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First partial driving automation safeguard ratings show industry has work to do

ARLINGTON, Va. — The Insurance Institute for Highway Safety is introducing a new ratings program to encourage automakers to incorporate more robust safeguards into their partial driving automation systems. Out of the first 14 systems tested, only one earns an acceptable rating. Two are rated marginal, and 11 are rated poor.

“We evaluated partial automation systems from BMW, Ford, General Motors, Genesis, Lexus, Mercedes-Benz, Nissan, Tesla and Volvo,” IIHS President David Harkey said. “Most of them don’t include adequate measures to prevent misuse and keep drivers from losing focus on what’s happening on the road.”

The Teammate system available on the Lexus LS is the only system tested that earns an acceptable rating. The GMC Sierra and Nissan Ariya are both available with partial automation systems that earn marginal ratings. The LS and Ariya each offer an alternative system that earns a poor rating. The Ford Mustang Mach-E, Genesis G90, Mercedes-Benz C-Class sedan, Tesla Model 3 and Volvo S90 also earn poor ratings, in some cases for more than one version of partial automation.

The ratings only apply to the specific models tested even though systems with the same names may be used on multiple vehicles from the same manufacturer.

“Some drivers may feel that partial automation makes long drives easier, but there is little evidence it makes driving safer,” Harkey said. “As many high-profile crashes have illustrated, it can introduce new risks when systems lack the appropriate safeguards.”

Vehicles with partial automation are not self-driving — though automakers sometimes use names that imply their systems are. The human driver must still handle many routine driving tasks, monitor how well the automation is performing and remain ready to take over if anything goes wrong. While most partial automation systems have some safeguards in place to help ensure drivers are focused and ready, these initial tests show that they’re not robust enough.

“The shortcomings vary from system to system,” said IIHS Senior Research Scientist Alexandra Mueller, who led the development of [the new program](#). “Many vehicles don’t adequately monitor whether the driver is looking at the road or prepared to take control. Many lack attention reminders that come soon enough and are forceful enough to rouse a driver whose mind is wandering. Many can be used despite occupants being unbelted or when other vital safety features are switched off.”

Today’s partial automation technology — which includes designated systems like Tesla’s Autopilot and GM’s Super Cruise as well as feature bundles that provide similar capabilities — uses cameras, radar or other sensors to “see” the

road and other vehicles. It combines adaptive cruise control (ACC), lane centering and various other driver assistance features. ACC maintains a driver-selected speed but will automatically slow to keep a set following distance from a slower moving vehicle ahead and then accelerate when the way is clear. Lane centering continuously adjusts the steering to help the driver keep the vehicle centered in the travel lane. Automated lane changing is also becoming more common.

The new IIHS ratings aim to encourage safeguards that can help reduce intentional misuse and prolonged attention lapses as well as to discourage certain design characteristics that increase risk in other ways — such as systems that can be operated when automatic emergency braking (AEB) is turned off or seat belts are unbuckled.

Scores are awarded based on a battery of tests conducted over multiple trials, and some performance areas are weighted more heavily than others.

When possible, tests are conducted on a closed test track. For certain tests that must be conducted on public roads, a second IIHS employee sits in the front passenger seat to monitor the driving environment and the vehicle systems.

In some cases, manufacturers are already making changes to their systems through software updates, which may result in adjustments to these ratings. The two Tesla systems evaluated, for example, used software that preceded the most recent recall in December 2023.

IIHS expects improvements to be rapid.

“These results are worrying, considering how quickly vehicles with these partial automation systems are hitting our roadways,” Harkey said. “But there’s a silver lining if you look at the performance of the group as a whole. No single system did well across the board, but in each category at least one system performed well. That means the fixes are readily available and, in some cases, may be accomplished with nothing more than a simple software update.”

Driver monitoring

Effective driver monitoring is essential to making partial automation safe. Systems should be able to detect if the driver’s head or eyes are not directed at the road and whether the driver’s hands are on the steering wheel or ready to grab it if necessary.

To evaluate this capability, IIHS engineers record what happens when the lens of the driver monitoring camera is blocked, the driver’s face is obscured, the driver is looking down, and the driver’s hands are not on the steering wheel. For systems that allow hands-free driving, the engineers also record what happens when the driver’s hands are holding a foam block the approximate size of a cell phone. Systems should not activate under these conditions, and, if they’re already switched on, they should issue an alert.

None of the 14 systems meets all these requirements, though the Ford systems come very close. Ford BlueCruise and Ford Adaptive Cruise Control with Stop & Go and Lane Centering Assist immediately issued alerts when the driver’s face or the camera lens was covered, for example, but failed to detect when the driver’s hands were occupied with another task. The BMW system did not react when the camera lens or driver’s face was covered, and the Mercedes-Benz system lacks a driver-monitoring camera altogether, though both vehicles were able to detect when the driver’s hands were not on the steering wheel.

Attention reminders

Timely and persistent attention reminders are also key. When a partial automation system detects that the driver’s eyes aren’t directed at the road or their hands aren’t ready to take over the steering, it should begin a dual-mode alert, such as an audible and visual warning, within 10 seconds. Before the 20-second mark, it should add a third mode of alert or begin an emergency procedure to slow the vehicle.

Lexus Teammate, both Ford systems and GM Super Cruise meet all these requirements. For example, when the test driver deliberately looked away from the road and held the foam block in both hands, Teammate began audible and visual alerts after 4 seconds and began an emergency slowdown procedure after 16 seconds.

Both the hands-on Nissan ProPILOT Assist with Navi-link and hands-free ProPILOT Assist 2.0 systems and Tesla Full Self-Driving performed almost as well. The hands-on Nissan system, for example, provided audible and visual alerts about 6 seconds after driver disengagement, but it didn't provide a third type of alert until around 21 seconds had passed, when it pulsed the brakes. Seven other systems didn't even provide dual-mode alerts within the first 15 seconds.

Emergency procedures

Partial automation systems need appropriate emergency escalation procedures to minimize the danger to occupants and other road users if the driver does not respond to those attention reminders. Regardless of how many different modes of alerts they issue, systems should begin a slowdown procedure within 35 seconds of driver disengagement. Drivers who ignore alerts for this long are either in distress or misusing the system. The system should send an SOS message to emergency responders or a 24-hour help center, and the driver should be prevented from restarting the automation for the remainder of the drive.

Of the 14 systems tested, only GM's meets all these requirements. Five systems include two of the three emergency procedures, and five include one. Lexus' combination of Dynamic Radar Cruise Control with Lane Tracing Assist system and the two Genesis systems all fail to take any emergency action if the driver disengages from driving and does not respond to repeated warnings.

Driver involvement

Another group of requirements is aimed at ensuring drivers stay involved in decision-making. All lane changes should be initiated or confirmed by the driver. When traffic causes the ACC to bring the vehicle to a complete stop, it should not automatically resume unless the system can confirm the driver is looking at the road and no more than two minutes have passed. The lane-centering feature should not switch off automatically when the driver makes manual steering adjustments within the lane, as that can discourage drivers from being physically involved in the driving, and physical involvement can help prevent mental disengagement.

More systems performed well in these categories than any of the others. GM Super Cruise and Tesla Full Self-Driving are the only ones that will make a lane change without any driver input. Super Cruise and both Tesla systems are the only ones that switch off lane centering when the driver does any manual steering.

Many systems allow ACC to resume automatically after a stop of more than two minutes or when the driver is not looking at the road. Both Tesla systems and BMW Active Driving Assist Pro will resume ACC in both scenarios, for example, while several others will restart in one of the two situations. Volvo Pilot Assist is one of seven systems that will not automatically resume in either scenario.

Safety features

There is little evidence that partial automation has any safety benefits, so it's essential that these systems can only be used when proven safety features are engaged. These include seat belts, AEB and lane departure prevention. For a good rating in this category, a partial automation system should not switch on if the driver is unbelted or AEB or lane departure prevention is not active. If already in operation and the driver unfastens their seat belt, the system should immediately begin its multi-mode, driver-disengagement attention reminders. Finally, it must be impossible to switch off AEB or lane departure prevention if the automation is engaged.

The hands-free ProPILOT Assist 2.0, Lexus Teammate, and GM Super Cruise systems are the only ones that meet all these requirements. The hands-on ProPILOT Assist with Navi-link and the BMW system come close, but each deactivates without issuing an alert when a key safety feature is disengaged. This is dangerous because the driver may not be aware that they need to resume full control of the vehicle.

In contrast, most of the systems fail multiple safety feature requirements. Volvo Pilot Assist, for example, deactivates without an alert when the driver unbuckles, can be activated with lane departure prevention turned off and also remains active if the feature is switched off mid-drive. The two Genesis systems fail all safety feature requirements.

Partial automation safeguard ratings

	Overall rating	Driver monitoring	Attention reminders	Emergency procedures	Driver involvement			
					Lane change	ACC resume	Cooperative steering	Safety features
Lexus Teammate with Advanced Drive 2022-24 Lexus LS	A	M	G	A	G	A	G	G
General Motors Super Cruise 2023-24 GMC Sierra	M	P	G	G	P	A	P	G
Nissan ProPILOT Assist with Navi-link 2023-24 Nissan Ariya	M	M	A	M	G	G	G	A
BMW Active Driving Assistant Pro 2023-24 BMW X1	P	M	P	A	G	P	G	A
Ford BlueCruise 2021-24 Ford Mustang Mach-E	P	A	G	M	G	M	G	P
Ford Adaptive Cruise Control with Stop & Go and Lane Centering Assist 2021-24 Ford Mustang Mach-E	P	A	G	M	G	G	G	P
Genesis Highway Driving Assist 2 2023-24 Genesis G90)	P	P	P	P	G	M	G	P
Genesis Smart Cruise Control/Lane Following Assist 2023-24 Genesis G90	P	P	P	P	G	G	G	P
Lexus Dynamic Radar Cruise Control with Lane Tracing Assist 2022-24 Lexus LS	P	P	P	P	G	G	G	M
Mercedes-Benz Active Distance Assist DISTRONIC with Active Steering Assist 2022-23 Mercedes-Benz C-Class	P	M	P	A	G	G	G	P
Nissan ProPILOT Assist 2.0 2023-24 Nissan Ariya	P	P	A	M	G	G	G	G
Tesla Autopilot, Version 2023.7.10 2021-23 Tesla Model 3	P	P	P	A	G	P	P	P
Tesla Full Self-Driving (Beta), Version 2023.7.10 2021-23 Tesla Model 3	P	P	A	A	P	P	P	P
Volvo Pilot Assist 2022-24 Volvo S90	P	P	P	M	G	G	G	P

G Good A Acceptable M Marginal P Poor

Requirements for a good partial automation safeguard rating

	Monitors both the driver's gaze and hand position	
	Uses multiple types of rapidly escalating alerts to get driver's attention	
	Fail-safe procedure slows vehicle, notifies manufacturer and keeps automation off limits for remainder of drive	
	Automated lane changes must be initiated or confirmed by the driver	
	Adaptive cruise control does not automatically resume after a lengthy stop or if the driver is not looking at the road	
	Lane centering does not discourage steering by driver	
	Automation features cannot be used with seat belt unfastened	
	Automation features cannot be used with automatic emergency braking or lane departure prevention/warning disabled	

For more information, go to [iihs.org](https://www.iihs.org)

The Insurance Institute for Highway Safety (IIHS) is an independent, nonprofit scientific and educational organization dedicated to reducing deaths, injuries and property damage from motor vehicle crashes through research and evaluation and through education of consumers, policymakers and safety professionals. IIHS is wholly supported by auto insurers.