DISASTER REPORT

Toyota Prius recalled over software glitch (2014)

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A. Describe the background behind the incident.

In the year 2014 incident of safety recall of 1.9million was filed in Toyota's (2013-2015) Prius and (2014-2017) Prius V hybrid model in the US. This problem occurred because of the programming error in hybrid control ECU software which may cause stalling and the engine power loss.

B. Describe the problem.

This problem was because of the software error the Prius and Prius V series vehicles and the problem is in the rare case the car faces the sudden stalling and the power loss in the engine, otherwise different warning lights will flash and the vehicle will switch to the failsafe mode.

C. Describe the cause and causes of the problem.

The cause of the problem was the vehicles that are recalled were equipped with one circuit call inverter. When there is any problem in a hybrid system of the car the inverter circuit should put the car into a fail-safe mode. Instead of that, the software defect results in higher thermal stress in the certain transistor of the inverter circuit which potentially damaged them. As a result, the engine of the car was getting low power which causes the car to stall while the car is in motion in rare circumstances, instead of flashing various warning lights and switch cars into the failsafe mode.

D. What would have prevented the problem?

This problem would have prevented if the software as well as hardware were tested with best test planes. Both should have gone through integration testing as well as boundary testing too, to come to a full understanding of the limit of temperature that transistor of this system can handle then I do not think this problem should have come in light.

E. Did this occur because a requirement was changed inappropriately? Justify your answer.

As per the document available, it is been concluded that they want two following features in their product.

1. They want their inverter to boost battery output voltage from 200 volts to as much as 500 volts when needed to power the motor.
2. By using the Algorithm, they adjusted the power to drive the wheels that were variously supplied by the engine and the electric motors.

F. Did this occur because the technology was rushed? Justify your answer.

Yeah, it seems that technology was in a rush because they want to launch the product which covers more distance with less power before anyone else.

G. Did this occur because the problem should have been caught by normal testing but was not? Justify your answer.

As I have earlier said if the testers had performed the boundary testing and integration testing then they have been caught the problem easily and if they have caught the problem earlier then compony has not gone through the process of reloading the software into the car system.

H. Did people pre-warn against the possibility of such a problem occurring? If so, what role did they have and why were their warnings ineffective. Justify your answer.

As per my knowledge, I don't think people were pre-warn against the possibility of such a problem occurring because if someone already knows then why would have they launched their product and above all why someone buys the product with this type of defect.

I. What role did software or electronic systems play in causing the disaster? Justify your answer.

I think, because of the software the electronic circuit got damaged, and the entire system collapse. It is a property of transistor that when you drive then too much heat you damage it and that exactly happened in this case software make transistor over hit and it got damaged and because of that engine was not getting enough power or the control circuit was not working perfectly and that is why the system goes into failsafe mode and displaying a various indication of the system fail.

J. Provide your references for the above information. Use an accepted bibliographic format.

- Read, Richard. "2012 - 2014 Toyota Prius V Recalled To Fix Software Glitch That Could Cause Stalling." The Car Connection, 15 July 2015, www.thecarconnection.com/news/1099136_2012--2014-toyota-prius-v-recalled-to-fix-software-glitch-that-could-cause-stalling.

- Albanesius, Chloe. "Toyota Recalls Prius Hybrids Over Software Glitch." *PCMAG*, PCMag, 12 Feb. 2014, www.pcmag.com/news/toyota-recalls-prius-hybrids-over-software-glitch.

- "Toyota Prius Recalled for Engine Stall Risk at High Speed." *Daily Hornet | Breaking News That Stings!*, 1 July 2020, www.dailyhornet.com/2020/toyota-prius-recalled-for-engine-stall-risk-at-high-speed/.

- "Toyota Recalls 625,000 Hybrids over Software Glitch." *BBC News*, BBC, 15 July 2015, www.bbc.com/news/business-33532673.

- Tabuchi, Hiroko, and Jaclyn Trop. "Toyota Recalls Newest Priuses Over Software." *The New York Times*, The New York Times, 12 Feb. 2014, www.nytimes.com/2014/02/13/business/international/toyota-issues-another-recall-for-hybrids-this-time-over-software-glitch.html?auth=link-dismiss-google1tap.

- "Toyota Recalls 1.9 Million Prius Hybrids to Fix Software Problem." *Los Angeles Times*, Los Angeles Times, 12 Feb. 2014, www.latimes.com/business/la-xpm-2014-feb-12-la-fi-hy-toyota-prius-recall-20140212-story.html.

- "Hybrid Electric Vehicle." *Wikipedia*, Wikimedia Foundation, 29 July 2020, www.en.wikipedia.org/wiki/Hybrid_electric_vehicle.

- "What Causes Damage to Transistors?" *Quora*, www.quora.com/What-causes-damage-to-transistors.

- Voelcker, John. "Toyota Prius Recall in 2014 Failed to Fix Problem, Lawsuit Says, May Have Cut Mileage." *Green Car Reports*, 26 Feb. 2018, www.greencarreports.com/news/1115453_toyota-prius-recall-in-2014-failed-to-fix-problem-lawsuit-says-may-have-cut-mileage.