



# PRELIMINARY REPORT

## HIGHWAY

### HWY18FH011

*The information in this preliminary report is subject to change and may contain errors.  
It will be supplemented or corrected during the course of the investigation.*

On Friday, March 23, 2018, about 9:27 a.m., Pacific daylight time, a 2017 Tesla Model X P100D electric-powered passenger vehicle, occupied by a 38-year-old driver, was traveling south on US Highway 101 (US-101) in Mountain View, Santa Clara County, California. As the vehicle approached the US-101/State Highway (SH-85) interchange, it was traveling in the second lane from the left, which was a high-occupancy-vehicle (HOV) lane for continued travel on US-101.

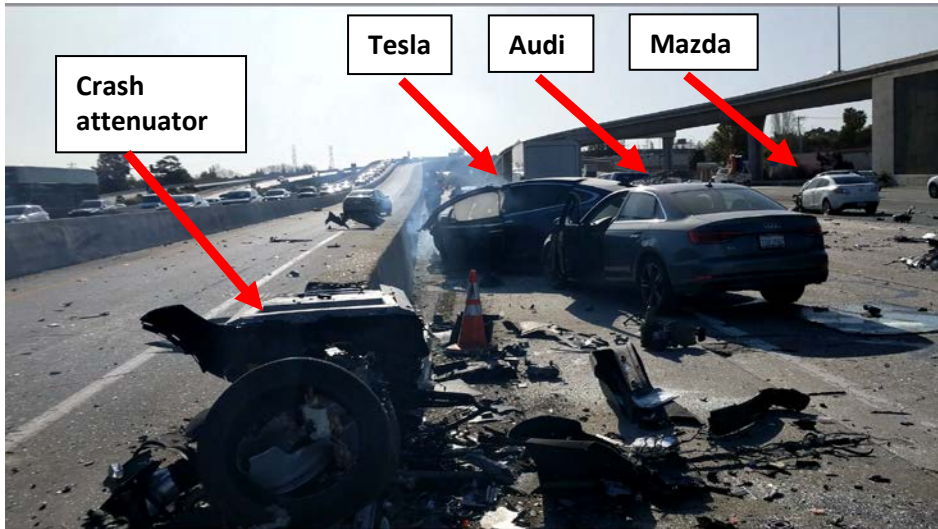
According to performance data downloaded from the vehicle, the driver was using the advanced driver assistance features traffic-aware cruise control and autosteer lane-keeping assistance, which Tesla refers to as “autopilot.” As the Tesla approached the paved gore area dividing the main travel lanes of US-101 from the SH-85 exit ramp, it moved to the left and entered the gore area.<sup>1</sup> The Tesla continued traveling through the gore area and struck a previously damaged crash attenuator at a speed of about 71 mph.<sup>2</sup> The crash attenuator was located at the end of a concrete median barrier. The speed limit on this area of roadway is 65 mph. Preliminary recorded data indicate that the traffic-aware cruise control speed was set to 75 mph at the time of the crash.<sup>3</sup> The impact rotated the Tesla counterclockwise and caused a separation of the front portion of the vehicle. The Tesla was involved in subsequent collisions with two other vehicles, a 2010 Mazda 3 and a 2017 Audi A4 (see figure 1).

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<sup>1</sup> A gore area is a triangular-shaped boundary created by white lines marking an area of pavement formed by the convergence or divergence of a mainline travel lane and an exit/entrance lane.

<sup>2</sup> (a) A crash attenuator is a device intended to reduce the damage to structures, vehicles, and motorists from a motor vehicle collision by absorbing the colliding vehicle’s kinetic energy. (b) The Tesla’s restraint control module was downloaded, and the speed at impact was recorded as 114 kilometers per hour (70.8 mph).

<sup>3</sup> Traffic-aware cruise control is an adaptive cruise control system that allows a set speed and a set following distance from a slower moving vehicle in front.



**Figure 1.** Southbound view of US-101 depicting Tesla, Audi, and Mazda vehicles at final rest. (Source: S. Engleman)

A preliminary review of the recorded performance data showed the following:

- The Autopilot system was engaged on four separate occasions during the 32-minute trip, including a continuous operation for the last 18 minutes 55 seconds prior to the crash.
- During the 18-minute 55-second segment, the vehicle provided two visual alerts and one auditory alert for the driver to place his hands on the steering wheel. These alerts were made more than 15 minutes prior to the crash.
- During the 60 seconds prior to the crash, the driver's hands were detected on the steering wheel on three separate occasions, for a total of 34 seconds; for the last 6 seconds prior to the crash, the vehicle did not detect the driver's hands on the steering wheel.
- At 8 seconds prior to the crash, the Tesla was following a lead vehicle and was traveling about 65 mph.
- At 7 seconds prior to the crash, the Tesla began a left steering movement while following a lead vehicle.
- At 4 seconds prior to the crash, the Tesla was no longer following a lead vehicle.
- At 3 seconds prior to the crash and up to the time of impact with the crash attenuator, the Tesla's speed increased from 62 to 70.8 mph, with no precrash braking or evasive steering movement detected.

During the collision sequence, the Tesla's 400-volt lithium-ion high-voltage battery was breached, and a postcrash fire ensued (see figure 2). The driver was found belted in his seat. Bystanders removed him from the vehicle before it was engulfed in fire. The driver was transported to a local hospital, where he died from his injuries. The driver of the Mazda sustained minor injuries, and the driver of the Audi was uninjured.

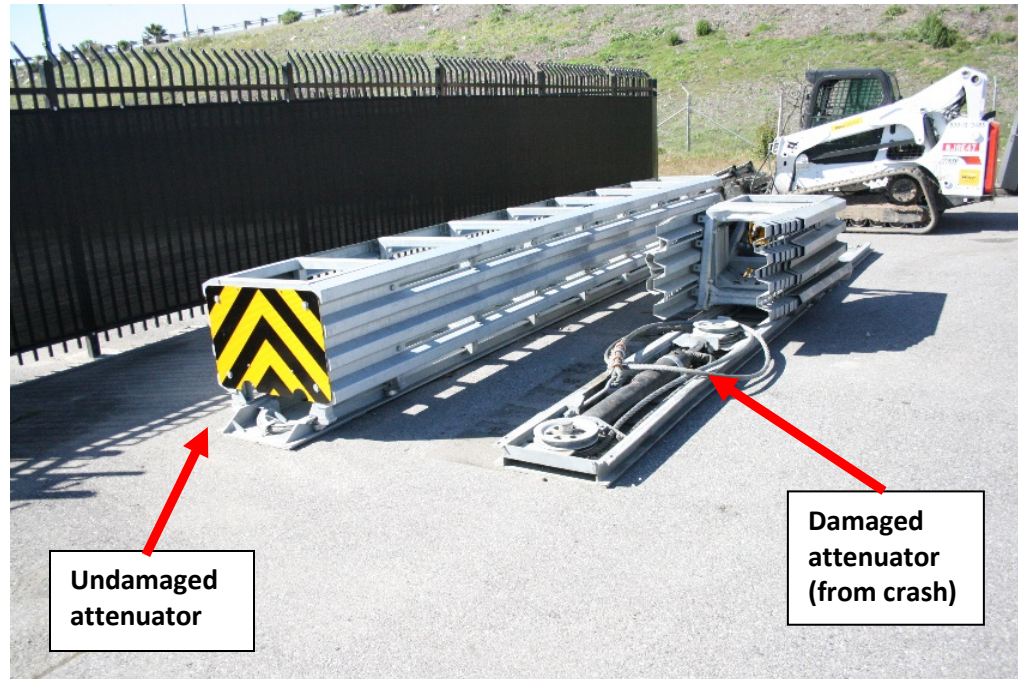


**Figure 2.** Northbound view of US-101 depicting Tesla postcrash fire (left) and remains of Tesla after initial fire was extinguished (right). (Source: S. Engleman)

The Mountain View Fire Department applied approximately 200 gallons of water and foam during a period of fewer than 10 minutes to extinguish fires involving the vehicle interior and the exposed portion of the high-voltage battery. Technical experts from Tesla responded to the scene to assist in assessing high-voltage hazards and fire safety. After being allowed to cool, the vehicle was transported with a fire engine escort to an impound lot in San Mateo. The highway was reopened at 3:09 p.m.

Around 4:30 p.m. that afternoon, at the impound lot, the Tesla battery emanated smoke and audible venting. The battery was monitored with a thermal imaging camera, but no active fire operations were conducted. On March 28, 5 days after the crash, the battery reignited. The San Mateo Fire Department responded and extinguished the fire.

The crash attenuator was an SCI smart cushion attenuator system, which was previously damaged on March 12, 2018, in a single-vehicle crash involving a 2010 Toyota Prius (see figure 3).



**Figure 3.** Undamaged attenuator (left) next to crash-damaged attenuator (right).

The NTSB continues to work with the California Highway Patrol and the California Department of Transportation to collect and analyze data, including all pertinent information relating to the vehicle operations and roadway configuration. All aspects of the crash remain under investigation as the NTSB determines the probable cause, with the intent of issuing safety recommendations to prevent similar crashes.