NATIONAL TRANSPORTATION SAFETY BOARD
Public Meeting of September 12, 2017
(Information subject to editing)

Collision between a Car Operating with Automated Vehicle Control Systems and a Tractor-Semitrailer Truck
Williston, FL
May 7, 2016
NTSB/HAR-17-XX

This is a synopsis from the NTSB's report and does not include the Board's rationale for the conclusions, probable cause, and safety recommendations. NTSB staff is currently making final revisions to the report from which the attached conclusions 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

At 4:36 p.m. eastern daylight time on Saturday, May 7, 2016, a 2015 Tesla Model S 70D car, traveling eastbound on US Highway 27A (US-27A), west of Williston, Florida, struck a refrigerated semitrailer powered by a 2014 Freightliner Cascadia truck-tractor. At the time of the collision, the truck was making a left turn from westbound US-27A across the two eastbound travel lanes onto NE 140th Court, a local paved road. The car struck the right side of the semitrailer, crossed underneath it, and then went off the right roadside at a shallow angle. The impact with the underside of the semitrailer sheared off the roof of the car.

After leaving the roadway, the car continued through a drainage culvert and two wire fences. It then struck and broke a utility pole, rotated counterclockwise, and came to rest perpendicular to the highway in the front yard of a private residence. Meanwhile, the truck continued across the intersection and came to a stop on NE 140th Court, south of a retail business located on the intersection corner.

The driver and sole occupant of the car died in the crash; the commercial truck driver was not injured.

System performance data downloaded from the car indicated that the driver was operating it using the Traffic-Aware Cruise Control and Autosteer lane-keeping systems, which are automated vehicle control systems within Tesla's Autopilot suite.

The National Transportation Safety Board (NTSB) became aware of the circumstances of the crash when the National Highway Traffic Safety Administration (NHTSA) began a defect

investigation on June 28, 2016, which focused on the automatic emergency braking and Autopilot systems of the Tesla Models S and X, for model years 2014–2016. On learning of the May 7, 2016, Williston crash that prompted the NHTSA investigation, the NTSB initiated its investigation, which focused on the use of the Autopilot system.

Findings

1. No investigative evidence indicates that either driver was fatigued, that cell phone use distracted the truck driver, that the car driver was impaired by alcohol or other drugs, that any mechanical system on either vehicle failed, or that the highway design was inappropriate; consequently, these were not factors in the crash.

2. There was sufficient sight distance to afford time for either the truck driver or the car driver to have acted to prevent the crash.

3. The Tesla's automated vehicle control system was not designed to, and did not, identify the truck crossing the car's path or recognize the impending crash; consequently, the Autopilot system did not reduce the car's velocity, the forward collision warning system did not provide an alert, and the automatic emergency braking did not activate.

4. Although the results of postcrash drug testing established that the truck driver had used marijuana before the crash, his level of impairment, if any, at the time of the crash could not be determined from the available evidence.

5. If automated vehicle control systems do not automatically restrict their own operation to those conditions for which they were designed and are appropriate, the risk of driver misuse remains.

6. Because driving is an inherently visual task and a driver may touch the steering wheel without visually assessing the roadway, traffic conditions, or vehicle control system performance, monitoring steering wheel torque provides a poor surrogate means of determining the automated vehicle driver's degree of engagement with the driving task.

7. The Tesla driver's pattern of use of the Autopilot system indicates an overreliance on the automation and a lack of understanding of system limitations.

8. The Tesla driver was not attentive to the driving task, but investigators could not determine from the available evidence the reason for his inattention.

9. The way that the Tesla Autopilot system monitored and responded to the driver's interaction with the steering wheel was not an effective method of ensuring driver engagement.

10. Without the manufacturer's involvement, vehicle performance data associated with highly automated systems on vehicles involved in crashes cannot be independently analyzed or verified.

11. A standardized set of retrievable data is needed to enable independent assessment of automated vehicle safety and to foster automation system improvements.

12. To determine the safety effects from the use of automated vehicle control systems and to analyze the benefit-cost outcomes of these systems, reliable information is needed on the types of systems deployed and the numbers of miles driven using them.

13. Connected vehicle technology will be most effective when all vehicles traveling on our roadways are equipped with the technology, and that is particularly important with respect to large, heavy trucks that pose the highest risk of injury to occupants of other vehicles.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the Williston, Florida, crash was the truck driver's failure to yield the right of way to the car, combined with the car driver's inattention due to overreliance on vehicle automation, which resulted in the car driver's lack of reaction to the presence of the truck. Contributing to the car driver's overreliance on the vehicle automation was its operational design, which permitted his prolonged disengagement from the driving task and his use of the automation in ways inconsistent with guidance and warnings from the manufacturer.

RECOMMENDATIONS

New Recommendations

As a result of its investigation, the National Transportation Safety Board makes the following new safety recommendations:

To the US Department of Transportation:

1. 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.

To the National Highway Traffic Safety Administration:

2. Develop a method to verify that manufacturers of vehicles equipped with Level 2 vehicle automation systems incorporate system safeguards that limit the use of automated vehicle control systems to those conditions for which they were designed.

3. Use the data parameters defined by the US Department of Transportation in response to Safety Recommendation [1] 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.

4. 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.

To manufacturers of vehicles equipped with Level 2 vehicle automation systems (Audi of America, BMW of North America, Infiniti USA, Mercedes-Benz USA, Tesla Inc., and Volvo Car USA):

5. Incorporate system safeguards that limit the use of automated vehicle control systems to those conditions for which they were designed.

6. Develop applications to more effectively sense the driver's level of engagement and alert the driver when engagement is lacking while automated vehicle control systems are in use.

To the Alliance of Automobile Manufacturers and to Global Automakers:

7. Notify your members of the importance of incorporating system safeguards that limit the use of automated vehicle control systems to those conditions for which they were designed.

Reiterated Recommendations

As a result of its investigation, the National Transportation Safety Board reiterates the following safety recommendations:

To the National Highway Traffic Safety Administration:

Develop minimum performance standards for connected vehicle technology for all highway vehicles. (H-13-30)

Once minimum performance standards for connected vehicle technology are developed, require this technology to be installed on all newly manufactured highway vehicles. (H-13-31)