EA96-006 AN "Park to Reverse" Overview

PE opened 06/23/95
EA opened 05/31/96

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Complaint Overview

Model Year	Complaints (US)	Population (A500)	Rate / 100,000
1991	36	55,596	64.8
1992	67	67,411	99.4
Total	103	123,007	83.7

* Two VIN's remain unknown (VOQ only) and Two VIN's are for Canadian built vehicles

Trend Analysis.

All VOQ analysis – Competitive Overview (Chart)
Dakota "Noise" level slightly higher than competitive
Subject year Dakota rate an order of magnitude greater than competitive

Complaint Vehicles

Date of Complaint (chart)
Highest complaints after EA date (28 within 6 months)
Only 5 complaints within 6 months of PE opening

Age of Complaint at Complaint Date (table)
A small number of complaints (18 total, 6-'91, 12-'92) are obviously "aged" and likely the result of publicity.

Sales Codes – DGN – A500 Transmission (Table – List by MY)
Calculated for the complaint vehicle population the percentage of representation for each vehicle sales code and compared it to the population rate for the same sales codes.
No other codes seem significant.

State Accident data – Prepared by Failure Analysis. (Draft Analysis)

Accident data collected from 17 States which keep such data.

PRO
Shows Dakota in middle of the pack

CON
Only lists 15 "crashes in which driverless vehicles run away backwards." For all of 1987-1995 Dakotas.
A number of crashes in the complaint database clearly indicate that no Police report was filed.
Confidence bands are only against four States with reliable data.

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NHTSA (Shadle) Theory Development

Early Focus

- NHTSA originally was looking for higher shift force peaks to occur during the reverse to park shift, that would cause an operator to stop "thinking they had obtained park"
- NHTSA requested all drawings associated with steering column and controls linkages. All design changes were reviewed and established as unrelated.
- Chrysler conducted testing. Successfully showed through testing that no "peak" forces exist in the shift from Reverse to Park
- Shift Forces Lift approximately 3.25 lbs
  Rotation approximately 5.5 lbs (lowest average force in the peer group)

Current NHTSA Hypothesis:

The high rate of complaint for the subject vehicles can be explained as follows:

- *The flat on the rooster comb (inner manual lever) is a place where an operator can mistakenly place the shift lever while shifting to park with the engine running.*
  NHTSA has assumed that all operators of Dakota vehicles have the same propensity for placing the shift lever on the flat spot in the rooster comb. Only operators of 1991 and 1992 vehicles are affected by doing this. This portion of the hypothesis is completely arbitrary but must be accepted for this vehicle explanation to exist. No vehicle reason can be put forth that would explain why an operator would stop at this point.

- *Once the operator makes the mistake, the vehicle will dwell in this position long enough to exit the vehicle but will ultimately move under power.*
  NHTSA has arbitrarily determined the defective dwell period to be 3 seconds or greater. No data has been suggested to validate this number. Exit time is entirely human factors dependant. We have a video that documents exit times as low as 1 second.

- *At this point the transmission is slowly building pressure in the reverse hydraulic circuit. Once sufficient time has elapsed and sufficient pressure has built, the vehicle begins to move.*
  As the manual valve closes, the opening for transmission fluid to flow becomes exponentially smaller, so the volume of flow exponentially approaches zero. This would mean that the time required to engage reverse would correspondingly increase to infinity. (see NHTSA hypothesis chart) Creating long delay times. Since the relationship is between reverse delay and shifter position, Scott has suggested that the size of the "3 second or greater" window may also be the "defect factor." He also has suggested that a limiting factor could be is the location where the park pawl may engage, preventing the vehicle from moving even though it is in hydraulic reverse.

Testing (FAA and NHTSA) and Computer simulation (VSA) have determined that there is a range of variation of reverse hydraulic engagement between park and reverse. The Pawl engagement point is variable and not repeatable measurable.

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NHTSA Proposed Survey Method

(attached)

Samples
Test four populations to statistical significance:
1. Prior to the subject vehicles ,1988 and 1989
2. Subject, non-complaint vehicles
3. Subject complaint vehicles
4. Post the subject vehicles, 1993 and beyond.

Method:
Artificially positioning the manual lever at linear defined discrete intervals, establish the reverse engagement delay time corresponding to each point. Repeat each point five times to reduce variability.

Expected outcome:
The number of points were delay times exceeds 3 seconds will be greater in the second group.

Status
NHTSA has sent a refined survey protocol. They have run the many variations on the method several times and feel confident in it.
We have reviewed with transmission, controls and transmission test and have very low confidence in repeatability and reliability of the test result.

Pro's to doing the Survey
It would identify a performance difference between the subject vehicles.

Con's
Repeatability suspect
Outcome does not result in a potential for field action
Product Liability concerns about giving credence to a hypothesis we continually challenge.

Parts/Process review history

A complete transmission change history has been generated by engineering through drawing change block records. Kokomo transmission plant also provided an independent design process, and supplier histories. This history matched the engineering history.

No changes or set of changes have been identified that relate to the transmission that could explain the complaint rate in the subject vehicles.

Independent Review
Product Liability has independently produced a similar chart that clearly shows no design change issues. (see chart)

Plant Visit Result
A Kokomo Plant Visit was conducted on July 27, 1998 to identify potential Process Changes. The visit determined that most of the equipment that produced the subject vehicles is still in use today. Some of the equipment experienced a major overhaul after 1993. The end of line check validates that the transmission is not in both park and reverse in either the detented park or reverse positions. No process controls exist that would control transmission operation when the manual lever is placed between the park and reverse detent positions.

Contingency Proposals Brainstorming

Warning Buzzer

Concept; a warning buzzer would sound if a vehicle door were opened with the key in the on position and the park/neutral switch not engaged. The three switches and buzzer exist on the vehicle, concept would be to identify wiring and logic to implement.

Reduce Delay Time through earlier engagement of the park pawl:

Concept; reduce the Park Rod length on a vehicle by vehicle basis to minimize the size of the window for delay. Would require an adjustable park rod and test method. Risk includes not being able to get out of park into Reverse without going to Drive first.

Reduce Delay Time through faster reverse onset time:

Concept; change the manual valve/valve body to reduce maximum dwell time while the fluid bleeds to reverse. Would require a new design valve body.

Decision on conducting the Survey

Conduct survey

- Possible Outcome 1: The subject vehicles are found to be statistically different.

Action:

- Conduct one of the contingency proposals on the subject population.

Significant Risks:

- Survey is focused on performance and not a design/build characteristic. This does not lend the outcome to an action.
- Product Liability credence to a concept we have long ignored.

- Possible Outcome 2: The subject vehicles are found to no different but the complaint vehicles are found to be different.

Action:

- Conduct an inspection for the performance characteristic on the subject population, and change the vehicles that display unacceptable performance.

Significant Risks:

- Survey is focused on performance test would have to be designed for dealers to conduct.
- Product Liability credence to a concept we have long ignored.

- Possible Outcome 3: The subject and complaint vehicles are found not to be statistically different from the non-subject vehicles.

Action:

- Unknown.

Significant Risks:

- Entire population of A500 transmission vehicles at risk, 926,500 vehicles from 1988 to 1994 AN, AB, AD, ZJ

Opt to not conduct survey

- NHTSA would likely conduct a limited survey.

Significant Risk:

- DaimlerChrysler will not be able to review or refute survey data without going to court to fight an ordered recall.

NHTSA position from DeMeter

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Suggestion

Action:
Conduct the warning buzzer action as a safety recall based entirely on the anomalous complaint rate in the subject years identifying the exact functional defect as the operator did not place the lever in park, set the brake or turn off the engine.

Defect
The defect that could be that the operator is not placing the transmission lever firmly in the Park position.

This is the basis for the NHTSA hypothesis.

Advantage:
This could eliminate all the disagreement about placing the lever between park and reverse and just focuses on the correct placement not being achieved by the operator.

Justification:
The wording of the law seems less than exact and allows for this position. If complaint rates are prima-facie evidence of a defect, why not just defer to that definition.

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