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4/17/06

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April 7, 2006

Ms. Kathleen C. DeMeter, Director  
Office of Defects Investigation Safety Assurance  
National Highway Traffic Safety Administration  
400 Seventh Street, S.W.  
Washington, D.C. 20590

Dear Ms. DeMeter:

Subject: PE06-011:NVS-213dsy

The Ford Motor Company (Ford) response to the agency's March 2, 2006, letter concerning reports of alleged engine stall while driving due to camshaft position sensor failures in 1999-2001 model year F-250/350 Super Duty, E-350 Super Duty, and Excursion vehicles with 7.3L diesel engines is attached.

Ford has received a number of reports alleging engine stall due to failure of the camshaft position sensor in these vehicles, and continues to investigate the circumstances concerning these allegations. As the agency is aware, engine stalling can occur in any vehicle for various reasons, including engine or engine control system malfunctions, or operator error or bad fuel, as examples. Despite the numerous reports and claims that were identified in searches of Ford's databases for reports related to this investigation, the number of reports received by Ford that indicate any type of safety concern relating to this condition is extremely low.

Feedback provided by customers in phone interviews consistently indicates that customers have found the vehicles to remain controllable after an engine stall condition and that they have the ability to move the vehicle to the side of the road and bring it to a complete stop without difficulty.

Ford is continuing to investigate the circumstances concerning allegations of engine stall in 1999-2001 model year F-250/350 Super Duty, E-350 Super Duty, and Excursion vehicles equipped with 7.3L diesel engines and will advise the agency of the results of this continuing investigation.

If you have any questions concerning this response, please feel free to contact me.

Sincerely,

James P. Vondale

Attachment



FORD MOTOR COMPANY (FORD) RESPONSE TO PE06-011

Ford's response to this Preliminary Evaluation (PE) information request was prepared pursuant to a diligent search for the information requested. While we have employed our best efforts to provide responsive information, the breadth of the agency's request and the requirement that information be provided on an expedited basis make this a difficult task. We nevertheless have made substantial effort to provide thorough and accurate information, and we would be pleased to meet with agency personnel to discuss any aspect of this PE.

The scope of Ford's investigation conducted to locate responsive information focused on Ford employees most likely to be knowledgeable about the subject matter of this inquiry and on review of Ford files in which responsive information ordinarily would be expected to be found and to which Ford ordinarily would refer. Ford notes that although electronic information was included within the scope of its search, Ford has not attempted to retrieve from computer storage electronic files that were overwritten or deleted. As the agency is aware, such files generally are unavailable to the computer user even if they still exist and are retrievable through expert means. To the extent that the agency's definition of Ford includes suppliers, contractors and affiliated enterprises for which Ford does not exercise day-to-day operational control, we note that information belonging to such entities ordinarily is not in Ford's possession, custody or control.

Ford has construed this request as pertaining to vehicles manufactured for sale in the United States, its protectorates and territories.

In a March 22, 2006, telephone conversation, Scott Yon of the agency informed Ford personnel that the "subject vehicles" are 1999-2001 model year vehicles, and that 1997-1998 model year vehicles and 2002-2003 model year vehicles are "peer vehicles." The agency also clarified that Requests 7, 8, 10, 13, and 15 pertain only to "subject vehicles," and that Ford's response to Request 9 should address changes to the subject component between the 1997 and 2001 model years.

Answers to your specific questions are set forth below. As requested, after each numeric designation, we have set forth verbatim the request for information, followed by our response. Unless otherwise stated, Ford has undertaken to provide responsive documents dated up to and including March 2, 2006, the date of your inquiry. Ford has searched within the following offices for responsive documents: Environmental and Safety Engineering, Ford Customer Service Division, Marketing and Sales Operations, Quality, Research, Global Core Engineering, Office of the General Counsel, and North American Truck Product Development.

Request 1

State, by model and model year, the number of subject vehicles Ford has manufactured for sale or lease in the United States. Separately, for each subject vehicle manufactured to date by Ford, state the following:

- a. Vehicle Identification number (VIN);
- b. Model;
- c. Transmission details (manual or automatic type, and model number);
- d. Power brake system details (Hydro-Boost, Hydro-Max, other);
- e. Date of manufacture;

- f. Date warranty coverage commenced; and
- g. The State in the United States where the vehicle was originally sold or leased (or delivered for sale or lease).

Provide the table in Microsoft Access 2000, or a compatible format, entitled "PRODUCTION DATA." See the attached CD-ROM, titled "PE06-001 IR Attachments," for a pre-formatted table which provides further details regarding this submission.

### Answer

Ford records indicate that the approximate total number of E-350 Super Duty, Excursion, and F-250/350 Super Duty vehicles equipped with a 7.3L Diesel engine sold in the United States (the 50 states and the District of Columbia) and its protectorates and territories (American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and Virgin Islands) is 1,202,873.

The number of subject vehicles sold in the United States by model and model year is shown below

Model	1997	1998	1999	2000	2001	2002	2003
E-350 SD	10,518	10,859	10,487	10,087	9,349	9,372	12,990
EXCURSION	-	-	-	14,655	13,098	12,638	4,639
F-250 SD	90,022	-	127,964	110,318	97,582	97,679	34,435
F-350 SD	88,240	-	127,766	106,059	88,724	87,843	27,551

The requested data for each subject vehicle is provided electronically in Appendix A (filename: 2006-04-07 Appendix A) on the enclosed CD.

### Request 2

State the number of each of the following, received by Ford, or of which Ford are otherwise aware, which relate to, or may relate to, the alleged defect in the subject vehicles:

- a. Consumer complaints, including those from fleet operators;
- b. Field reports, including dealer field reports;
- c. Reports involving a crash, injury, or fatality, based on claims against the manufacturer involving a death or injury, notices received by the manufacturer alleging or proving that a death or injury was caused by a possible defect in a subject vehicle, property damage claims, consumer complaints, or field reports;
- d. Property damage claims; and
- e. Third-party arbitration proceedings where Ford is or was a party to the arbitration; and
- f. Lawsuits, both pending and closed, in which Ford is or was a defendant or codefendant.

For subparts "a" through "d," state the total number of each item (e.g., consumer complaints, field reports, etc.) separately. Multiple incidents involving the same vehicle are to be counted separately. Multiple reports of the same incident are also to be counted separately (i.e., a consumer complaint and a field report involving the same

Incident in which a crash occurred are to be counted as a crash report, a field report and a consumer complaint).

In addition, for items "c" through "f," provide a summary description of the alleged problem and causal and contributing factors and Ford's assessment of the problem, with a summary of the significant underlying facts and evidence. For items "e" and "f," identify the parties to the action, as well as the caption, court, docket number, and date on which the complaint or other document initiating the action was filed.

#### Answer

For purposes of identifying reports of incidents that may be related to the alleged defect and any related documents, Ford has gathered "owner reports" and "field reports" maintained by Ford Customer Service Division (FCSD), fleet reports maintained in a Fleet Test Database and claim and lawsuit information maintained by Ford's Office of the General Counsel (OGC).

Descriptions of the FCSD owner and field report systems and the Fleet Test Database, and the criteria used to search each of these are provided electronically in Appendix B (filename: 2006-04-07 Appendix B) on the enclosed CD.

The following categorization was used in the review of reports located in each of these searches:

Category	Allegation
A	Allegations of engine stall while driving due to camshaft position sensor failure.
B	Allegations of engine stall while driving, ambiguous if due to camshaft position sensor failure.

We are providing electronic copies of reports categorized as "B" as "non-specific allegations" for your review because of the broad scope of the request. Based on our engineering judgment, the information in these reports is insufficient to support a determination that they pertain to the alleged defect.

Ford has not made an evaluation to determine if duplicate reports exist for single incidents, either from a single source or across sources.

Owner Reports: Records identified in a search of the Master Owner Relations Systems (MORS) database, as described in Appendix B, were reviewed for relevance and categorized in accordance with the categories described above. The number and copies of relevant owner reports identified in this search that may relate to the agency's investigation are provided in the MORS II and MORS III portion of the electronic database contained in Appendix C (filename: 2006-04-07 Appendix C) on the enclosed CD. The categorization of each report is identified in the "Category" field.

Legal Contacts: Ford is providing, in Appendix B, a description of Legal Contacts and the activity that is responsible for this information, Litigation Prevention. To the extent that responsive (i.e., not ambiguous) owner reports indicate that they are Legal Contacts, Ford has gathered the related files from the Litigation Prevention section. Non-privileged documents for files that were located that are related to the responsive owner reports are provided electronically in Appendix D (folder name: 2006-04-07 Appendix D).

**Fleet Reports:** In addition to fleet reports that may be contained in the owner reports or field reports identified in this response, Ford conducted a search of its Fleet Test Database, as described in Appendix B, for reports that may relate to the alleged defect in the subject vehicles. No fleet reports were identified that relate to the subject defect.

**Field Reports:** Records identified in a search of the Common Quality Indicator System (CQIS) database, as described in Appendix B, were reviewed for relevance and categorized in accordance with the categories described above. The number and copies of relevant field reports identified in this search that may relate to the agency's investigation are provided in the CQIS portion of the electronic database contained in Appendix C on the enclosed CD. The categorization of each report is identified in the "Category" field.

**Unified Database:** The Unified Database (UDB) was created to facilitate parts availability by tracking part sales and is not intended as a problem reporting system. However, because a small percentage of the records may contain verbatim comments that could potentially relate to the agency's inquiry, we searched UDB for reports responsive to Request 2 as described in Appendix B. The number and copies of relevant reports identified in this review that may relate to the agency's investigation based on these verbatim comments is provided in Appendix C.

**VOQ Data:** This information request had an attachment that included 31 Vehicle Owner's Questionnaires (VOQs). Ford made inquiries of its MOR8 database for customer contacts, and its CQIS database for field reports concerning the vehicles identified on the VOQs. Ford notes that in some instances where the VOQ does not contain the VIN or the owner's last name and zip code, it is not possible to query the databases for owner and field reports specifically corresponding to the VOQs. Any reports located on a vehicle identified in the VOQs related to the alleged defect are provided electronically in Appendix C. Ford notes that five owner reports on five separate vehicles relating to the VOQs were not found using the search criteria stated in Appendix B. Copies are provided in Appendix C2 (filename: 2006-04-07 Appendix C2).

**Crash/Injury Incident Claims:** For purposes of identifying allegations of accidents or injuries that may have resulted from the alleged defect, Ford has reviewed responsive owner and field reports, warranty claims, and lawsuits and claims and found one report (VIN 1FTNW21F82E [REDACTED]) that alleges an engine stall resulted in the vehicle contacting a pole. No police report was filed. Documents relating to this incident can be found in Appendix D. A separate customer (VIN 1FTSW31F22E [REDACTED]) alleges in multiple contacts with Ford that an engine stalled while backing out of the driveway causing the vehicle to contact a basketball pole. No police report was filed. Copies of corresponding reports for these events are provided in Appendix C.

Ford notes that three VOQs provided by the agency allege some type of related accident or vehicle contact with an object following an engine stall:

- **VIN 1FTNX21F01E [REDACTED]** – The VOQ contains an allegation that the driver "scrapped my truck against the guard rail". A search of Ford databases found no contact with Ford from this customer relating to this incident.
- **VIN 1FTWW32F5E [REDACTED]** – The VOQ contains an allegation that the vehicle made contact with a curb. A search of Ford databases found no contact with Ford from this customer relating to this incident.
- **ODI Report 10141357** – The VOQ contains an allegation that the engine stalled in March 2000. No accident was alleged, but it was claimed "there was no time to get out

of the lane we were in to the shoulder before we slowed too much and caused a wreck behind us," perhaps indicating that traffic was not following at a safe distance. Though this VOQ did not contain a VIN, a search of Ford vehicle information based on the customer's last name, city and state identified the likely VIN for this 1999 model year F-250 as 1FTNW21F7X8[REDACTED]. A search of Ford databases found that the vehicle had been serviced in February 2000 for a complaint of engine "runs rough at cruise speed" for which four glow plugs, the air filter, the IDM and the camshaft position sensor were replaced. The vehicle also had two injectors replaced in April 2001 for a similar engine "runs rough" concern. No warranty repairs relating to the camshaft position sensor are noted following the alleged incident.

Ford notes that customer statements in a VOQ relating to VIN 1FTWW33F0YE[REDACTED] allege that the vehicle "went over an embankment" after the engine stalled. In a related contact to Ford there was no mention of any type of accident alleged to have occurred in this incident.

Ford also notes that a customer associated with VIN 1FTSW31FXYE[REDACTED] alleged that their vehicle stalled while driving causing them to go "into the gravel...she corrected and got back on the hwy and then it with her trying to countersteer caused the veh to flip over." However, this incident does not appear to be related to the camshaft position sensor which had reportedly been replaced the day prior to the incident. Copies of documents identified in a search of Ford's Litigation Prevention files relating to this ambiguous allegation are provided in Appendix D. Furthermore, a search of Ford's lawsuit and claim files found one non-litigated claim filed in August 2002 corresponding to this vehicle with no further information. A copy of documents relating to this claim can be found in Appendix E1 (filename: 2006-04-07 Appendix E1). In an abundance of caution we are providing information related to this incident, though we believe that the report does not relate to the alleged defect.

**Claims, Lawsuits, and Arbitrations:** For purposes of identifying incidents that may relate to the alleged defect, Ford has gathered claim and lawsuit information maintained by Ford's OGC. Ford's OGC is responsible for handling product liability lawsuits, claims, and consumer breach of warranty lawsuits and arbitrations against the Company.

Lawsuits and claims gathered in this manner were reviewed for relevance and categorized in accordance with the categories described above. Ford has also located other lawsuits, claims or consumer breach of warranty lawsuits; each of these is ambiguous as to whether it meets the alleged defect criteria. We have included these lawsuits and claims as "non-specific allegations" for your review because of the broad scope of the request. Based on our engineering judgment, the information in these lawsuits and claims is insufficient to support a determination that they pertain to the alleged defect.

We are providing the requested detailed information, where available, on the responsive and ambiguous lawsuits and claims in our Log of Lawsuits and Claims, as Appendix E (filename: 2006-04-07 Appendix E) on the enclosed CD. The number of relevant lawsuits and claims identified is also provided in this log. To the extent available, electronic copies of complaints, first notices, or MORs reports relating to matters shown on the log are provided on the enclosed CD in Appendix E1 (filename: 2006-04-07 Appendix E1). With regard to these lawsuits and claims, Ford has not undertaken to contact outside law firms to obtain additional documentation.

**Request 3**

Separately, for each item (complaint, report, claim, notice, or matter) within the scope of your response to Request No. 2, state the following information:

- a. Ford's file number or other identifier used;
- b. The category of the item, as identified in Request No. 2 (i.e., consumer complaint, field report, etc.);
- c. Vehicle owner or fleet name (and fleet contact person), address, and telephone number;
- d. Vehicle's VIN;
- e. Vehicle's make, model and model year;
- f. Vehicle's mileage at time of incident;
- g. Incident date;
- h. Report or claim date;
- i. Whether a crash is alleged;
- j. Whether property damage is alleged;
- k. Number of alleged injuries, if any; and
- l. Number of alleged fatalities, if any.

Provide this information in Microsoft Access 2000, or a compatible format, entitled "REQUEST NUMBER TWO DATA." See the attached CD-ROM, titled "PE06-011 IR Attachments," for a preformatted table which provides further details regarding tiffs submission.

**Answer**

Ford is providing owner and field reports in the electronic database contained in Appendix C on the enclosed CD in response to Request 2. To the extent information sought in Request 3 is available for owner and field reports, it is provided in the database. To the extent information sought in Request 3 is available for lawsuits and claims, it is provided in the Log of Lawsuits and Claims in Appendix E.

**Request 4**

Produce electronic copies of all documents related to each item within the scope of Request No. 2. Organize the documents separately by category (i.e., consumer complaints, field reports, etc.) and describe the method Ford used for organizing the documents.

**Answer**

Ford is providing owner and field reports in the electronic database contained in Appendix C on the enclosed CD in response to Request 2. Copies of complaints, first notices, or MORS reports relating to matters shown on the Log of Lawsuits and Claims (Appendix E) are provided in Appendix E1. To the extent information sought in Request 4 is available, it is provided in the referenced appendices.

**Request 5**

State, by model and model year, a total count for all of the following categories of claims, collectively, that have been paid by Ford to date that relate to, or may relate to, the alleged defect in the subject vehicles: warranty claims; extended

warranty claims; claims for good will services that were provided; field, zone, or similar adjustments and reimbursements; and warranty claims or repairs made in accordance with a procedure specified in a technical service bulletin or customer satisfaction campaign.

Separately, for each such claim, state the following reformation:

- a. Ford's claim number;
- b. Vehicle owner or fleet name (and fleet contact person) and telephone number;
- c. VIN;
- d. Repair date;
- e. Vehicle mileage at time of repair;
- f. Repairing dealer's or facility's name, telephone number, city and state or ZIP code;
- g. Labor operation number;
- h. Problem code;
- i. Replacement part number(s) and description(s);
- j. Concern stated by customer; and
- k. Comment, if any, by dealer/technician relating to claim and/or repair.

Provide this information in Microsoft Access 2000, or a compatible format, entitled "WARRANTY DATA." See the attached CD-ROM, titled "PE06-011 IR Attachments," for a pre-formatted table which provides further details regarding this submission.

#### Answer

Ford's search of the Analytical Warranty System (AWS) database for potentially relevant records is described in Appendix B. In the interest of responding promptly to this inquiry, Ford reviewed and categorized a random sample of the records identified and provided in this search and categorized them in accordance with the following:

Category	Allegation
A	Allegations of engine stall while driving due to camshaft position sensor failure.
B	Allegations of engine stall while driving, ambiguous if due to camshaft position sensor failure.
C	Non-responsive reports (e.g. not related to engine stall allegations, allegations related to other components, etc.)

The number and copies of relevant warranty claims identified, reviewed and categorized in this search that may relate to the agency's investigation are provided in the AWS portion of the electronic database contained in Appendix C1 (filename: 2006-04-07 Appendix C1), including those reviewed that were determined to be not responsive, on the enclosed CD. If the claim was reviewed, the categorization of the reviewed report is identified in the "Category" field. Uncategorized records identified in the search of the AWS database are also included in Appendix C1.

Ford has not made an evaluation to determine if duplicate reports exist for single incidents, either from a single source or across sources.

Requests for "goodwill, field or zone adjustments" received by Ford to date that relate to the alleged defect that were not honored, if any, would be included in the MORS reports identified



above in response to Request 2. Such claims that were honored are included in the warranty data provided.

#### Request 6

Describe in detail the search criteria used by Ford to identify the claims identified in response to Request 5, including the labor operations, problem codes, part numbers and any other pertinent parameters used. Provide a list of all labor operations, labor operation descriptions, problem codes, and problem code descriptions applicable to the alleged defect in the subject vehicles. State, by make and model year, the terms of the new vehicle warranty coverage offered by Ford on the subject vehicles (i.e., the number of months and mileage for which coverage is provided and the vehicle systems that are covered). Describe any extended warranty coverage option(s) that Ford offered for the subject vehicles and state by option, model, and model year, the number of vehicles that are covered under each such extended warranty.

#### Answer

Detailed descriptions of the search criteria, including all pertinent parameters, used to identify the claims provided in response to Request 5 are described in Appendix B.

For 1997-2003 model year E-350 Super Duty, F-250/350 Super Duty, and Excursion vehicles, the New Vehicle Limited Warranty, Bumper-to-Bumper Coverage begins at the warranty start date and lasts for three years or 36,000 miles, whichever occurs first. Powertrain warranty for the 7.3L Diesel engine begins at the vehicle warranty start date and lasts for five years or 100,000 miles, whichever occurs first. After the Bumper-to-Bumper coverage is completed, a \$100 deductible is applied throughout the remainder of the powertrain warranty period. Optional extended plans are offered to increase powertrain warranty coverage to either six or seven year periods. The details of the various plans are provided electronically in Appendix F (filename: 2006-04-07 Appendix F) on the enclosed CD. Counts of new vehicle ESP policies (and engine extended warranty policies) that have been purchased for subject vehicles can be found in Appendix F1 (filename: 2006-04-07 Appendix F1).

#### Request 7

Produce copies of all service, warranty, and other documents that relate to, or may relate to, the alleged defect in the subject vehicles, that Ford has issued to any dealers, regional or zone offices, field offices, fleet purchasers, or other entities. This includes, but is not limited to, bulletins, advisories, informational documents, training documents, or other documents or communications, with the exception of standard shop manuals. Also include the latest draft copy of any communication that Ford is planning to issue within the next 120 days.

#### Answer

For purposes of identifying communications to dealers, zone offices, or field offices pertaining, at least in part, to engine stall due to failure of the camshaft position sensor, Ford has reviewed the following FCSD databases and files: The On-Line Automotive Service Information System (OASIS) containing Technical Service Bulletins (TSBs) and Special Service Messages (SSMs); Internal Service Messages (ISMs) contained in CQIS; and Field Review Committee (FRC) files. We assume this request does not seek information related to electronic communications

between Ford and its dealers regarding the order, delivery, or payment for replacement parts, so we have not included these kinds of information in our answer.

A description of Ford's OASIS messages, ISMs, and the Field Review Committee files and the search criteria used are provided in Appendix B.

OASIS Messages: Ford has identified two SSMS and no TSBs that may relate to this request and is providing copies of them in Appendix G (filename: 2006-04-07 Appendix G).

Internal Service Messages: Ford has identified no ISMs that may relate to this request.

Field Review Committee: Ford has identified no field service action communications that may relate to this request.

### Request 8

Describe all assessments, analyses, tests, test results, studies, surveys, simulations, investigations, inquiries and/or evaluations (collectively, "actions") that relate to, or may relate to, the alleged defect in the subject vehicles that have been conducted, are being conducted, are planned, or are being planned by, or for, Ford. For each such action, provide the following information:

- a. Action title or identifier;
- b. The actual or planned start date;
- c. The actual or expected end date;
- d. Brief summary of the subject and objective of the action;
- e. Engineering group(s)/supplier(s) responsible for designing and for conducting the action; and
- f. A brief summary of the findings and/or conclusions resulting from the action.

For each action identified, provide copies of all documents related to the action, regardless of whether the documents are in interim, draft, or final form. Organize the documents chronologically by action.

### Answer

Ford is construing this request broadly and is providing not only studies, surveys, and investigations related to the alleged defect, but also notes, correspondence, and other communications that were located pursuant to a diligent search for the requested information. Ford is providing the responsive non-confidential Ford documentation in Appendix H (folder name: 2006-04-07 Appendix H).

To the extent that the information requested is available, it is included in the documents provided. If the agency should have questions concerning any of the documents, please advise.

Ford is submitting additional responsive documentation as Appendix J with a request for confidentiality under separate cover to the agency's Office of the Chief Counsel pursuant to 49 CFR, Part 512.

In the interest of ensuring a timely and meaningful submission, Ford is not producing non-responsive materials or items containing little substantive information. Examples of the types of

materials not being produced are meeting notices, raw data lists (such as part numbers or VINs) without any analytical content, duplicate copies, non-responsive elements of responsive materials, and draft electronic files for which later versions of the materials are being submitted. Through this method, Ford is seeking to provide the agency with substantive responsive materials in our possession in the timing set forth for our response. We believe our response meets this goal. Should the agency request additional materials, Ford will cooperate with the request.

#### Request 9

Describe all modifications or changes made by, or on behalf of, Ford in the design, material composition, manufacture, quality control, supply, or installation of the subject component, from the start of production to date, which relate to, or may relate to, the alleged defect in the subject vehicles. Include in your response a detailed description of the subject components used in MY 2005 subject models and all differences between those vehicles and the subject vehicles that may relate to the alleged defect. For each such modification or change, provide the following information:

- a. The date or approximate date on which the modification or change was incorporated into vehicle production;
- b. A detailed description of the modification or change;
- c. The reason(s) for the modification or change;
- d. The part numbers (service and engineering) of the original component;
- e. The part number (service and engineering) of the modified component;
- f. Whether the original unmodified component was withdrawn from production and/or sale, and if so, when;
- g. When the modified component was made available as a service component; and
- h. Whether the modified component can be interchanged with earlier production components.

Also, provide the above information for any modification or change that Ford is aware of which may be incorporated into vehicle production within the next 120 days.

#### Answer

A table of the requested changes is provided electronically as Appendix K (filename: 2006-04-07 Appendix K) on the enclosed CD.

#### Request 10

For each unique power braking system used in the subject vehicles (as identified in Request 1d above), briefly describe how each system works including the major components and their locations on the vehicle. For each system, describe in detail the reserve power assist braking and how it functions when an engine stall occurs due to the alleged defect.

#### Answer

There are two unique power braking systems used in the subject vehicles. The 1999-2001 model year E-350 Super Duty vehicles use a vacuum boost braking system while the 1999-2001 model year F-250/350 Super Duty and Excursion vehicles use a Hydro-Boost braking system.

### Vacuum Boost System

The vacuum boost system amplifies the input of the brake pedal force. It is a two-chamber booster where, at rest, air pressure is equivalent in the front and rear chambers. During brake pedal application, atmospheric air is allowed to enter the rear chamber causing a pressure differential between the front chamber (vacuum) and the rear chamber (atmospheric). This pressure differential allows for a "boost" of the pedal input force. The amount of boost is directly related to the boost ratio (valve body ID/plunger OD), the total area of the brake booster and the total amount of vacuum. During brake release, valving inside the booster simultaneously allows air in the rear chamber to enter the front chamber while isolating the rear chamber from atmosphere, resulting in equivalent air pressure between the front and rear chambers.

The system additionally incorporates a "reserve mode" that is put into effect in the event there is a loss of supply vacuum for any reason, including an engine stoppage. When the system is in reserve mode, vacuum is no longer provided to the booster. In this case, air inside the booster is isolated from atmosphere via a check valve. Normal brake assist is provided for at least one stop, with gradually reduced brake assist provided for additional stops. There are no accumulators in the system; only the vacuum air remaining inside the booster allows for the boost.

### Hydro-Boost System

The Hydro-Boost and master cylinder components are attached to the dash panel and the brake pedal and are considered part of the brake system. The Hydro-Boost also interfaces with the power steering system. The Hydro-Boost is located downstream of the power steering pump and upstream of the power steering gear. The steering gear receives full pump flow at all brake pressure and conditions. The Hydro-Boost incorporates a pressure accumulator.

As the brake pedal is depressed, flow to the steering gear is restricted, building pressure inside the booster. This provides brake assist. Flow to the steering gear is not reduced because power steering pressure increases as the flow is restricted.

If the system goes into reserve mode, such as it would if the engine stopped rotating, power steering fluid is not supplied to the booster. The applied pedal force fully strokes the spool valve and sleeve inside the Hydro-Boost. This action depresses the reserve dump valve pin, allowing reserve pressure stored in the accumulator to fill the boost cavity. This construction provides two to three typical boosted stops. After a few full brake applications, the reserve system is essentially depleted providing no additional boost. If the engine is restarted, the pump resumes operation and the system fully charges itself automatically during a steering or braking event. After the re-charge, the Hydro-Boost is capable of another two or three power-off reserve stops.

### Request 11

For each unique automatic transmission model used in the subject vehicles (as identified in Request 1c above), state whether engine back-drive (wind milling, due to vehicle inertia and rear wheel rotation) occurs when an engine stalls due to the alleged defect. For each transmission where back-drive occurs:

- a. Describe the mechanism(s) by which the back-drive is transmitted to the engine (i.e., is this caused by hydraulic coupling, mechanical coupling, electro-mechanical coupling such as a torque converter locking clutch, some combination of these, or something else);
- b. State the vehicle conditions that effect whether back-drive occurs or not (i.e., gear or transmission function selected, vehicle speed, key position, etc)

- c. State the vehicle speed(s) above which back-drive occurs; and
- d. Describe what happens to back-drive if the operator shifts from drive to neutral, and then subsequently back to drive.

### Answer

The subject vehicles use either the E4OD or the 4R100 automatic transmission. Both of these transmissions have the same power flow and back-drive mechanisms. Engine back-drive is achieved through the application of several clutches in the transmission depending on the gear that is selected. The converter will provide coasting torque in both hydraulic and locked up modes. If the engine stalls, the wheels will back-drive the engine as a result of hydraulic coupling through the transmission because the transmission front pump will be driven through the engaged clutches.

Some degree of automatic transmission back-drive will occur at any vehicle speed commensurate with the manually selected gear, as long as the transmission remains in a gear that provides engine braking. Even in the event of a stalled engine, the engine will be back-driven. In 4<sup>th</sup> gear, it will be back-driven down to about 30 mph. Manual selection of a lower gear will result in engine back-drive down to lower speeds. For example, engine back-drive will occur down to about 14 mph with a manual selection of 1<sup>st</sup> gear.

If an operator shifts from drive to neutral, all clutches are disengaged. If the engine is not running, the hydraulic connection between the engine and transmission will be lost because the transmission front pump will not be driven. Shifting back into gear will not cause the transmission to re-engage the engine, and as a result engine rotation will not occur.

### Request 12

State by model and model year, whether the subject vehicle owner's manual gives any instruction, or discusses in any manner, the actions the vehicle operator should take, or not take, if an engine stall occurs, either while the vehicle is stopped or moving, and especially as regards the use of the brake system, movement of the gear shift selector, or restarting of the engine while the vehicle is moving. State by model and model year, whether the owner's manual gives any instruction, or discusses in any manner, changes in vehicle brake and steering system operation that result when an engine stall occurs. Provide copies of the pertinent sections of any owner's manuals.

### Answer

The owner guides for the subject vehicles do not include any operating instructions, nor does it discuss change in vehicle braking and/or steering in the event of a stall.

### Request 13

Produce an exemplar sample of each design version of the subject component Ford used on the subject vehicles either as original equipment or as a Ford service replacement part. Produce a field return sample of each of these design versions which exhibits each known failure mechanism or failure mode, and describe the failure mechanism or mode, and how it can be detected by a service technician, or by ODI.

Answer

A service part representing the latest 7.3L design camshaft position sensor design is included with this submission and tagged with a label identifying the part number. We are unable to obtain an unused part representing prior design iterations. Instead, five field-return sensors are included with the submission. The field-return parts which are being supplied have not been evaluated to determine the reason they were replaced in service.

Request 14

State the number of subject components that Ford has sold that may be used in the subject vehicles by component name, part number (both service and engineering/production), model and model year of the vehicle in which it is used and month/year of the sale (including the cut-off date for sales, if applicable). For each component part number, provide the supplier's name, address, and appropriate point of contact (name, title, and telephone number). Also, identify by make, model and model year, any other vehicles of which Ford is aware that contain the identical component, whether installed in production or in service, and state the applicable dates of production or service usage.

Answer

As the agency is aware, Ford service parts are sold in the U.S. to authorized Ford and Lincoln-Mercury dealers. Ford has no means by which to determine how many of the parts were actually installed on vehicles, the vehicle model or model year on which a particular part was installed, the reason for any given installation, or the purchaser's intended use of the components sold.

Ford is providing the requested information, where available, in electronic form in Appendix L (filename: 2006-04-07 Appendix L) on the enclosed CD.

Request 15

Furnish Ford's assessment of the alleged defect in the subject vehicle, 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;
- f. The reports included with this inquiry;
- g. The ability to restart a vehicle that has experience engine stall caused by failure of a subject component;
- h. Ford's analysis of subject component failure rates at 1, 2 and 3 years in service; and
- i. Ford's analysis of projected subject component failure rates at 5 and 10 years in service. Provide a detailed explanation of the methods used to perform these analyses.

Answer

Ford has received a number of reports alleging engine stall due to failure of the camshaft position sensor in these vehicles and continues to investigate the circumstances concerning these allegations. As the agency is aware, engine stalling can occur in any vehicle for various reasons, including engine or engine control system malfunctions, or operator error or bad fuel, as examples. Due to their nature, older diesel engines may be particularly prone to misfires, sputter and or other drivability characteristics which may at times be misunderstood or mischaracterized by a customer as an engine stall. Ford's analysis of the reports provided in this response has found that some technicians routinely replace camshaft position sensors in an effort to address a wide range of engine drivability complaints, principally due to the ease of camshaft position sensor removal and installation. In fact, review of repeat repairs has found that camshaft position sensor replacement has not resolved the issue. For example, field reports relating to VINs 1FDWX36F1YE [REDACTED] 1FTHF265V [REDACTED] and 1FTHX28F8VE [REDACTED] indicate that the technician replaced the ICP sensor, the EBP sensor, the PCM, and the camshaft position sensor, yet the performance concern remained. Accordingly, any issue that existed was apparently not related to the cam shaft position sensor.

The number of reports received by Ford that indicate any type of safety concern relating to this condition is extremely low. Despite the numerous responsive reports and claims that were identified in searches of Ford's databases that relate to this subject, only two, apparently minor, single vehicle accidents are alleged. Two VOQs provided by the agency (VINs 1FTNX21F01E [REDACTED] and 1FTWW32F5XE [REDACTED]) allege some type of contact with a curb or guardrail. A thorough search of Ford's databases found no contact with Ford from these customers pertaining to these incidents. A third VOQ provided by the agency alleged an accident resulting from an engine stall, though review of Ford's files found no indication of cam sensor service on this vehicle following the incident. Ford also notes the one VOQ alleging an accident was submitted nearly five years after the alleged incident took place.

As discussed in response to Requests 10 and 11, engine back-drive results in full braking and power steering assist down to speeds of 30 mph, and brake assist is available after engine stoppage and steering efforts are manageable. In fact, most reports to Ford were initiated not due to any type of vehicle maneuverability concern but rather due to customer dissatisfaction relating to such things as repair cost, replacement part availability, towing expense, or inquiries as to warranty coverage for the repair. Ford has conducted phone interviews with 13 customers to better understand circumstances relating to their claim of engine stall due to cam position sensor failure. The feedback provided by these customers has consistently found that the vehicle remained controllable after an engine stall condition and that customers have demonstrated an ability to move the vehicle to the side of the road and bring it to a complete stop without difficulty.

As a result of this PE, Ford has conducted evaluations of an E-Series Super Duty vehicle with a vacuum boost system and a fully loaded F-350 Super Duty with a Hydro-Boost system. These vehicle evaluations confirmed that engine back-drive down to speeds of approximately 30 mph results in full brake assist and power steering assist. Further, even when the engine is no longer being back-driven, significant brake assist is available for a few brake applications and steering efforts, while increased, are manageable. Ford notes that these vehicle operating characteristics are consistent with those described in the agency's closing resume to investigation PE98-057. In this resume, the agency observed that when vehicles stall while in motion, "... (t)his give the driver time and vehicle momentum with which to maneuver onto the roadway shoulder, away from the travel lanes." Although this condition is undesirable, it does

not represent an unreasonable risk to motor vehicle safety. Ford is willing to demonstrate a driver's ability to safely control the vehicle at our test facility if the agency desires.

Ford is continuing to investigate the circumstances concerning allegations of engine stall in 1999-2001 model year F-250/350 Super Duty, E-350 Super Duty, and Excursion vehicles equipped with 7.3L Diesel engines and will advise the agency of the results of this continuing investigation.

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