573 Defect Information Report for Recall 174

Attachment A

AMENDED on April 18, 2018

Chronology of events leading up to the defect decision:

- In February 2012, HMA was notified of a collision involving a 2011 Hyundai Sonata vehicle in which an allegation of AAS non-deployment was made. In June 2012, HMA inspected the vehicle and found no crash event recorded. HMA communicated with the supplier, ZF TRW, and enlisted its assistance and explanation. Further inspection of the ACU indicated EOS inside the unit's ASIC, which, at that time, was attributed to numerous aftermarket accessories installed in the vehicle.

- In May 2015, HMA was notified of a collision involving a 2011 Hyundai Sonata in which a similar allegation of AAS non-deployment was made. In October 2015, HMA inspected the vehicle. The ACU was non-communicative. Subsequent analysis by ZF TRW indicated internal damage potentially caused by EOS. HMA conducted a U.S. marketplace search of incidents of similar nature and circumstance, but no incidents other than the two that HMA received in February 2012 and May 2015 were identified. HMA then began monitoring for specific crash events containing similar facts and circumstances as the two vehicles identified so far.

- Between July and November 2016, HMA received two additional reports of collisions involving 2011 Hyundai Sonata vehicles in which similar allegations of AAS non-deployment were made. HMA began to reassess its prior analysis. HMA again enlisted the assistance of ZF TRW to investigate the ACU's recovered from the incident vehicles. ZF TRW confirmed the recovered ACU from one of the vehicles as being damaged internally potentially by EOS. As of the date of this filing, the results of ZF TRW's inspection of the recovered ACU from the remaining vehicle are still pending. Furthermore, Hyundai Motor Company ("HMC") determined, upon examination of the unique facts and circumstances associated with each incident, that it was possible that AAS deployment was not warranted.

- HMA's investigation was ongoing when, in November 2017, NHTSA's Office of Defects Investigation ("ODI") contacted HMA to obtain follow-up information in connection with one of the four vehicles under investigation. HMA responded to ODI's request and continued analysis of all available information surrounding each incident. During this time period, ODI and HMA continued to communicate and exchange information.

- In December 2017, HMA engaged a third-party engineering firm to study and analyze the facts and circumstances surrounding its investigation and reassessment.

- On February 21, 2018, Hyundai met with ZF TRW to discuss its reassessment. HMA and ZF TRW noted that the circumstances associated with this defect mechanism bore similarities to those related to recall campaign 16V-668, where EOS appeared to be a root cause of airbag non-deployment in significant frontal crashes in certain Fiat Chrysler vehicles. ZF TRW asserted that EOS

on the ACU could be caused by negative transients originating from certain vehicle components, such as the wire harness connecting the ACU to the frontal crash sensors, and could be prevented by circuit protection installed in ACU's used by later model year (2013+) Hyundai Sonatas. On February 22, 2018, based on information received from known incidents, HMA convened its Technical Committee with a recommendation to conduct a safety recall on model year 2011 Hyundai Sonata vehicles, while continuing its investigation into potential causes of EOS and its effect on AAS deployment.

- HMA contacted ODI and requested an in-person discussion at NHTSA headquarters in Washington, D.C. On March 9, 2018, HMA met with ODI to discuss the facts and data known to date, the foundation for HMA's recall scope at the time of filing its Part 573 report, information and tentative conclusions reached by HMA's third-party engineering firm, and HMA's best understanding of the defect mechanism, which consisted of the tentative conclusion that the root cause of the failure is likely to involve a component/equipment issue (as opposed to a vehicle systems issue). This conclusion is based on the relative susceptibility of the subject ACU to EOS due to the lack of Schottky diodes, a feature included in subsequent ACU versions provided by ZF TRW starting with model year 2013 and later Hyundai Sonata and Sonata Hybrid vehicles.

- HMA proposed an accelerated, 30-day plan to conduct crash testing with the intent to replicate the EOS mechanism in the subject ACU, identify its source, and study its effect on AAS deployment in high-energy frontal collisions. NHTSA ODI concurred with HMA's proposal.

- Between March 19, 2018 and March 28, 2018, HMA conducted seven crash tests developed by both HMC R&D and HMA's third-party engineering firm. Representatives from NHTSA were in attendance at the crash testing. During this time, HMA and NHTSA communicated regularly on status, tentative views, and next steps. Hyundai was able to replicate EOS damage to the ACU in three of the seven crash tests, with at least one of the confirmed EOS events resulting in the inability of the AAS to deploy. Of the three crash tests that produced ACU's with evident EOS damage, Hyundai observed wire harness damage in two of these tests. There was no observed vehicle abnormality that could have caused EOS in the third test.

- On April 3, 2018, HMA and NHTSA ODI discussed the results and tentative conclusions arising from Hyundai's crash tests, along with all other information available to both HMA and NHTSA to date.

- On April 11-12, 2018, Hyundai, NHTSA, and ZF TRW representatives analyzed three ACUs from the HMA crash testing vehicles at ZF TRW Global Electronics Headquarters in Farmington Hills, Michigan. The analysis showed that, in all three ACUs, an internal electrical short occurred on the 5-volt VCC line of the DS84 ASIC. One of the three ACUs contained visible evidence of EOS.

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- On April 18, 2018, based on an analysis of all information to date, HMA reconvened its Technical Committee and decided to expand its safety recall scope to include all model year Sonata and Sonata Hybrid vehicles equipped with ACUs that do not contain Schottky diode circuit protection.

- As of the date of this filing, Hyundai is aware of four incidents in the U.S. market and one incident in the Canadian market alleging the subject condition. EOS was observed inside the ACUs involved in three of these crashes. Hyundai continues to actively investigate the fourth and fifth incidents.