

A Million Nissan Vehicles Recalled Due to Faulty Sensor

D'Angelo R. Woods
September 29, 2014
Howard University

What Happened

- ❖ Nearly 1 million vehicles from Japanese automaker Nissan were recalled earlier this year due to an airbag system defect that led to airbags not being deployed properly or at all
- ❖ The defect may have been caused by sensitive software just below the passenger seat

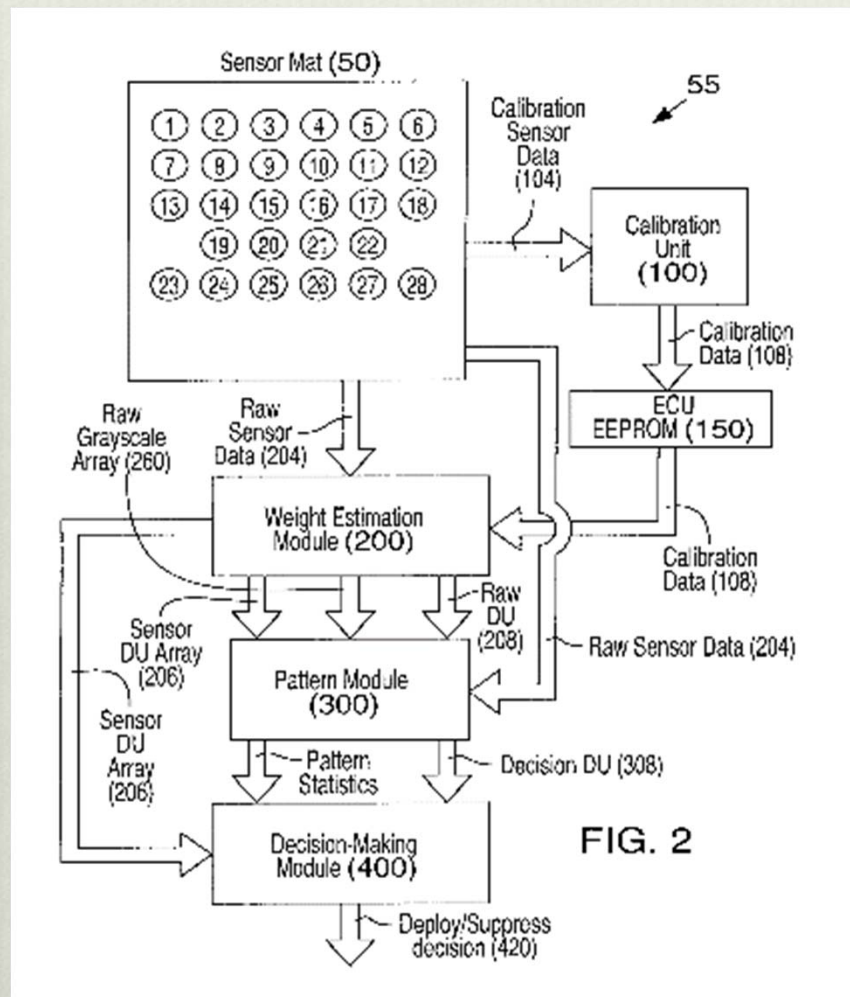
OCS and PODS

- ❖ Occupant Classification System (OCS) or Passive Occupant Detection System (PODS)
 - ❖ Software uses pressure-filled bladders and electronic control systems located underneath the seat to detect a passenger's weight
 - ❖ Sensor calibration unit
 - ❖ A scatter count is used to classify an occupant based on their seating position
 - ❖ If the threshold is set at 9 and the scatter count ≤ 9 , then the system classifies the occupant as a child
 - ❖ Sensors measure the person's weight and then send this information to the electronic control unit (ECU)
 - ❖ The ECU then outputs a signal to the airbag control unit and the instrument panel, which notifies the driver that the airbags are activated



Source: <http://www.delphi.com/manufacturers/auto/safety/passive/oc/pods/>

Major Components



- ❖ Calibration Unit (100)
- ❖ Weight Estimation Module (200)
- ❖ Pattern Module (300)
- ❖ Decision-Making Module (400)

Normal Functions and Operations

Passenger sits on seat

```
graph TD; A[Passenger sits on seat] --> B[Weight measured and sent to ECU]; B --> C[ECU activates airbag and warns driver];
```

Weight measured
and sent to ECU

ECU activates airbag
and warns driver

Potential Hazards

- ❖ Common behavior such as leaning against the door or sitting towards the front of the seat
- ❖ Distinguishing between a 5th percentile female (75 pounds) and a 3-year-old child seated in a forward-facing child seat (73 pounds)
- ❖ If OCS sensor logic is not set up to account for these anomalies...

Typical In-Seat Weights

Occupant Type	Typical Weight in Automobile Seat
5 th Percentile Female	75 pounds
6-Year-Old	65 pounds
3-Year-Old in Forward-Facing Car Seat (FFCS)	73 pounds

Potential Failure

- ❖ Adult is classified as a child due to how he or she is sitting in the seat
- ❖ Sensors will not send an activation signal to the airbag control unit
- ❖ Adult is unprotected should an accident occur

Conclusion

- ❖ Not the first incident of occupant misclassification
 - ❖ Hyundai recalled over 5,000 vehicles last year for the same issue
- ❖ Nissan has since updated the classification software used for owners of the affected vehicles
- ❖ As more and more vehicles adopt this technology, it becomes even more important to mitigate the hazards surrounding the occupant classification system
- ❖ Includes refining the OCS software algorithm that differentiates between adult and child weight
 - ❖ Improving the sensors ability to discern a person's seating position