* Washington, DC: AAA Foundation for Traffic Safety.

The Hartford Center for Mature Market Excellence (2015). *In the Driver's Seat: A Guide to Vehicle Safety Technology*. Hartford, CT: The Hartford Financial Services Group, Inc.

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