Preliminary Evaluation Closing Report

SUBJECT: Steering Wander/Drift

EA No.: PE10-008 **OPENED DATE:** February 18, 2010 **CLOSED DATE**: May 4, 2011

SUBJECT VEHICLES: Model year (MY) 2009 through 2010 Toyota Corolla and Matrix.

Figure 1. MY 2010 Toyota Corolla LE.

BASIS: On February 18, 2010, the Office of Defects Investigation (ODI) opened Preliminary Evaluation PE10-008 to investigate complaints of steering wander or drift in MY 2009 through 2010 Toyota Corolla vehicles. The majority of complaints expressed concerns with steering feel around neutral at highway speeds. When the investigation was opened, ODI was aware of eight complaints alleging steering performance as a potential factor in a crash.

DESCRIPTION OF COMPONENT: Toyota introduced electric power steering (EPS) assist in Corolla vehicles in MY 2009. The EPS system uses an electric motor and reduction mechanism to provide assist torque to the steering shaft. The motor is controlled by an electronic control unit (ECU) which calculates the appropriate amount of assist to provide based on vehicle speed, steering angle and steering torque. Toyota designed the Corolla steering to have a slightly stiff on-center steering feel.

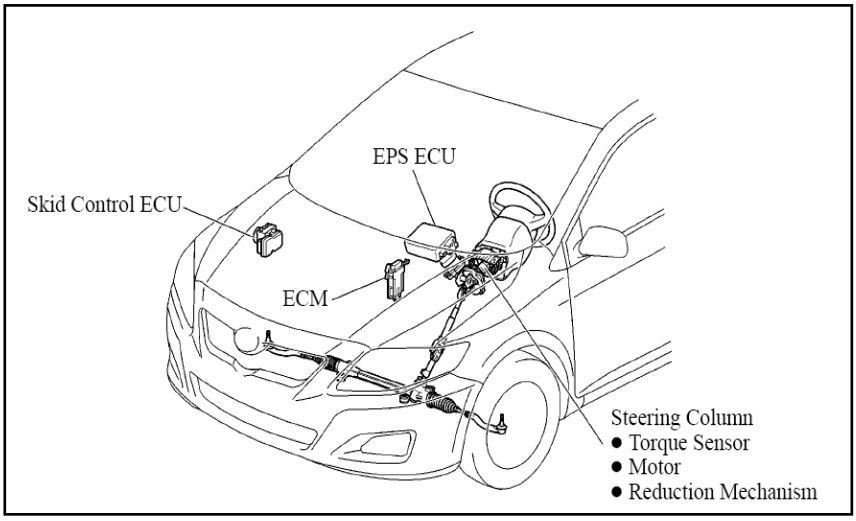

Figure 2. Toyota Corolla EPS components.

ALLEDGED DEFECT: The alleged defect condition is not related to a component failure. The alleged defect is driver related "preference" for a less sensitive on-center steering feel. Approximately 25 percent of drivers interviewed by ODI related the condition to the feeling of driving in a strong crosswind. Other drivers expressed concerns with the attention required to maintain the desired vehicle heading, which increased driver fatigue on longer trips.

VEHICLE POPULATION:

Model	Model Year		Grand Total
	2009	2010	
Corolla	364,777	307,420	672,197
Matrix	58,240	19,248	77,488
Total	423,017	326,668	749,685

Table 1. Subject vehicle sales by model and model year.

FAILURE REPORT SUMMARY: ODI has identified 918 unique complaints and 4,118 Toyota warranty claims relating to steering wander, drift or pulling. The complaint rate is 122 per 100,000 vehicles and the warranty claim rate is 0.55 percent.

Problem Experience	PE Open	PE Close		
	ODI	ODI	Toyota	Total
Owner Reports / Field Reports	168	539	529	918
Claims/Lawsuits	0	-	-	-
Crashes/Injury	8/11	2/0	1/0	2/0
Fatal Incidents	0	0	0	0

Table 2. Problem experience.

ODI reviewed eight (8) reports alleging that steering wander/drift had been mentioned or diagnosed prior to a crash and where the owner said the crash occurred in part because of the steering. This review excluded five of these crashes, because other factors were identified as more likely contributors. These include icy road conditions, striking a deer, steering while braking in a skid and an unintended acceleration claim. The remaining two incidents would appear to be related to a steering over-correction and may be related to the interaction between the driver and the vehicle steering calibration.

TECHNICAL SERVICE BULLETIN: In June 2010, Toyota issued a technical service bulletin (**T-SB-0140-10, "Steering On-Center Feel"**) to provide dealers with service repair for consumers expressing dissatisfaction with on-center steering feel in MY 2009 and 2010 Corolla vehicles. The bulletin repair involves a new steering ECU retuned to provide an alternative steering feel.

TESTING: The NHTSA Vehicle Research Test Center (VRTC) assisted ODI in conducting vehicle tests[1] to assess the performance of the subject electric power steering system and the allegations contained in the consumer complaints. A complaint vehicle was acquired for testing (VOQ No. 10279928), a MY 2010 Corolla with slightly less than 11,000 miles on the odometer. The owner complaint reads, "Vehicle is unstable at freeway speeds, wanders and drifts, needs to be 'actively driven' in order to track straight, very tiring on long drives. Does not instill confidence that vehicle could be controlled during an emergency swerve." The vehicle was subjected to a series of tests to assess baseline steering effort and general handling. In addition, a subjective study was designed to assess the human factors aspects of the alleged defect. This involved a study of 16 randomly chosen

[1] Full test results can be found in Memorandum Report PE10-008 "Toyota Corolla Electric Power Steering"

driver subjects who drove the vehicle under similar conditions on a circuit that included mostly highway driving at speeds greater than 50 mph.

The subjective driving tests ODI/VRTC conducted using 16 subjects found the following:

1) All drivers said that the vehicle drove normally and felt safe;
2) Of eight drivers who drove with both the original ECU and new Service part ECU released in June 2010, two were able to discern a difference in the steering the remaining six could not;
3) Although no changes other than steering ECUs were made to the test vehicle, three drivers mentioned that they thought the brake performance had changed between test sessions; and
4) Fourteen of 16 drivers said that the Corolla steering felt the same or better than other cars they had driven.

Based on all data gathered the revised steering ECU would make the vehicle feel less responsive or sensitive to some drivers. It should be noted that some of the 16 subject drivers preferred the original steering feel (more sensitive).

REASON FOR CLOSING: The alleged defect does not involve a component failure or performance concern that causes or contributes to a loss of vehicles control. The alleged crashes are not associated with a system fault/failure resulting in a loss of vehicle control, but instead involve concerns with how the steering performed in some unusual circumstance, such as the vehicle's dynamic response to steering input in a steering maneuver to avoid an object. The complaints reviewed by ODI are related to concerns about steering feel. Toyota has released an ECU with a re-tuned steering on-center feel to address concerns from customers unhappy with the feel of the base design.

Accordingly, this investigation is closed. The closing of this investigation does not constitute a finding by NHTSA that a safety-related defect does not exist. The agency will continue to monitor complaints and other information relating to the alleged defect in the subject vehicles and take further action in the future if warranted.

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