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April 7, 2017**Roar File No.: 16R11004****Attention: Mr. Theodore P. Charney**

RE: Dual-Clutch Transmission Failure
File Number: CV-15-539855-00CP
Claimant: Ms. Rebecca Romeo
Loss Vehicle: Ford Fiesta, Ford Focus Vehicles

Dear Mr. Charney:

As per your correspondence of March 15, 2017, please find this letter as an addendum to the Roar Engineering Report dated November 29, 2016 (the "Roar Report"). At the request of your firm, three (3) affidavits were reviewed. These included the affidavit of Mr. Jack Morais of Rimkus Consulting Group (the "Rimkus Affidavit"), the affidavit of Mr. Paul Taylor of Exponent Failure Analysis Associates (the "Exponent Affidavit"), and the affidavit of Mr. Matthew Fyie of Ford Motor Company (the "Ford Affidavit"). The following sections outline the opinion of the author with respect to the content of these affidavits, the information on which the affidavits are based, and the approach taken by their authors.

THE RIMKUS AFFIDAVIT

The Roar Report endeavours to describe failure modes associated with specific components in the system as part of an engineering failure investigation to determine whether these vehicles are repairable. The Rimkus Affidavit, on the other hand, presents a description of the components and an evaluation of Ford's actions in response to the complaints, as well as a possible explanation of the design stage at which these design

problems should have been uncovered and remedied. The Rimkus Affidavit does not contain an engineering failure analysis. Because it is not an engineering failure analysis, the Rimkus Affidavit does not identify a specific defect in the components responsible for the failures described by the complainants. The Rimkus Affidavit, therefore, does not comment on the reparability of this defect. The Rimkus Affidavit made the following preliminary conclusions:

- Ford marketed the Dual Clutch Transmission (DCT) as having the fuel economy of a manual transmission but the convenience and ease of a premium automatic transmission. They subsequently released documentation outlining the differences between a DCT and a typical automatic transmission.
- All Ford Fiesta and Ford Focus vehicles equipped with the DPS6 Powershift DCT can be described as “defective”.
- Vehicles equipped with the DCT were at “increased risk for potential accidents” due to the defective gearboxes.

In general, the author agrees with the conclusions presented in the Rimkus Affidavit. The Ford Powershift DCT equipped Fiesta (MY 2011 – 2017) and Focus (MY 2012 – 2017) vehicles appear to have been marketed as “automatic” transmissions, while marked differences exist between a DCT and a traditional hydraulic automatic transmission. The Rimkus Affidavit, beginning on Page 5, describes the difference between a “Typical Automatic Transmission” and the “Ford Powershift Transmission/Transaxle”. This section is in agreement with Section 4.0 of the Roar Report.

The author agrees with the two additional conclusions made in the Rimkus Affidavit, specifically that all Ford Fiesta and Focus vehicles equipped with the DPS6 Powershift DCT are “defective”, and that these vehicles are at an increased risk for potential collisions. However, the Rimkus Affidavit has not identified the component or components which are the root cause of the defective nature of the transmission. Further, the Rimkus Affidavit does not outline any specific reasons why the affected Ford Fiesta and Focus

vehicles were at an elevated collision risk, only stating "vehicles with the Powershift transmission/gearbox were at risk for potential accidents in the vehicles or potentially causing other accidents due to the defects experienced by the gearbox".

Prior to the writing of the initial Roar Report, Roar Engineering was provided a database which contained 1629 customer complaints. To date, Roar Engineering has been provided an additional 332 customer complaints, for a total of 1961 Ford Fiesta and Ford Focus vehicles equipped with a Dual Clutch Transmission. Of these vehicles, at least 51 were involved in collisions, reportedly as a result of poor transmission performance.

Analysis of this data assisted the author in understanding the nature of the complaints, which components were involved in the transmission complaints, and the nature of their failures. The methodology undertaken was similar to the Design Failure Mode & Effects Analysis (DFMEA) discussed beginning on Page 12 of the Rimkus Affidavit. Given how much information was provided, the authors are confident that the root cause components were correctly identified. It is understood that the author of the Rimkus Affidavit was provided only five (5) such customer complaints. This difference in sample size may be one reason why the Rimkus Affidavit does not identify the root cause components, and therefore, does not present a conclusion regarding repairability.

The conclusions drawn in the initial Roar Report were obtained by an engineering failure analysis involving over 1900 reportedly malfunctioning vehicles. The author of the Rimkus Affidavit was not provided with nearly this many reported malfunctions, nor did it contain an engineering failure analysis. As such, the Rimkus Affidavit does not conclude which components are involved in the failure, and therefore, does not comment on repairability.

THE EXPONENT AFFIDAVIT

The author of the Exponent Affidavit was asked by Ford Motor Company to explain the functioning of transmission components and problems that can affect driveability, discuss the considerations and resources available to diagnose transmission issues, and evaluate what component is most commonly repaired / replaced.

The Exponent Affidavit describes the transmission as a "PowerShift transmission", and correctly identifies that the transmissions designed to fit the Ford Fiesta vehicles are not interchangeable with those designed to fit the Ford Focus. While these transmissions are certainly not identical, the internal components and internal function of those components are identical. The aluminium housings in Figure 1 of the Exponent Affidavit are largely the same, with somewhat different mounting locations to facilitate use in Fiesta / Focus vehicles. Figure 2 of the Exponent Affidavit shows the opposite side of the transmission, which is nearly identical. Therefore, in the context of mechanical function and failure modes, the DPS6 transmissions installed in Fiesta and Focus vehicles are the same.

The Transmission Control Module (TCM) function is described in the Exponent Affidavit. Its author correctly describes the function of the TCM relative to the rest of the mechanical workings of the transmission. It states "Adaptive learning is an important feature of the DPS6 system, and changes in driveability can result from the adaptive learning process". This statement is consistent with the Roar Report, in which the author states that problems with the on-the-fly adaptive learning process (or lack thereof) contribute to the driveability and safety issues experienced by the more than 1900 complainants. The Exponent Affidavit goes on to state that "the engagement of the clutch, if too abrupt, will cause shuddering and a jerky fore-aft motion." This again is in complete agreement with the Roar Report.

With respect to transmission problems, the Exponent Affidavit states that "not all transmission problems are the same; there are multiple causes, symptoms and repairs". The Exponent Affidavit goes on to evaluate which component in the transmission was identified as the part responsible for the failure, the so-called "causal part". Though in

general, transmission problems do require an individual assessment to determine the specific failed component, the analysis presented in the Exponent Affidavit clearly shows that, by far, the dual clutch assembly represents the bulk of the issues. The TCM, while a distant second, accounts for many of the other complaints. These two issues (the issues outlined in the Roar Report) represent the cause of between 75 – 90% of the warranty repairs reported. Figure 20 of the Exponent Affidavit is reproduced below as Figure 1. Figure 21 is similar.

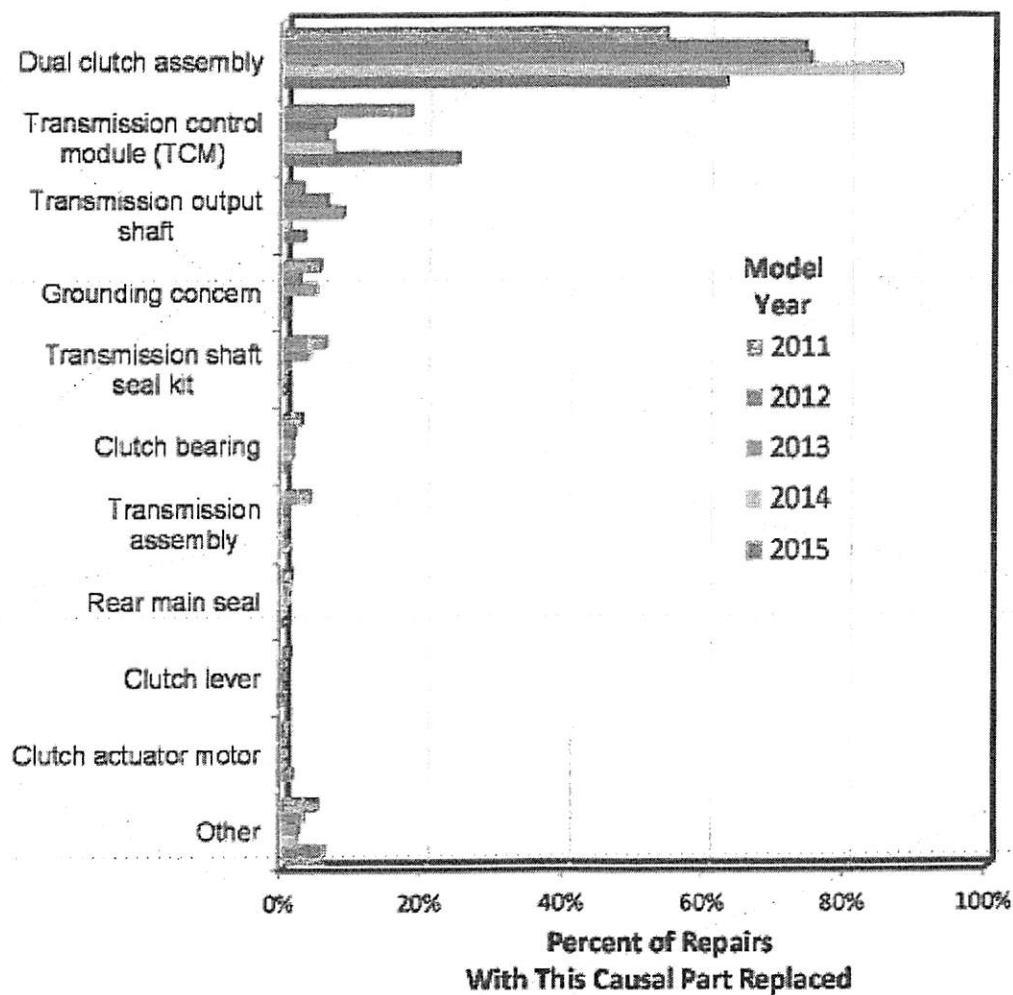


Figure 1: Reproduction of the Exponent Affidavit Figure 20

The Exponent Affidavit concludes that there is “no unique or common fault, symptom, or fix that can address all reported transmission problems”. While this is true of a transmission fault in general, the data reported on in the Ford warranty database clearly shows that the bulk of the issues are inclusive of only the dual clutch assembly and the TCM. These components and their failure modes have been outlined in the Roar Report. No evidence was included in the Exponent Affidavit that contradicts these previous findings.

THE FORD AFFIDAVIT

The Ford Affidavit outlines the problems reported by customers related to their DPS6 dual clutch transmissions, the analyses conducted by Ford, and the actions taken by Ford to remedy these problems. The problems outlined within the Ford Affidavit are common to both the Fiesta and Focus vehicles, and the transmissions equipped in both vehicles are referred to as “the DPS6 transmission” throughout the Ford Affidavit.

The reported issues were summarized into three categories: Shudder from oil contamination, shudder due to dry friction material characteristics, and TCM issues. In general, these failure modes are consistent with the findings in the Roar Report, specifically the oil contamination and TCM issues.

The dry friction material characteristics described include a property known as “its inherent negative damping (“self-excitation”) characteristic”. This characteristic means that, when a vibration is introduced into the system, such as when the transmission shifts gears, the system is unable to dissipate that vibration. In fact, the system amplifies this vibration (hence the term “self-excitation”) and this vibration will continue until acted upon by an external force. This clutch material, known as B8080, was reportedly found to be “less effective in mitigating the shudder and vibration felt when the clutch is engaged”. This is consistent with the symptoms reported by the complainants.

It was reported that the clutch materials were changed on Fiesta vehicles (changed to RCF10 in October, 2014) and Focus Vehicles (changed to B8040 in October, 2015). The

Ford Affidavit indicates that the new clutch material changes “have fully addressed the issue of poor shift quality and transmission launch performance issues in the DPS6 transmissions”. However, the database of customer complaints provided to Roar Engineering includes vehicles that were manufactured after these reported changes were implemented. Further, complainants who received new dual clutch assemblies as a part of their warranty repairs confirm that the issue remains after the work was completed. This indicates that the issue is not “fully addressed”.

The Ford Affidavit outlines issues within the TCM which relate more to the complete loss of transmission function, including the cracking of a solder joint which results in a “loss of communication and transmission function”. These issues were addressed by making changes not only to the chips themselves which were soldered, but to the software within the TCM which alert the vehicle to an impending issue. As discussed in the previous section, however, the TCM issues represent only a small percentage of the overall issues, which customers state persist even after updated TCMs have been installed in their vehicles.

It is stated that “numerous hardware design changes” further distinguish the Fiesta and Focus vehicles with the DPS6 transmission. It is assumed by the author that the Ford Affidavit is suggesting that these hardware changes mean the Fiesta DPS6 transmission is materially different from the Focus DPS6 transmission. However, the list of hardware changes does not distinguish for which vehicle the transmission is destined. It is titled simply “DPS6 Hardware Changes (Irapuato) 2011 – 2016”. As discussed above, and in the Roar Report, the DPS6 Transmissions installed in the subject Fiesta and Focus vehicles are materially the same, and these hardware changes appear to apply to both vehicles, as would be expected.

There is no mention in the Ford Affidavit with respect to on-the-fly adaptive learning. The adaptive learning procedures discussed in all Technical Service Bulletins (TSBs) and Customer Service Programs (CSPs) are undertaken at the dealer level. As discussed in the Roar Report, it is believed that these vehicles are either not capable of learning on-the-fly, or the system for learning on-the-fly is inadequate. Interestingly, the Ford Affidavit

states that approximately two software and calibration updates per year have been released to improve the performance of the DPS6 transmission and to resolve customer complaints. Though not explicit, the existence of so many software updates suggest that there might be an on-the-fly adaptive learning procedure which is simply not functioning at a level satisfactory to Ford's customers.

The Ford Affidavit comments on the safety implications of a transmission failure similar to those reported by Ford's customers. Related to clutch contamination and shudder, it states that "they do not present a safety concern". The author disagrees. As stated in the Roar Report, an intermittent performance issue can manifest itself as a safety issue. 51 of the complainants in the provided database experienced collisions as a result of the poor performance of their DPS6 transmission. This does not include near-misses, which the author expects would be numerous.

Many decisions facing a driver are made with the assumption that their driver action will result in vehicle motion at a previously understood rate. This means that, if a driver decides to cross through an intersection, for example, the decision is made based on that driver's understanding of how quickly their vehicle can accelerate relative to when the accelerator pedal is pressed. If the vehicle fails to deliver this performance, a collision could occur where one would otherwise not have.

Further, the Ford Affidavit indicates that, in the case of a complete transmission failure (no power condition), that the power steering, power braking, and electrical systems will continue to function, suggesting that these systems in and of themselves are sufficient to eliminate the risk of a collision and, therefore, of an injury. This is simply not the case. A vehicle that instantaneously loses power while travelling on a busy roadway is in very real danger of being struck. Having no ability to accelerate toward safety, or to maintain a safe speed relative to other traffic is a very real hazard. The author has investigated a number of collisions involving vehicles which lost power, some of which resulted in fatalities. To understate the severity of a vehicle instantaneously losing power on a busy roadway is a mistake.

Based on a review of the three provided affidavits, all three authors have identified issues with the dual clutch assembly and the TCM which result in malfunctions consistent with the over 1900 complainants. These identified issues are consistent with those outlined in the Roar Report. All documents with the exception of the Ford Affidavit correctly outline the safety risks associated with a transmission malfunction, the gravity of which cannot be understated.

Sincerely,

ROAR ENGINEERING INC.



**Darryl W. Schnarr, P.Eng.
Forensic Engineer and
Accident Reconstruction Manager**

