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December 19, 2014

Mr. Frank S. Borris, Director
Office of Defects Investigation
National Highway Traffic Safety Administration
1200 New Jersey Avenue SE, Room W45-302
Washington, DC 20590

Dear Mr. Borris:

Subject: PE14-030:NVS-213cnl

The Ford Motor Company (Ford) response to the agency's October 22, 2014 letter concerning reports of loss of power steering assist while driving for 2010 through 2012 model year Ford Fusion, Mercury Milan, and Lincoln MKZ vehicles is attached.

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

Sincerely,

Steven M. Kenner

Attachment

ATTACHMENT
December 19, 2014

FORD MOTOR COMPANY (FORD) RESPONSE TO PE14-030

Ford's response to this Preliminary Evaluation 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 Preliminary Evaluation.

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.

Ford notes that some of the information being produced pursuant to this inquiry may contain personal information such as customer names, addresses, telephone numbers, and complete Vehicle Identification Numbers (VINs). Ford is producing such personal information in an unredacted form to facilitate the agency's investigation with the understanding that the agency will not make such personal information available to the public under FOIA Exemption 6, 5 U.S.C. 552(b)(6).

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 October 22, 2014, the date of your inquiry. Ford has searched within the following offices for responsive documents: Ford Customer Service Division, Marketing and Sales Operations, Quality, Global Core Engineering, Office of the General Counsel, and North American 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. Make;
c. Model;
d. Model Year;
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 2007, or a compatible format, entitled "PE14-030 PRODUCTION DATA." See Enclosure, A Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

Answer

Ford notes that 2010 through 2012 model year Ford Fusion and Lincoln MKZ vehicles built with the 3.5L engine were equipped with a hydraulic power steering system and these vehicles are not included in the counts below or in Appendix A. This criteria would eliminate the entire 2010 model year production of the Lincoln MKZ since it was only available with the 3.5L engine. In addition, the 2011 through 2012 model year Mercury Milan is defined as part of the subject vehicle population; however, Ford produced the Mercury Milan with the subject system during the 2010 through 2011 model years and these vehicles are included in the counts below and in Appendix A. The Mercury Milan was not sold in the 2012 model year.

Ford records indicate that the approximate total number of 2010 through 2012 model year Ford Fusion and Lincoln MKZ, and 2010 through 2011 model year Mercury Milan vehicles equipped with electric power assist steering (EPAS) sold in the United States (the 50 states and the District of Columbia), protectorates, and territories (American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and Virgin Islands) is 824,378.

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

Model	2010 MY	2011 MY	2012 MY
Ford Fusion	262,599	202,303	301,179
Mercury Milan	38,846	6,293	0
Lincoln MKZ	0	4,801	8,357

The requested data for each subject vehicle is provided in Appendix A.

Request 2

State the number of each of the following, received by Ford, or of which Ford is 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), 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 criteria used to search each of these are provided in Appendix B.

The following categorizations were used in the review of reports located in each of these searches:

Category	Allegation
A	Loss of Electric Power Assisted Steering While Driving
B	Ambiguous Steering Issue

Ford notes that while the alleged defect is "loss of electric power assisted steering while driving", many reports do not contain sufficient information to determine whether the vehicle was being driven at the time of the loss of assist allegation. However, Ford included all reports alleging loss of power steering assist in Category A in an abundance of caution and believes the actual number of responsive reports is likely much lower. Ford's response to Requests 11 and 12 discuss several scenarios that may result in a reduction or loss of power steering assist when the vehicle is not in motion.

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.

Owner Reports: Records identified in a search of the FMC360 Owner Relations System, as described in Appendix B, were reviewed for relevance and sorted in accordance with the categories described above. The number and copies of relevant owner reports identified in this search that allege loss of electric power assisted steering in a subject vehicle are provided in the FMC360 portion of the database contained in Appendix C. The categorization of each report is identified in the "Category" field.

When we were able to identify that responsive (i.e., not ambiguous) duplicate owner reports for an alleged incident were received, each of these duplicate reports was marked accordingly, and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one report associated with their VINs. These reports have been counted separately.

Legal Contacts: Ford is providing, in Appendix B, a description of Legal Contacts and the activity that is responsible for this information. 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 Office of General Counsel (OGC). Non-privileged documents for files that were located that are related to the responsive owner reports are provided in Appendix D.

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 sorted in accordance with the categories described above. The number and copies of relevant field reports identified in this search that allege loss of electric power assisted steering in a subject vehicle are provided in the CQIS portion of the database contained in Appendix C. The categorization of each report is identified in the "Category" field.

When we were able to identify that responsive duplicate field reports for an alleged incident were received, each of these duplicate reports was marked accordingly, and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one report associated with their VINs. These reports have been counted separately. In addition, field reports that are duplicative of owner reports are provided in Appendix C but are not included in the field report count.

VOQ Data: This information request had an attachment that included 629 Vehicle Owner Questionnaires (VOQs), 12 of which were duplicative, four were on vehicles outside the model years of the subject vehicle population, and three were on vehicles with 3.5L engines (vehicles built with 3.5L engines are equipped with hydraulic power steering assist). Ford made inquiries of its FMC360 database for customer contacts, and its CQIS database for field reports regarding 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.

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, and lawsuits and claims. A chart identifying potentially relevant allegations is being provided in Appendix E. Copies of reports corresponding to these alleged incidents are provided in the FMC360, CQIS, and Analytical Warranty System (AWS) portions of the database provided in Appendix C.

Claims, Lawsuits, and Arbitrations: For purposes of identifying incidents that may relate to the alleged defect in a subject vehicle, 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 sorted in accordance with the categories described above. Ford has also located other lawsuits, claims, or consumer breach of warranty lawsuits, each of which 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 F. The number of relevant lawsuits and claims identified is also provided in this log. To the extent available, copies of complaints, first notices, or FMC360 reports relating to matters shown on the log are provided Appendix D. 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. 3, 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. Vehicle's speed at time of incident;
h. Incident date;
i. Report or claim date;
j. Whether a crash is alleged;
k. Whether a fire is alleged;
l. Whether property damage is alleged;
m. Number of alleged injuries, if any; and
n. Number of alleged fatalities, if any.

Provide this information in Microsoft Access 2007, or a compatible format, entitled "PE14-030 REQUEST NUMBER THREE DATA," See Enclosure, A Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

Answer

Ford is providing owner and field reports in the database contained in Appendix C 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 as Appendix F.

Request 4

Produce copies of all documents related to each item within the scope of Request No. 3. 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 database contained in Appendix C in response to Request 2. Copies of complaints, first notices, or FMC360 reports relating to matters shown on the Log of Lawsuits and Claims as Appendix F are provided in Appendix D. 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 information:

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 2007, or a compatible format, entitled "PE14-030 WARRANTY DATA." See Enclosure, A Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

Answer

Records identified in a search of the AWS database, as described in Appendix B, were reviewed for relevance and sorted in accordance with the categories described in the response to Request 2. The number and copies of relevant warranty claims identified in this search that allege loss of electric power assisted steering in a subject vehicle are provided in the AWS portion of the database contained in Appendix C. The categorization of each report is identified in the "Category" field.

When we were able to identify that duplicate claims for an alleged incident were received, each of these duplicate claims was marked accordingly and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one claim associated with their VINs. These claims have been counted separately. Warranty claims that are duplicative of owner and field reports are provided in Appendix C but are not included in the report count above.

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 FMC360 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 No. 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 2010 through 2012 model year Ford Fusion and 2010 through 2011 Mercury Milan 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. For 2010 through 2012 model year Lincoln MKZ vehicles, the New Vehicle Limited Warranty, Bumper-to-Bumper Coverage begins at the warranty start date and lasts for four years or 50,000 miles, whichever occurs first. Optional Extended Service Plans (ESPs) are available to cover various vehicle systems, time in service, and mileage increments. The details of the various plans are provided in Appendix G. As of the date of the information request, 163,969 new vehicle ESP policies had been purchased on the subject vehicles.

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 loss of electric power assisted steering while driving, 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.

Ford notes that, while the alleged defect is "loss of electric power assisted steering while driving", many service messages are meant as general service tips for the technician and do not specify whether the vehicle is being driven at the time of the loss of power steering assist. However, in an abundance of caution, Ford included all messages relating to loss of power steering assist in our response below.

OASIS Messages: Ford has identified seven SSMs and one TSB that may relate to the agency's request and is providing copies of them in Appendix H1.

Internal Service Messages: Ford has identified two ISMs that may relate to the agency's request and is providing copies of them in Appendix H2.

Field Review Committee: Ford has identified no field service action communications that may relate to the agency's request.

Request 8

> Describe all assessments, analyses, tests, test results, studies, surveys, simulations, investigations (including field inspections), 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 I.

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 in 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. Redacted copies of the confidential documents will be provided under separate cover, on separate media, to the agency's Office of Chief Counsel as Appendix J – Redacted. As of the date of this response, Ford is still in the process of obtaining some supplier confidentiality certificates and documents, and will provide the certificates and documents once they are received.

In the interest of ensuring a timely and meaningful submission, Ford is not producing materials or items containing little or no 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. If the agency would like additional materials, please advise.

Request 9

Describe all modifications or changes made by, or on behalf of, Ford in the design, material composition, manufacture, quality control, supply, software, or installation of the subject systems, from the start of production to date, which relate to, or may relate to, the alleged defect or subject condition in the subject vehicles. 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. The applicable models;
c. A detailed description of the modification or change;
d. The reason(s) for the modification or change;
e. The part number(s) and a description (service and engineering) of the original components;
f. The part number(s) and a description (service and engineering) of the modified components;
g. Whether the original unmodified component was withdrawn from production and/or sale, and if so, when;
h. When the modified component was made available as a service component;
i. A photograph or graphic showing each component, highlighting the design features that may relate to the alleged defect or subject condition; and
j. 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 in Appendix K.

Request 10

State the number of the subject components 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 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 dealers. Ford has no means 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 information pertaining to supplier point of contact and vehicle usage for each part number, the total number of Ford service replacement EPAS gear assemblies (which, on the subject vehicles, includes the torque sensor, power steering control module, position sensor, and motor) by part number (both service and engineering) and month and year of sale, where available, in Appendix L.

Request 11

Provide the following information regarding the subject vehicles and subject system:

a. Describe the subject system and provide diagrams of the complete steering system;
b. Provide a functional block diagram of the subject system showing all EPAS controllers, sensor inputs and actuator outputs;
c. Describe the subject system diagnostics, including a list of all associated diagnostic trouble codes, the name/description of each, a detailed description of the conditions necessary to set the code, and the conditions necessary to clear the code;
d. Provide a video file showing all driver visual and audible chimes, messages, and/or warning lamps associated with each of the faults identified in 11.c;
e. Describe failsafe operation for the subject system for each of the faults/conditions identified in 11.c, including the transition times from normal to failsafe mode and any restrictions on when the transition can occur (e.g., maximum steering torque at which change can be made from normal to failsafe mode);
f. Identify all vehicle design factors that Ford believes can influence steering effort in manual steering mode and provide the design information for the subject vehicles for each factor (e.g., steering ratio, front axle weight, etc);
g. Describe the range of speeds, lateral accelerations, steering angles, steering rates and steering efforts (normal and failsafe/manual modes) Ford believes can be expected for the subject vehicles in the following driving conditions/maneuvers: (1) parking lot maneuvers; (2) intersection turns (both right and left); (3) highway exit ramps (state all assumptions for speed and radius); (4) curves in roads with speed

limits 25 mph or less; (5) curves in secondary roads with speed limits of 30 to 45 mph; and (6) highway driving with speed limits at or above 60 mph;

h. Provide a table showing steering hand wheel forces for both normal and manual modes under the following conditions: (1) lock-to-lock static turning, (2) 0.1 g turn at 5 mph, (3) 0.25 g turn at 20 mph, and (4) 0.4 g turn at 30 mph;

i. Describe, and provide copies of all documents relating to, all testing performed to meet internal or external requirements for the steering system during transitions from normal to failsafe/manual steering mode (e.g., ECE R79); and

j. Describe, and provide copies of all documents relating to, all engineering requirements relating to changes in steering angle or steering effort during and after transition from normal to manual steering modes in the subject vehicles.

Answer

Ford is providing the requested information for subparts a through h in Appendix M.

To the extent that the requested information for subparts i and j is available, Ford is providing the requested documents and information pertaining to steering efforts in Appendix N with a request for confidentiality under separate cover to the agency's Office of the Chief Counsel pursuant to 49 CFR Part 512.

The power steering control module (PSCM) is the electronic control unit for the EPAS system. The PSCM monitors all sensor inputs and High Speed CAN messages that relate to the EPAS system and directly controls the output of the EPAS motor. The PSCM is self-monitoring and is capable of setting and storing diagnostic trouble codes (DTCs). Depending on the fault detected, the PSCM responds by either reducing or removing assist, and the PSCM may also send a request to the instrument panel cluster over the High Speed CAN displaying a message and alerting the driver of a potential EPAS concern. The action taken by the PSCM for each DTC is provided in Appendix M.

The system will go into Reduced Steering Assist Mode if any of the following conditions are detected:

1) Vehicle Speed signal lost over CAN,
2) Voltage to the EPAS module is below 10.8 volts or above 17 volts,
3) Environmental temperatures above 105 degrees Celsius at the EPAS module,
4) High friction detected in gear.

As mentioned, some DTCs may cause the system to go into Manual Steering Mode. If this occurs, the following actions will take place:

1) A warning chime will sound,
2) The message "POWER STEERING ASSIST FAULT" will be displayed in the message center, and
3) Steering assist will be removed.

If this occurs, the mechanical linkage between the steering wheel and the wheels is unaffected, the vehicle continues to be steerable, and the driver is instructed in the Owner's Manual to: "...stop the vehicle in a safe place, and turn off the engine. After at least 10 seconds, reset the system by restarting the engine, and watch the message center for POWER STEERING ASSIST FAULT. If the message returns, or returns while driving, take

the vehicle to your dealer to have it checked. With the message displayed, the steering assist is turned off, making the vehicle harder to steer."

The conditions necessary for power steering assist to be restored after a fault is detected by the PSCM will vary depending on the message displayed in the instrument cluster. If a particular fault causes a "POWER STEERING ASSIST FAULT" to be displayed, the driver is instructed in the Owner's Manual to stop the vehicle in a safe place, turn off the engine, wait at least 10 seconds, and reset the system by restarting the engine. If power steering assist is not restored, "POWER STEERING ASSIST FAULT" will continue to be displayed, and the vehicle will require dealership service to have power steering assist restored. Under other conditions "SERVICE POWER STEERING NOW" may be displayed, also requiring dealership service to have power steering assist restored. Regardless, there is no normal circumstance under which power steering assist would be turned off because of fault detection by the PSCM without driver notification via an audible chime and/or message displayed in the instrument cluster that there is a power steering assist fault.

Request 12

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, and
f. The reports included with this inquiry.

Answer

Ford's analysis of the information provided with this response indicates that the customer complaint rate for allegations of loss of power steering assist on the subject vehicles is low at 3.6 complaints per 1,000 vehicles. As previously mentioned, the alleged defect is "loss of electric power assisted steering while driving", and many reports do not contain sufficient information to determine whether the vehicle was being driven at the time of the loss of assist allegation. However, Ford included all reports alleging loss of power steering assist in Category A in an abundance of caution and believes the actual number of responsive reports is likely much lower, due to the several scenarios discussed below that may result in a reduction or loss of power steering assist when the vehicle is not in motion.

Even in the unlikely event of loss of power steering assist, base steering functionality is maintained, including the mechanical linkage between the steering wheel and the wheels, with steering efforts being greater at lower speeds and tighter turning radiuses as compared to higher speeds and/or larger turning radiuses. As described in the Owner's Manual, drivers are informed of a change in the status of the EPAS system via both an audible chime and the display of a power steering assist fault message in the instrument cluster. Additionally, braking functionality is maintained, affording the driver adequate opportunity to slow or stop the vehicle in a safe manner. This is particularly pertinent at lower speeds where the highest amount of steering assist is provided and where stopping distances are relatively short.

Furthermore, considering that: 1) loss of power steering assist, accompanied by visual and audible driver warnings, isn't expected to be more likely to occur during any particular driving maneuver, and 2) during a typical drive cycle, it seems likely that more vehicle operation time is spent on activities that require lower steering efforts or smaller steering inputs, or steady-state highway driving, than on operations that require higher steering efforts and inputs, such as low speed parking lot maneuvers, it is reasonable to conclude that loss of assist is more likely to occur at a time when lower steering efforts are required. It is also reasonable to conclude that if a driver becomes aware of a lack of assist condition at a time when lower steering efforts are required, it is likely that the driver will be better able to compensate for this lack of assist when conditions requiring higher steering efforts are encountered, thus increasing the ability to safely control the vehicle at lower speeds. Additionally, the very low probability of actually losing power steering assist, based on the reports included in this response, combined with the low probability that loss of assist would actually occur while driving at a time when the highest steering efforts are required, supports a conclusion that the real world likelihood of a driver experiencing loss of assist at a time when the highest efforts are being provided, although possible, is uncommon.

There are scenarios when the power steering assist may be removed at vehicle startup due to errors detected by the EPAS software. The two most prominent scenarios are when the voltage regulator responds to erroneous signals transmitted by the main micro at the time immediately after ignition on, and when the EPAS system detects high steering system friction. If certain signals were sent to the voltage regulator at start up, power could be shut off to either the motor encoders or torque sensor which would remove assist in less than a second after start up. Assist would be restored if the driver cycles the key. The EPAS diagnostic software was revised to address this issue beginning in January 2011. In another scenario, if the EPAS system detects high friction in the steering system, assist will be reduced during the drive cycle and removed at start up in the next key cycle. An analysis of the subject components returned from the field shows the first and second most frequent root causes for the removal of steering assist occur at start up (specifically, the voltage regulator issue and high friction detected in the steering system). In these scenarios, the loss of assist does not occur while driving. As noted previously in this response, many of the reports do not contain sufficient information to determine if the loss of assist occurred while driving.

By extrapolating this analysis to the reports provided in this response, a large number of the provided reports would not be considered responsive, as the power steering assist would have been removed when the vehicle was first started and not while being driven.

In addition, a Ford investigation identified three other quality issues that, in some cases, may result in loss of power steering assist in the subject vehicles:

1) Ribbon Cable Conformal Coating
2) Ribbon Cable Pin Misalignment
3) Relay Contacts

<u>Ribbon Cable Conformal Coat (Ford Diagnostic Trouble Code (DTC): C200D-49; TRW Fault Code: B9A)</u>:
When the motor printed circuit board (PCB) is assembled at Nidec, the ribbon cable and motor relay are soldered to the board. The board is then flipped over and a conformal coat is applied through an automatic process on specific locations of the board, one of which is the relay solder joints. The board is then placed in a fixture to dry for one minute, and then moves along a conveyor for four minutes to cure. This conveyor was originally tilted at three degrees

which allowed the conformal coat to run away from the relay, prior to curing, and pool around the ribbon cable connector. If the conformal coating seeped into the insulation of the ribbon cable it could subsequently cause intermittent connections. This issue is believed to have been associated with supplier capacity expansions that began in late 2010.

Ribbon Cable Misalignment (Ford DTC: C200D-49; TRW Fault Code: B9A):
The ribbon cable assembly is comprised of a 12 wire insulated ribbon cable with a cover and connector base on each end. Each of the 12 wires consists of seven strands. The ribbon cable is fed vertically through an automatic assembly machine. A cover and connector base is automatically fed into the fixture located on the horizontal surface of the machine. Slides push the cover and connector base into the ribbon cable, sandwiching the wires so that a connection is made. If the ribbon cable and connector base are allowed to move out of design position because of tolerances in the moving equipment, any of the seven strands can miss the "slot" and break. If there are fewer than seven strands inside the connector slot, the connection may be loose and, over time, may result in an intermittent connection.

Relay Contacts: Link Relay (Ford DTC: U3000-49; TRW Fault Code: B43) and Motor Relay (Ford DTC: U2011-49; TRW Fault Code: B3A):
The relay contacts (rivets) are built by a Tier 5 supplier (Doduco) in Spain. They are shipped in large batches (120,000 pieces per batch) to a Tier 4 supplier (TE Connectivity) in Portugal where they are assembled into the relays. Two relays, a motor relay and a link relay, are used in the subject component. The motor relay is shipped to a Tier 3 supplier (Nidec) in Zhejiang, China, where it is assembled into the motor assembly. The motor assembly is then shipped to a Tier 2 supplier (TRW Automotive Components) in Shanghai, China, where it is assembled onto the Electrical Power Pack (EPP). The link relay is shipped directly to the Tier 2 supplier (TRW Automotive Components) where it is assembled into the Power Filter Stage of the EPP. The EPP is then shipped to TRW Automotive in Marion, Virginia, where it is assembled onto the gear before being shipped to the Hermosillo Assembly Plant for installation in the subject vehicles.

When the relay contacts were originally manufactured at the Tier 5 supplier, voids could exist between the copper and silver layers on the bi-metal contacts. Sulfur used in the cleaning process at the Tier 5 supplier could then get into the voids causing copper sulfate corrosion on the contact surface, potentially resulting in a loss of connection. Loss of power steering assist resulting from relay contact corrosion would typically be expected to occur at vehicle start up.

Ford notes that most of the field reports included with this response are related to technician requests for assistance with vehicle diagnosis and repair, and do not pertain to driver's ability to control their vehicles when loss of power steering assist occurs. To address technician diagnosis questions, Ford issued various service messages (copies provided in Appendixes H1 and H2) informing technicians that selected diagnostic procedures in the shop manual related to loss of power steering assist had been revised, improving the technician's capability of vehicle diagnosis and repair without the need for diagnostic assistance.

Summary:
Ford's analysis of the information provided with this response indicates that the customer complaint rate for allegations of loss of power steering assist on the subject vehicles while driving and while parked is low at 3.6 complaints per 1,000 vehicles. This rate is substantially lower than the complaint rate of 12.6 complaints per 1,000 vehicles associated with investigation EA04-018 which the agency closed without action. More recently, the agency closed PE07-023 without action on vehicles with a complaint rate of 8.9 complaints per 1,000 vehicles and similar time in service relative to the vehicles that are the subject of this

information request. The complaint rate for the alleged defect of "loss of assist while driving" is even lower than 3.6 since a significant number of ambiguous reports alleging a loss of assist are believed to have occurred at start up.

Ford has also tested the increase in steering efforts during a loss of power steering assist while driving a subject vehicle and compared the results to a larger vehicle. The increase in measured steering efforts for the subject vehicles is significantly less than the increase in steering efforts for a larger vehicle in similar loss of steering assist events. For example, during a 0.4g maneuver, the hand wheel torque required by the driver of the subject vehicle went from 10 Nm to 32 Nm (an increase of 22 Nm), while a similar maneuver in a larger vehicle went from 17 Nm to 57 Nm (an increase of 40 Nm). In a 0.1g maneuver, the subject vehicle the hand wheel torque required went from 7 Nm to 18 Nm (an increase of 11 Nm) and the larger vehicle went from 10 Nm to 28 Nm (an increase of 18 Nm). Consistent with the less objectionable increase in steering efforts measured during a loss of power steering assist event, Ford's report analysis found that the proportion of complaints describing an alleged loss of assist event using terms such as "vehicle steering locked up on me " was only 2% of the total number of complaints for the subject vehicles. This proportion compares to approximately 20% of the complaints reviewed in response to Ford Explorer PE12-017. Ford notes that verbatims alleging steering "lock up" are inconsistent with the failure mode of the subject component, our engineering analysis of returned parts, and our investigation of this issue, however, the less objectionable description of the loss of assist is consistent with Ford's measured data and suggests that the relative ability of drivers to maneuver the vehicle without steering assist is significantly greater in the subject vehicles than the Explorer. In addition, Ford evaluated the subject vehicle during a loss of assist event using the Neukum-Kruger Handling & Controllability Rating scale (lower rating being less objectionable) and found the rating to be noticeably lower than the rating for a larger vehicle in a similar event.

In summary, Ford believes that loss of power steering assist in the subject vehicles does not present an unreasonable safety risk in these vehicles based on the following reasons:

1) A low overall rate of reports,
2) A significant number of ambiguous reports alleging a loss of assist that are believed to have occurred at start up and not while driving,
3) The measured steering efforts required to control the subject vehicles in the event that steering assist is lost while driving is significantly less than required on larger vehicles. This is further supported by the less objectionable customer descriptions of an alleged loss of assist event on the subject vehicles when compared to report descriptions on a larger vehicle.
4) The mechanical linkage between the steering wheel and the wheels is maintained at all times, allowing the vehicle to be steered in a safe and controlled manner,
5) Drivers are clearly informed of a change in the status of the steering system via both an audible chime and the display of a power steering assist fault message in the instrument cluster,
6) The loss of power steering assist is unlikely to be associated with accidents at higher speeds because the amount of assist supplied is inversely proportional to vehicle speed and, therefore, greatest at low speeds, such as during parking lot maneuvers, and reduced as vehicle speed increases. The reports included with this response support this conclusion.

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