NATIONAL TRANSPORTATION SAFETY BOARD

Meeting of March 31, 2026

(Information subject to editing)

Fatal Crashes Between Vehicles Operating in Hands-Free Partial Automation Mode and Stationary Vehicles in San Antonio, Texas, and Philadelphia, Pennsylvania

HWY24FH006 (San Antonio)
HWY24FH008 (Philadelphia)

This is a synopsis from the National Transportation Safety Board's (NTSB) report and does not include the Board's rationale for the findings, probable causes, and safety recommendations. NTSB staff is currently making final revisions to the report from which the attached findings and safety recommendations have been extracted. The final report and pertinent safety recommendation letters will be distributed to recommendation recipients as soon as possible. The attached information is subject to further review and editing to reflect changes adopted during the Board meeting.

Executive Summary

What Happened

The NTSB investigated two fatal, rear-end collisions with stationary vehicles at highway speeds. In both crashes, the striking vehicle was a 2022 Ford Mustang Mach-E operated in partial driving automation mode. Partial driving automation systems are designed to provide steering and control of acceleration/deceleration, with an understanding that the driver performs the rest of the driving task and is responsible for monitoring the environment, including detecting hazards and automation failures.

San Antonio, Texas. On February 24, 2024, at 9:48 p.m. local time, a 2022 Ford Mustang Mach-E battery-electric sport utility vehicle (SUV) was traveling east in the center lane of Interstate 10 (I-10) in San Antonio, Bexar County, Texas, and approaching the Woodlake Parkway exit. At this location on I-10, the eastbound direction of travel consisted of three travel lanes with a posted speed limit of 70 mph. The Ford, traveling at a system-recorded speed of 74.7 mph, collided with the rear of a stationary 1999 Honda CR-V SUV that was also in the center lane.

Upon impact, the Honda rotated counterclockwise and then overturned onto its roof before coming to rest on the left shoulder of I-10. The Ford continued east after the collision and came to rest on the right shoulder.

The Ford driver had been operating the vehicle in hands-free partial driving automation mode, which Ford refers to as BlueCruise. Neither driver-applied nor system-applied braking or steering were recorded before impact. As a result of the crash, the Honda driver died and the Ford driver sustained minor injuries.

Moments before this collision sequence, a 2017 Chevrolet Cruze traveling east in the center lane ahead of the Ford executed a quick lane change to the right to avoid colliding with the stationary Honda.

Philadelphia, Pennsylvania. On March 3, 2024, at 3:16 a.m. local time, a multi-vehicle collision occurred in a work zone on northbound Interstate 95 (I-95) near the Betsy Ross Bridge in Philadelphia, Pennsylvania. The speed limit in the work zone was 45 mph, reduced from 55 mph. Before the crash, two vehicles, a 2012 Hyundai Elantra and a 2006 Toyota Prius, were stationary in the left travel lane, with the Elantra positioned behind (south of) the Prius. A 2018 Toyota Corolla was traveling in the center lane, approaching these stationary vehicles. At the same time, a 2022 Ford Mustang Mach-E SUV was traveling north in the left lane of I-95. Traveling at a system-recorded speed of 72.4 mph, the Ford collided with the rear of the stationary Elantra, propelling it forward into the Prius. The impact redirected both the Prius and the Elantra forward and rightward, causing them to strike the passing Corolla.

The Ford driver had been operating the vehicle in hands-free partial driving automation mode. Neither driver-applied nor system-applied braking or steering were recorded before impact. As a result of the crash, the Prius and Elantra drivers died and the Ford driver sustained minor injuries. The Corolla driver was uninjured.

Moments before this collision sequence, a 2015 Hyundai Genesis sedan traveling north in the left lane ahead of the Ford had swerved around the stopped Elantra and Prius. Although the Genesis avoided the stopped vehicles, its driver lost control and collided with the roadside longitudinal barriers north of the crash location.

What We Found

In the San Antonio, Texas, crash, we found that the Ford driver was distracted by the vehicle's infotainment system, exhibited overreliance on automation through excess dependence and failure to properly monitor the system, and failed to respond to the stationary vehicle ahead. Although the partial automation system provides steering and control of acceleration/deceleration, the driver must always be prepared to take control. We also found that the driver of the stationary vehicle was impaired by alcohol, which may have contributed to the crash.

In the Philadelphia, Pennsylvania, crash, we found that the Ford driver failed to respond to the stopped vehicles ahead due to a combination of potentially interacting factors: impairment from substance use, disengagement from the driving task (likely due to cell phone use and overreliance on the vehicle's partial automation), and speeding. If the Ford had been traveling at the posted speed limit of 45 mph instead of 72 mph, the collision avoidance systems would have been more

likely to alert the driver sooner or mitigate the crash. The National Highway Traffic Safety Administration's (NHTSA) failure to meet the statutory date for requiring advanced impaired driving technology on all new passenger vehicles exposes the public to dangers posed by impaired drivers.

The circumstances of both crashes (involving a stationary lead vehicle, a striking vehicle traveling at highway speed, and nighttime conditions) were likely outside the capabilities of the Ford vehicles' collision avoidance systems available at the time of the crash. However, these scenarios are addressed in the performance parameters of a recently issued Federal Motor Vehicle Safety Standard.

The San Antonio and Philadelphia investigations revealed limitations in the Ford Motor Company's design of its telematics data collection programs (which do not transmit direct crash parameters such as airbag deployment), delays in manufacturer awareness about crashes involving partial vehicle automation, and reporting discrepancies across manufacturers in both the number of incidents reported and the information sources for the reports. Therefore, the data that NHTSA collects about these crashes (and the factors that contribute to them) is likely not comprehensive. The circumstances of both crashes demonstrated that without federal requirements for the recording of partial automation data, critical information about these crashes remains inconsistent and inaccessible to local law enforcement, safety investigators, regulators, and automakers.

Ford's driver monitoring system (DMS) did not effectively mitigate visual distraction and driver disengagement following off-road glances, because it allowed brief driver glances to the forward roadway to reset the distraction alert timer. In the San Antonio crash, the Ford driver's repeated off-road glances and minimal on-road glances demonstrate the risks of accumulated glances away from the roadway and the need for prolonged glance pattern evaluation in DMS implementation. In the Philadelphia crash, the Ford's DMS did not distinguish between attention to the forward roadway and attention to objects positioned in the driver's forward line of sight. This limitation would have permitted the Ford driver to use her phone in a distracting manner without receiving a DMS alert.

An urgent need exists for standardized US-based DMS performance requirements, as demonstrated by:

- the DMS deficiencies observed in both crashes and in previous NTSB investigations;
- NHTSA's ongoing research in assessing DMS effectiveness in eliminating distraction; and
- the more stringent performance testing protocols already implemented by the European New Car Assessment Programme and Insurance Institute for Highway Safety.

Both crashes revealed deficiencies in the implementation of partial automation, including:

- allowing drivers to disable the automatic emergency braking system;
- not requiring the active intelligent speed assistance system to be engaged while the vehicle is in partial automation mode;
- permitting hands-free partial automation in work zones with reduced speed limits; and
- allowing the active intelligent speed assistance system to allow cruise speeds up to 20 mph above posted speed limits.

The lack of federal guidance for partial automation systems in passenger vehicles has led to safety-critical design gaps in:

- mitigating known system limitations;
- enhancing safety redundancy by ensuring concurrent engagement of safety technologies; and
- promoting driver engagement by design.

We determined that the probable cause of the San Antonio, Texas, crash was the driver's failure to respond to the stationary vehicle ahead due to distraction, likely from the in-vehicle navigation system, stemming from overreliance on the vehicle's hands-free partial automation system and disengagement from the driving task. Contributing to the crash was the inability of the Ford vehicle's partial automation system, including its automatic emergency braking system, to detect and respond to the stationary vehicle ahead. Also contributing to the crash was the location of the stationary vehicle, which may have been stopped in the center lane of the highway due to the impairment of its driver.

We determined that the probable cause of the Philadelphia, Pennsylvania, crash was the driver's failure to respond to the stationary vehicles ahead due to impairment from alcohol that may have been worsened by cannabis use, as well as distraction, likely from cell phone use, stemming from overreliance on and misuse of the vehicle's hands-free partial automation system. Contributing to the crash was the driver's operation of the vehicle about 27 mph over the speed limit in a work zone. Further contributing to the crash was the Ford Motor Company's inadequate integration of its active speed management system with its partial automation system, which permitted excessive speed, including in a work zone.

What We Recommended

As a result of our investigations into these crashes involving vehicles with hands-free partial driving automation, we issued six new safety recommendations, reiterated one previously issued recommendation, and classified six previously issued recommendations. We recommended that NHTSA require manufacturers to equip new passenger vehicles with partial automation capabilities with a telematic system that notifies the manufacturer of crashes meeting NHTSA's reporting requirements.

We also recommended that NHTSA require all new passenger vehicles with partial automation capabilities to record data elements related to these

systems, including system availability, engagement and activation denial, driver alerts, and system faults for the collision avoidance system, DMS, partial automation system operation, and any other systems deemed necessary.

We recommended that NHTSA require that all new passenger vehicles with partial automation capabilities be equipped with DMSs capable of minimizing driver disengagement, automation complacency, and misuse of automation. We also recommended that the Ford Motor Company revise the DMSs in its new vehicles to detect and provide warnings about accumulated short distractions over a prolonged period of time, differentiate genuine on-road glances from attention directed to objects (such as cell phones) in the driver's forward line of sight, and issue initial and subsequent multi-modal alerts at intervals that minimize eyes-off-road duration.

We recommended that the US Department of Transportation (USDOT) issue comprehensive guidelines for vehicle manufacturers implementing partial vehicle automation systems that address known system limitations, including integration and concurrent engagement of safety technologies, promotion of driver engagement by design, reduction of the safety risks associated with automation complacency and misuse, and setting maximum operational speeds for automation systems based on overall system capabilities. We also recommended that the Ford Motor Company modify its BlueCruise system for new vehicles to require that the automatic emergency braking system is engaged and that its active intelligent speed assistance system uses speed tolerances to mitigate excessive speeding, taking into consideration the system's operational capabilities as well as traffic and highway complexity.

We reiterated Safety Recommendation H-22-22 to NHTSA to require that all new vehicles be equipped with passive vehicle-integrated alcohol impairment detection systems and/or advanced DMSs capable of preventing or limiting vehicle operation if driver impairment by alcohol is detected.

Finally, we classified six previously issued safety recommendations: one to the USDOT, four to NHTSA, and one to SAE International.

Findings

1. None of the following were factors in the San Antonio crash: (1) the licensing of either driver; (2) the Ford driver's experience with his vehicle; (3) intoxication of the Ford driver; (4) the mechanical condition of the Ford; (5) highway factors; or (6) weather.

2. None of the following were factors in the Philadelphia crash: (1) the licensing of the Ford driver; (2) the mechanical condition of the Ford; (3) highway factors; or (4) weather.

3. The emergency responses to both the San Antonio and Philadelphia crashes were timely and adequate.

4. In the San Antonio crash, the reasons for the Honda being stopped in the center lane could not be determined, but the Honda driver's alcohol impairment could have contributed.

5. The Ford driver in the San Antonio crash did not respond to the stationary vehicle ahead, despite having adequate opportunity to identify the hazard and initiate an evasive maneuver, due to distraction from use of the vehicle's infotainment system and overreliance on the vehicle's partial automation.

6. The Ford driver in the Philadelphia crash did not respond to the stopped vehicles ahead, despite having adequate opportunity to identify the hazard and initiate an evasive maneuver, due to a combination of potentially interacting factors, including:

    - impairment from substance use;
    - disengagement from the driving task, likely due to cell phone use and overreliance on the vehicle's partial automation; and
    - speeding, which reduced the duration of clear line of sight to the stopped Elantra.

7. The National Highway Traffic Safety Administration's failure to meet the statutory date for completing a final rule requiring advanced impaired driving technology on all new passenger vehicles continues to expose the public to dangers posed by impaired drivers.

8. If the Ford in the Philadelphia crash had been traveling at the posted speed limit of 45 mph instead of 72 mph, the forward collision warning and automatic emergency braking systems would have been more likely to alert the driver sooner or mitigate the crash, based on the Ford Mach-E performance in the existing testing protocols.

9. The circumstances of the San Antonio and Philadelphia crashes—stationary lead vehicle, striking vehicle traveling at highway speed, and nighttime conditions—were likely outside the capabilities of the Ford vehicles' collision avoidance systems (forward collision warning and automatic emergency braking) available at the time of the crash but are addressed in the performance parameters of the recently issued Federal Motor Vehicle Safety Standard 127.

10. The San Antonio and Philadelphia crashes revealed limitations in the Ford Motor Company's design of its telematics data collection programs, which do not transmit direct crash parameters such as airbag deployment. These limitations restrict the automaker's ability to identify relevant crashes and comply with the reporting requirements of the National Highway Traffic Safety Administration's SAE International Level 2 Standing General Order.

11. The San Antonio and Philadelphia investigations, which revealed delays in manufacturer awareness of crashes involving active SAE International Level 2 (L2) systems and reporting disparities across manufacturers in both the number of incidents reported and the information sources for the reports, show that the National Highway Traffic Safety Administration's L2 Standing General Order incident database likely does not reflect the full extent of L2-related crashes in the United States or the factors that contribute to these crashes.

12. When automakers lack a mechanism to become informed about incidents involving their vehicles that meet the reporting criteria specified in the National Highway Traffic Safety Administration's SAE International Level 2 (L2) Standing General Order (SGO)—as was the case for Ford in the San Antonio and Philadelphia crashes—the completeness of L2 SGO incident data cannot be assured, and the automakers' ability to investigate these incidents and the safety risks associated with L2 systems are likely to be limited.

13. The circumstances of the San Antonio and Philadelphia crashes demonstrate that without federal requirements for the recording of SAE International Level 2 (L2) data, critical precrash information (such as L2 or advanced driver assistance systems activation) and crash information (such as driver or system evasive actions and system hazard detection) remains inconsistent and inaccessible to local law enforcement, safety investigators, regulators, and automakers.

14. Inaction by the US Department of Transportation and National Highway Traffic Safety Administration (NHTSA) in establishing requirements for recording automated vehicle control system data—including the supporting advanced driver assistance systems features—continues to enable non-standardized and inconsistent data collection, hindering crash investigations and NHTSA's oversight of potential safety defects associated with SAE International Level 2 (L2) systems as well as limiting the broader usefulness of NHTSA's L2 Standing General Order incident database in revealing incidents and crashes involving partial automation.

15. The Ford Motor Company's driver monitoring system implementation, which allowed brief driver glances to the forward roadway to reset the distraction alert timer, does not effectively mitigate visual distraction and driver disengagement following off-road glances.

16. In the San Antonio crash, the Ford driver's repeated off-road glances, combined with his insufficient, brief on-road glances to detect the stationary vehicle ahead, demonstrate the risks of accumulated glances away from the roadway and highlight the need for prolonged glance pattern evaluation in driver monitoring system implementation.

17. In the Philadelphia crash, the limitations of the Ford Motor Company's driver monitoring system (DMS) in distinguishing between forward roadway attention and attention to objects positioned in the driver's line of sight to the roadway would have permitted the Ford driver to use her phone in a distracting manner without receiving a DMS alert.

18. An urgent need exists for standardized US-based driver monitoring system (DMS) performance requirements, as demonstrated by:

    - the DMS deficiencies observed in the San Antonio and Philadelphia crashes and in previous National Transportation Safety Board investigations;
    - the National Highway Traffic Safety Administration's ongoing research and plans to develop objective and repeatable procedures for assessing DMS effectiveness in eliminating driver distraction; and
    - the more stringent performance testing protocols already implemented by the European New Car Assessment Programme and Insurance Institute for Highway Safety.

19. The San Antonio and Philadelphia crashes revealed implementation deficiencies including allowing drivers to disable the automatic emergency braking system, not requiring the concurrent engagement of vehicle-equipped Intelligent Adaptive Cruise Control (ACC) (active intelligent speed assistance), permitting hands-free partial automation in work zones with reduced speed limits, and allowing Intelligent ACC to be configured with cruise speed tolerances up to 20 mph above posted speed limits.

20. The lack of federal guidance for SAE International Level 2 systems in passenger vehicles has led to safety-critical design gaps in mitigating known system limitations, enhancing safety redundancy by ensuring concurrent engagement of safety technologies, and promoting driver engagement by design.

Probable Causes

San Antonio, Texas

The National Transportation Safety Board determines that the probable cause of the San Antonio, Texas, crash was the driver's failure to respond to the stationary vehicle ahead due to distraction, likely from the in-vehicle navigation system, stemming from overreliance on the vehicle's hands-free partial automation system and disengagement from the driving task. Contributing to the crash was the inability of the Ford vehicle's partial automation system, including its automatic emergency braking system, to detect and respond to the stationary vehicle ahead. Also contributing to the crash was the location of the stationary vehicle, which may have been stopped in the center lane of the highway due to the impairment of its driver.

Philadelphia, Pennsylvania

The National Transportation Safety Board determines that the probable cause of the Philadelphia, Pennsylvania, crash was the driver's failure to respond to the stationary vehicles ahead due to impairment from alcohol that may have been worsened by cannabis use, as well as distraction, likely from cell phone use, stemming from overreliance on and misuse of the vehicle's hands-free partial automation system. Contributing to the crash was the driver's operation of the vehicle about 27 mph over the speed limit in a work zone. Further contributing to the crash was the Ford Motor Company's inadequate integration of its active speed management system with its partial automation system, which permitted excessive speed, including in a work zone.

Recommendations

New Recommendations

To the United States Department of Transportation:

1. Issue comprehensive guidelines for vehicle manufacturers implementing partial vehicle automation systems that address known system limitations, including:
    - integration and concurrent engagement of other safety-critical technologies (such as automatic emergency braking, active intelligent speed assistance, and driver monitoring system);
    - promoting driver engagement by design;
    - reducing the safety risks associated with automation complacency and misuse; and
    - setting maximum operational speeds for automation systems based on overall system capabilities.

To the National Highway Traffic Safety Administration:

2. Require manufacturers to equip new SAE International Level 2-capable passenger vehicles with a telematic system that notifies the manufacturer of crashes meeting your reporting requirements in Standing General Order 2021-01.

3. Amend 49 *Code of Federal Regulations* Part 563, "Event Data Recorders," to require that all new SAE International Level 2-capable passenger vehicles record data elements related to these systems, including at a minimum:
    - system availability;
    - engagement and activation denial;

- driver alerts; and
- system faults for automatic emergency braking, forward collision warning, driver monitoring system, lane departure prevention, lane centering, partial automation system operation, and any other systems deemed necessary.

[Note: new recommendation 3 is classified Open—Unacceptable Response upon issuance.]

4. Require that all new SAE International Level 2-capable passenger vehicles be equipped with driver monitoring systems capable of minimizing driver disengagement, automation complacency, and misuse of vehicle automation by, at a minimum:
    - providing warnings about accumulated short glances over a prolonged period of time;
    - differentiating genuine on-road glances from attention directed to objects, such as cell phones, located in the driver's forward line of sight; and
    - issuing initial and subsequent multi-modal alerts at intervals that minimize eyes-off-road duration.

To the Ford Motor Company:

5. Revise the driver monitoring systems in your new vehicles to detect and provide warnings about accumulated short distractions over a prolonged period of time; differentiate genuine driver on-road glances from attention directed to objects, such as cell phones, located in the driver's forward line of sight; and issue initial and subsequent multi-modal alerts at intervals that minimize eyes-off-road duration.

6. Modify your BlueCruise system for new vehicles to require that the automatic emergency braking system is engaged and that the Intelligent Adaptive Cruise Control system uses appropriate speed tolerances to mitigate excessive speeding, taking into consideration the system's operational capabilities as well as traffic and highway complexity.

Previously Issued Recommendation Reiterated in This Report

To the National Highway Traffic Safety Administration:

Require that all new vehicles be equipped with passive vehicle-integrated alcohol impairment detection systems, advanced driver monitoring systems, or a combination thereof; the systems must be capable of preventing or limiting vehicle operation if driver impairment by alcohol is detected. (H-22-22)

Safety Recommendation H-22-22 is reiterated in section 2.2.3 of the report.

Previously Issued Recommendations Classified in This Report

To US Department of Transportation:

Define the data parameters needed to understand the automated vehicle control systems involved in a crash. The parameters must reflect the vehicle's control status and the frequency and duration of control actions to adequately characterize driver and vehicle performance before and during a crash. (H-17-37)

Safety Recommendation H-17-37 is classified Closed—Unacceptable Response/Superseded by new recommendation 3 in section 2.3.1.3 of the report.

To National Highway Traffic Safety Administration:

Use the data parameters defined by the US Department of Transportation in response to Safety Recommendation H-17-37 as a benchmark for new vehicles equipped with automated vehicle control systems so that they capture data that reflect the vehicle's control status and the frequency and duration of control actions needed to adequately characterize driver and vehicle performance before and during a crash; the captured data should be readily available to, at a minimum, National Transportation Safety Board investigators and National Highway Traffic Safety Administration regulators. (H-17-39)

Safety Recommendation H-17-39 is classified Closed—Unacceptable Response/Superseded by new recommendation 3 in section 2.3.1.3 of the report.

Define a standard format for reporting automated vehicle control systems data, and require manufacturers of vehicles equipped with automated vehicle control systems to report incidents, crashes, and vehicle miles operated with such systems enabled. (H-17-40)

Safety Recommendation H-17-40 is classified Closed—Unacceptable Response/Superseded by new recommendation 3 in section 2.3.1.3 of the report.

For vehicles equipped with Level 2 automation, work with SAE International to develop performance standards for driver monitoring systems that will minimize driver disengagement, prevent automation complacency, and account for foreseeable misuse of the automation. (H-20-3)

Safety Recommendation H-20-3 is classified Closed—Acceptable Response/Superseded by new recommendation 4 in section 2.3.2.2 of the report.

After developing the performance standards for driver monitoring systems recommended in Safety Recommendation H-20-3, require that all new passenger vehicles with Level 2 automation be equipped with a driver monitoring system that meets these standards. (H-20-4)

Safety Recommendation H-20-4 is classified Closed—Acceptable Response/Superseded by new recommendation 4 in section 2.3.2.2 of the report.

To SAE International:

For vehicles equipped with Level 2 automation, work with the National Highway Traffic Safety Administration to develop performance standards for driver monitoring systems that will minimize driver disengagement, prevent automation complacency, and account for foreseeable misuse of the automation. (H-20-7)

Safety Recommendation H-20-7 is classified Closed—Unacceptable Action/No Response Received in section 2.3.2.2 of the report.