

Motor Vehicle Defect Petition to Recall All Tesla Vehicles Due to Sudden Unintended Acceleration

Mr. Jack Danielson
Executive Director
National Highway Traffic Safety Administration
1200 New Jersey Avenue SE, West Building
Washington, DC 20590

12 May 2023

Dear Executive Director Carlson,

On December 19, 2019, NHTSA received a petition from [REDACTED] requesting that the Agency "recall all Tesla Model S, Model X, and Model 3 vehicles produced from 2013 to the present" due to sudden unintended acceleration (SUA), citing 232 driver complaints to NHTSA, including 203 reported crashes. On January 13, 2020, NHTSA opened investigation DP 20-001 in response to this petition. The investigation was closed on January 8, 2021, stating:

"After reviewing the available data, ODI has not identified evidence that would support opening a defect investigation into SUA in the subject vehicles. In every instance in which event data was available for review by ODI, the evidence shows that SUA crashes in the complaints cited by the petitioner have been caused by pedal misapplication. There is no evidence of any fault in the accelerator pedal assemblies, motor control systems, or brake systems that has contributed to any of the cited incidents. There is no evidence of a design factor contributing to increased likelihood of pedal misapplication."

The purpose of this letter is to request that investigation DP 20-001 be re-opened because of new information, enclosed with this letter, that NHTSA investigators erred in ascribing the cause of these incidents to pedal misapplication. The enclosed paper shows that nearly all of these incidents may have been caused instead by a change in the analog-to-digital converter (ADC) calibration used when the accelerator pedal sensor outputs were digitized, which can make the digitized accelerator pedal sensor outputs increase to a maximum of 100% even though the analog accelerator pedal outputs are never changed because the accelerator pedal is not being pressed by the driver. This mechanism explains how sudden unintended acceleration can occur in all Tesla vehicles, with the accelerator pedal sensor data in both the EDR and the vehicle log increasing up to 100% pedal, even though the driver has never stepped on the accelerator pedal. It also explains why the drive motor torque is not limited by the torque monitor during sudden acceleration when it should be limited to zero if the accelerator pedal is not pressed. This is because the digitized pedal sensor outputs are increased up to a maximum of 100% even though the analog accelerator pedal outputs remain unchanged because the accelerator pedal is not being pressed by the driver.

The change in ADC calibration in this case is caused by a voltage dip on the "12V" power supply bus caused by an inrush current in the booster motor of the electronic power steering system while suddenly turning on as a result of the electronic power steering system requiring greater boosting force during low-speed turning maneuvers (which can

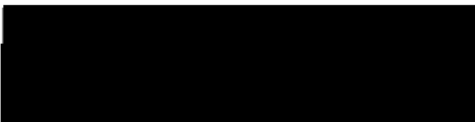
draw over 300 amperes temporarily). This voltage dip can cause a dip in the ADC calibration voltage that lasts for several hundred microseconds. If this voltage dip happens while the ADC is digitizing the calibration voltage, then the digitized ADC calibration voltage can decrease and remain at a lower voltage until another calibration is performed, which can be minutes later. A lower digital ADC calibration voltage results in higher digitized values for the two APP sensor outputs even though the analog values of the two APP sensor outputs do not change. The result is that the two APP sensor analog outputs, which remain unchanged at their unpressed values, are multiplied by a value of 1 to 6 while being digitized, which mimics in every way the changes produced in the two APP sensors by the driver stepping on the accelerator pedal. Therefore, the two APP sensor digital outputs pass every test performed subsequently on the two digitized APP sensor signals, creating no diagnostic test codes (i.e., alerts in Tesla's nomenclature) and creating non-zero pedal data that is stored in the EDR and the vehicle's data log, even though the accelerator pedal has not been pressed by the driver.

The enclosed paper proposes a simple test that can be done to prove or disprove the explanation provided. This test has not been done by the author because of the cost involved with acquiring the needed Tesla Model 3 inverter PWB. But this test can be performed easily by NHTSA investigators, which generates a strong motivation for re-opening investigation DP 20-001 on this topic. It must be remembered that NHTSA investigations are meant to gather further information about an alleged defect that can aid a decision about a defect, and not merely to decide that there is insufficient information to justify an investigation, in which case the request for an investigation is denied.

The time for NHTSA to respond to this request to re-open a previous investigation should be the same as for a request to open a new investigation. If you desire to contact me for any reason relevant to this letter, please use the email address given below.

Sincerely yours,


Ronald A. Belt


Encl: Paper entitled "Tesla Model 3 Susceptibility to Sudden Unintended Acceleration" by Ronald A. Belt, 26 pages, dated 1 May 2023.