Request 13

Furnish Ford's assessment of the alleged defect in the subject vehicles, including:

a. The causal or contributory factor(s);
b. The failure mechanism(s);
c. The failure mode(s);
d. The risk to motor vehicle safety that it poses;
e. What warnings, if any, the operator and the other persons both inside and outside the vehicle would have that the alleged defect was occurring, or subject component was malfunctioning; and
f. The reports included with this inquiry.

Answer

The Office of Defects Investigation (ODI) of the National Highway Traffic Safety Administration (NHTSA) opened this Recall Query based on eighty-six (86) Vehicle Owner Questionnaire (VOQ) reports of unexpected, unintended transmission downshifting in certain model year (MY) 2014 Ford F-150 vehicles. Ford has conducted an investigation associated with this subject, including the cause of these reports, the circumstances under which they occurred, and the anticipated performance of the subject vehicles and subject components related to these reports.

Ford's response addresses the subject component of this investigation, which is the transmission and all subsequent control systems related to the transmission (including, but not limited to, the molded lead frame and the Output Speed Sensor). On the subject vehicles, the Powertrain Control Module (PCM) controls the electronic functions of this transmission. A plastic molded lead frame is bolted to the main control assembly. The lead frame contains the Turbine Shaft Speed (TSS), Output Shaft Speed (OSS), Transmission Fluid Temperature (TFT) and Transmission Range (TR) sensors. The Transmission Electronic Control System is described in detail in the workshop manual included in the file "RQ24-005 Request 13 – Workshop Manual."

Investigation has found that the primary causes for the majority of the reported unexpected transmission downshifts relate to the molded lead frame (base part number 7G276), and the main control assembly (base part number 7A100). Drivers report symptoms of unexpected downshifting to 5th, 4th, 3rd, 2nd, or 1st gear, unexpected upshifting, harsh shifting, vehicle "locking" into a single gear (limp home mode), clunk sounds, engine revving, engine or wrench light illuminating, speedometer malfunction, bucking/jerking and others.

The root cause of the lead frame failures for the original Field Service Action (FSA) 16S19 (NHTSA Recall Number 16V-248) recall population was identified to be solder joint cracks on the OSS circuit board. An internal investigation determined an equipment maintenance issue at the lead frame supplier attributed to fatigue cracking of the solder joint on the OSS circuit board for lead frames produced between August 4, 2011, and December 1, 2011. During this time interval, the potting material was changed from ES100 to Hysol E7038 to meet Ford's design rule restricting the use of halides. Residue of the Hysol E7038 could build up, which obstructed the dispensing system and changed the properties of the epoxy.

Unlike the lead frame solder defect identified in FSA 16S19, a predominant root cause for the intermittent OSS signal has not been identified and was not identified in 19S07. Ongoing warranty parts analysis from both within and outside the original 16S19 FSA population has identified other contributing factors leading to an intermittent OSS signal including contamination, power short, corrosion, sensor and swaging concerns. These were identified following component inspection, bench testing and in-vehicle evaluation.

In response to increased lead frame warranty, the lead frame supplier implemented improved solder process parameters and quality controls on February 15, 2013 (during 2013 model year). To further improve supplier quality related to the integrity of the solder joint, Ford made a change to the potting material on the AL3P-7G276-AG version of the lead frame on October 1, 2013 (late 2013/early 2014 model year).

Some vehicles may experience an intermittent loss of the transmission OSS sensor signal to the PCM, potentially resulting in a temporary, unintended downshift into first gear. However, by design, the complete loss of the OSS signal will always set a fault code and result in 5th gear operation if the vehicle was in 4/5/6th gears when the fault occurred, or 3rd gear operation if the vehicle was in 1/2/3rd gears; none of which would be expected to result in wheel slip.

Depending on the vehicle speed at the time of an intermittent OSS failure, an abrupt transmission downshift to first gear could occur. Due in part to the ongoing improvements described above, these abrupt transmission downshifts are occurring at a lower rate in the subject population as compared to previous model years. As described in Ford's Part 573 submissions for the subject recalls, a downshift to first gear without warning could result in a loss of vehicle control, increasing the risk of a crash.

A downshift to first gear may illuminate a Malfunction Indicator Light (MIL). In some cases, the OSS signal could recover while driving and the vehicle will resume normal function; in other cases, the vehicle may need to be stopped and restarted to regain normal transmission operation.

As of April 08, 2024, Ford is aware of 300 warranty reports, 96 field reports and 124 customer complaints, corresponding to 482 vehicles in the US and US territories received from March 24, 2014, to March 29, 2024, related to unexpected transmission downshifting. Of these reports, 40 vehicles had alleged rear wheel lock-up and/or loss of vehicle control.

Ford completed a thorough review of MY 2014 Ford F-150 vehicle customer and field claims related to the alleged defect of unexpected, unintended transmission downshifting and have summarized the findings according to the following categories:

Category	Definition
A1	Wheel Lock-Up due to Sudden (Unexpected) Downshift
A2	Sudden (Unexpected) Transmission Downshift
B1	Wheel Lock Up Unknown Cause
B2	Harsh Downshift and Other Downshifting Issues

Ford reviewed the eighty-six (86) VOQs provided by NHTSA and found that thirty (30) claims were responsive to the A1 category, thirty-seven (37) claims were responsive to the A2 category, and six (6) claims were responsive to the B2 category. The thirteen (13) remaining VOQs were not considered responsive since either their symptoms did not match the focus of this investigation, or the root cause was related to a component(s) not included in the list of potential subject components.