

Ford Motor Company

Automotive Safety Office
Environmental and Safety Engineering

January 9, 2009

Ms. Kathleen C. DeMeter, Director
Office of Defects Investigation Safety Assurance
National Highway Traffic Safety Administration
1200 New Jersey Avenue, S.E. W45-302
Washington, D.C. 20590

Dear Ms. DeMeter:

Subject: PE08-060 NVS-213cnl

The Ford Motor Company (Ford) response to the agency's October 16, 2008, letter concerning reports of alleged premature tire valve cracking in vehicles utilizing TR413, TR414 and TR418 snap-in tire valves is attached.

Common experience and the data presented in this response shows that loss of tire air pressure occurs frequently for a wide variety of reasons. The need to repair or change a tire due to air loss is so common that almost all vehicles sold in the United States have repair or replacement equipment as standard features. To determine whether cracks in valves have resulted in a significant increase in the rate of air loss reports, we must evaluate the report information in the context of the typical number of air loss events during normal operations. The incidents of air loss due to cracks in valves in this population of vehicles is not a significant increase compared to the number of air loss events typically experienced by drivers.

Ford has thoroughly evaluated the potential consequences of a valve crack resulting from an identified lack of anti-ozone constituents in the chemical formulation. Unlike other tire investigations in which the structural integrity of the tire can be compromised resulting in a loss of vehicle control, this condition does not present any such risks. The condition causes a slowly propagating crack in the valves that can potentially, but not always, result in an air leak over a period of several minutes, or longer. An air leak resulting from a slowly propagating crack in the tire valve does not result in sudden and rapid tire deflation, does not impair an operator's ability to safely control a vehicle, and does not present an unreasonable risk to vehicle safety. Steering and braking control are fully maintained even in the event that the leak causes a complete loss of pressure. The lack of reports of loss of control, accidents or injuries in the very large population of vehicles reviewed for this response to this inquiry supports this conclusion. In fact, a review of the reports that indicate a tire was replaced due to damage resulting from operating underinflated for an extended period of time, finds not even one allegation of loss of vehicle control. This is not an unexpected result for several reasons. The progressive nature of valve cracks due to the improper material formulations is a slow,

2009 JAN 13 AM 8:18



January 9, 2009

propagating leak over time and a sudden, rapid, complete deflation of the tire is not likely to occur.

If the cracks are not identified and addressed, and a slow leak occurs, the leak will most likely be identified during routine inspection and maintenance or, because the majority of the vehicles manufactured during the time period in question were manufactured with a Tire Pressure Monitoring System (TPMS), via a TPMS warning on vehicles equipped with the system.

The agency has previously concluded that slow and even more rapid air loss due to a valve concern does not present an unreasonable safety risk in larger Ford vehicles, that were not equipped with TPMS, as stated in the closing resume for EA02-018 dated August 23, 2003. The agency concluded, after extensive vehicle testing, that an operator's ability to control a vehicle under such circumstances was not compromised. That conclusion is consistent with the circumstances pertaining to this investigation and is supported by the information provided in reports in response to this inquiry.

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 PE08-060

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 16, 2008, the date of your inquiry. Ford has searched within the following offices for responsive documents: Environmental and Safety Engineering, Ford Customer Service Division, Purchasing, Global Core Engineering, Office of the General Counsel, Vehicle Operations, and Product Development..

Request 1

State, by model and model year, the number of 2006 through 2008 vehicles equipped with subject components 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 2000, or a compatible format, entitled "PRODUCTION DATA." See Enclosure I, Data Collection Disc, for a pre-formatted table which provides further details regarding this submission.

Answer

Ford records indicate that the approximate number of 2006 through 2008 model year vehicles equipped with the TR413 or TR414 snap-in tire valves 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 5,934,233. Ford notes that it did not utilize TR418 model tire valves.

The requested data for each subject vehicle is provided electronically in Appendices A2006, A2007, and A2008 on the enclosed CD.

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 model year 2006 through 2008 Ford vehicles equipped with the subject components:

- 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;
- 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 electronically in Appendix B on the enclosed CD.

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

Category	Allegation
A1	Allegations of a tire leak related to a cracked or leaking tire valve
A2	Allegations of a cracked valve without indication of an air leak
B1	Allegations of tire leaks with a valve replacement but ambiguous if related to the alleged defect

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 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 III portion of the electronic database contained in Appendix C on the enclosed CD. 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, OGC. Ford's OGC is responsible for handling product liability lawsuits, claims, and consumer breach of warranty lawsuits and arbitrations against the Company. 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 OGC. Non-privileged documents for files that were located that are related to the responsive owner reports are provided electronically 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 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.

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 67 Vehicle Owner's Questionnaires (VOQs). Ford made inquiries of its MORS 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. Any reports located on a vehicle identified in the VOQs related to the alleged defect are included in the MORS and CQIS portions of the electronic database provided in Appendix C and have been identified by a "Y" in the "VOQ Dup" field. Two additional MORS reports were located searching by VINs provided in the VOQs and those reports are provided in Appendix C1.

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. One ambiguous claim was identified related to VIN 1FTRRF12277KC [REDACTED] that alleged some sort of accident approximately one month prior to the contact due to "a faulty valve stem." The contact provided that no police report was filed, no insurance claim was filed, and the vehicle had been repaired at an independent facility. The claim was subsequently closed without further action because the claimant did not respond to Ford's requests for information.

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.

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 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 H1 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 H2. 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. The number of tire valves alleged to have cracked;
- j. The tire positions of the valves alleged to have cracked;
- k. Whether air leakage from a cracked valve is alleged for one or more tires (yes/no);
- l. The number of tire valves alleged to have leaked air from a cracked valve;
- m. The tire positions where air leakage from a cracked valve is alleged, if known;
- n. Whether tire damage is alleged (yes/no);
- o. The position(s) of the tire(s) allegedly damaged by air leakage from a cracked valve;
- p. Whether a loss of control is alleged (yes/no);
- q. Whether a crash is alleged (yes/no);
- r. Whether property damage is alleged (yes/no);
- s. Number of alleged injuries, if any; and
- t. Number of alleged fatalities, if any.

Provide this information in Microsoft Access 2003, or a compatible format, entitled "REQUEST NUMBER TWO DATA," See Enclosure, Data Collection Disc, for a preformatted table which provides further details regarding this 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 H1.

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 H1) are provided in Appendix H2. 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 model year 2006 through 2008 Ford vehicles: equipped with the subject components: 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. If air leakage is alleged (yes/no);
- j. If a claim for tire replacement was made;
- k. Replacement part number(s) and description(s);
- l. Concern stated by customer; and
- m. Comment, if any, by dealer/technician relating to claim and/or repair..

Provide this information in Microsoft Access 2003, or a compatible format, entitled "WARRANTY DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table which 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 categorized 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 may relate to the agency's investigation are provided in the AWS portion of the electronic database contained in Appendix C on the enclosed CD. 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 MORS reports identified above in response to Request 2. Such claims that were honored are included in the warranty data provided.

Ford assumes that providing the warranty claims in the electronic database format meets the requirements of this request because the agency can review or order the claims as desired.

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 2007 model year vehicles equipped with the subject components, 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 Ford and Mercury vehicles, and four years or 50,000 miles for Lincoln vehicles. Optional Extended Service Plans (ESPs) were available to cover various vehicle systems, time in service and mileage increments. No incremental valve coverage was available under any of the optional ESPs

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 the alleged defect, 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 no SSMs and no TSBs that may relate to the alleged defect in the subject vehicles.

Internal Service Messages: Ford has identified one ISM that relates to reminding dealers that tire valves are covered under the standard bumper to bumper warranty in the subject vehicles and is providing a copy of it in Appendix I2.

Field Review Committee: Ford has identified no field service action communications that may relate to the alleged defect in the subject vehicles.

Electronic Field Communications: Under certain circumstances Ford may utilize Electronic Field Communications (EFCs) to communicate information of interest to all dealerships including product or service information or items receiving media attention that could cause customers to visit dealers in search of more information. Ford identified one EFC related to the subject of this inquiry that provided general information to dealerships and reemphasized Ford's warranty policy. A copy of the EFC is provided in Appendix I2.

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 J.

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 K 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. 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

Ford construes this information request to be "start of production" for the 2006 model year because those are the earliest vehicles for which the agency has requested information in this inquiry. A table of the requested changes is provided electronically as Appendix L on the enclosed CD.

Request 10

State the number of subject components sold by Ford from January 1, 2006 to date by component name, part number (both service and engineering/production), vehicle application (vehicles using the part by model and model year) and month/year of sale (including the cut-off date for sales, if applicable).

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 total number of Ford service replacement valves by part number (both service and engineering) and year and month of sale, where available, in electronic form in Appendix M1 on the enclosed CD. Information pertaining to service usage for each part number, and supplier point of contact information, is also included in Appendix M1.

Although Ford specifies a manufacturing source for parts used in vehicle production, that source may or may not be used by Ford Customer Service Division (FCSD) to obtain parts for distribution to Ford dealers. In this particular instance, FCSD does obtain service parts from the same valve manufacturer, but dealers are allowed to procure valves locally from alternate sources because they are a consumable commodity. Also, please note that in some cases the FCSD part number is for a kit that contains more than one valve. Ford notes that one part number supplied in Appendix M1 is a package of five valves that was released to support FSA 07S48 related to Crown Victoria Police Interceptor wheels, and while, as indicated, Ford has no means to determine actual use of every package purchased, it is expected that a large number of the kits were used to support the FSA.

Each vehicle provided in response to Request 1 would have received five valves (four tires plus the spare tire). With the exception of the Lincoln Town Car (prior to 2008 MY), the Lincoln LS, and the 2006 MY E150 vehicles that utilized TR413 tire valves, all of the other vehicles listed in Appendix A utilized TR414 valves. Supplier contact information is provided in Appendix M2.

Request 11

Describe, and provide copies of all documents relating to, all communications between Ford and each supplier of subject components from January 1, 2006 to date that may relate in any way to the alleged defect.

Answer

Ford is providing the requested information electronically as Appendices J and K.

Request 12

Provide the following information about the subject vehicles and subject components:

- a. Copies of all Ford specifications for the subject components since January 1, 2000 (i.e., if the specification has changed during that time, provide copies of the original specification and each revision);
- b. Copies of all Ford design/and/or process failure mode and effects analyses related to the subject component;
- c. Describe, and provide copies of all documents relating to, all testing conducted by, or for, Ford of the subject components since January 1, 2006;
- d. A table of subject vehicles showing tire usage by brand, tire line, and size;
- e. A table of subject vehicles showing recommended tire inflation pressures; and
- f. A table of subject vehicles showing tire pressure monitoring system usage, with pressure range where warning would be provided.

Answer

Information provided in response to parts a. through c. is provided in Appendix K.

Information provided in response to parts d. through f. is provided in Appendix N. The information provided in Appendix N provides the tire options available by vehicle platform. To further assist the agency in its evaluation Ford is also providing, by VIN, in Appendix A the requested tire information where available.

Ford notes that for part e. a strategy is applied that takes into account the tire wheel system, recommended pressures and component variability to ensure the TPMS system will activate as required by safety standards. There is not a range prescribed where a warning would be provided.

Request 13

Provide the following information about the effects of inflation pressure on tire failure and the effects of tire failure on vehicle control:

- a. Describe, and provide copies of all documents relating to, all testing conducted by, or for, Ford relating to the effects of tire inflation pressure on tire operating temperature and/or tire durability;
- b. Describe, and provide copies of all documents relating to, all testing conducted by, or for, Ford since January 1, 2000 relating to vehicle dynamic response to tire failures and identify the vehicles (model and model year), tire positions tested, type of tire failures tested, test conditions, test results and test conclusions;
- c. Describe, and provide copies of all documents relating to, all analyses/assessments of tire related crash incidents that have been conducted by, or for, Ford since January 1, 2000 and provide a spreadsheet of all such incidents with the following information: (1) crash date; (2) vehicle make, model year and VIN (if multiple vehicles were involved, so state, and give the requested information for the vehicle experiencing the tire failure); (3) position of failed tire (front/rear, left/right); (4) type of tire failure; (5) driving conditions when the tire failure occurred (speed, turning, braking); (6) Ford's assessment of the vehicle response to the tire failure; (7) Ford's assessment of the driver response to the tire failure; (8) a description of the crash; (9) the number of deaths and injuries resulting from the crash; and
- d. Describe, and provide copies of all documents relating to, all analyses of crash databases conducted by, or for, Ford since January 1, 2000 that related in any way to tire related crashes.

Answer

The scope of this request is so broad that it would require Ford to make an exhaustive search for materials unrelated to the subject vehicles or the alleged defect in this information request. The request seeks information relating to the effects of tire pressure on tire failure and effects of tire failure on vehicle control, on a population of vehicles that includes virtually every segment of light duty vehicles including cars, trucks, SUVs and CUVs and, by definition, includes reasons and vehicles unrelated in any way to this investigation. Similarly, this request seeks Ford's assessment relating not only to tire failure due to deflation, but also for any other reason. Ford has not undertaken to conduct the comprehensively exhaustive search that the literal terms of

this request would necessarily entail, but we are providing references to tire air pressure loss materials that may be informative.

For example, the agency's closing resume to EA02-018, dated August 23, 2003, documents testing conducted jointly by Ford and ODI engineers to evaluate the effects on vehicle controllability of both slow air loss (defined as pressure dropping from 72 PSI to 2 PSI in approximately four and one half to six minutes) and rapid air loss (defined as complete tire deflation in less than ten seconds for a valve core ejection and less than four seconds for a valve ejection from the wheel) relating to the valves, in the front tires of larger F-Super Duty vehicles. The test conditions and parameters were determined by the agency, including evaluation of the effects on the front tires only. This testing, conducted at Ford's Michigan Proving Grounds, under a variety of conditions with VRTC engineers as test drivers led to the agency's conclusion, "Both drivers concluded that, based on the dynamic handling test, the test vehicle presented no unusual or difficult controllability demands upon the driver when faced with either a slow or rapidly deflating front tire." The vehicles that were the subject of EA02-018 did not have a Tire Pressure Monitoring System (TPMS) as do the majority of the vehicles that are the subject of this PE. Because this information is already in the custody of the agency, we are not providing it with this response.

We also refer to FMVSS 110 performance requirements and Ford's related Corporate Engineering Test Procedure 04.4-R-802-US (Passenger Car Tire Retention Test). This procedure evaluates vehicle performance to FMVSS 110, specifically, "In the event of rapid loss of pressure at 97 kph, the deflated tire must be retained until the vehicle can be stopped with controlled braking." While the acceptance criteria for this test procedure do not directly include a vehicle controllability assessment, it is nevertheless, a key element of the test. Vehicles included in the subject vehicle population comply with this standard. As the agency is aware, any FMVSS test requirement, by law, demonstrates meeting the need of motor vehicle safety.

Ford notes that the scope of this request also includes vehicles that were the subject of a Bridgestone/Firestone, Inc. tire recall as well as vehicles that may experience a tire failure for any number of other reasons including road hazard or vehicle component failures. As the agency is aware, the Firestone tire issue spanned millions of vehicles and a large number of alleged incidents related to the tires. Due to the nature of the tire issue and the large number of vehicles involved both local (non-Ford) legal counsel and Ford OGC resources were utilized to address the matters. In some instances non-Ford counsel had vehicle evaluations conducted as well as testing performed. Information and results from such evaluations and testing is not under the direct control of Ford, nor does Ford necessarily have all of the information related to such evaluations or tests. Further, due to the litigious nature of these matters much of the information, if it were located by Ford, would be protected by Attorney - Client privilege (privilege) and the log of privileged documents alone would be unmanageable in a reasonable amount of time, and would not provide information germane to the topic of this information request.

Also, Ford has previously provided the agency a substantial amount of data concerning 235 tire related reports from Ford's Early Warning Report data in response to DI06-Explorer, dated March 7, 2006, that may be informative for the agency's analysis here. Given the litigious nature of our society, Ford, like all major vehicle manufacturers, receives some number of legal claims alleging tire issues on an ongoing basis. Many of those cases are still pending and our analyses would be protected from disclosure by the Attorney-Client and Attorney Work-Product privileges. Ford has provided responsive information from legal claims with allegations that may be potentially related to the subject vehicles and the subject defect in this investigation.

However, Ford has not undertaken a search for data and analysis involving allegations that are unrelated to the scope of this investigation.

If the agency has questions about any specific tests or incidents Ford will continue to cooperate in responding to those requests.

Ford notes that any crash database analyses that it would have conducted would be those databases maintained by the agency. Ford has not undertaken any such analyses regarding the subject of this inquiry, and analyses previously undertaken for the issues mentioned would have been provided to the agency in response to those inquiries.

Request 14

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 of tire failure while driving at highway speed. To the extent that Ford considers the safety risk to be dependent on the type of tire failure (e.g., tread separation or sidewall failure), tire position (axle or side), driving conditions (e.g., speed, turning, braking), vehicle characteristics or driver behavior, so state and describe the variability Ford believes exists within each factor, the reasons for the variability and the underlying data Ford used for each assessment;
- 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

In order to fully respond to the scope of this request, Ford will first provide our investigation process summary and technical analyses, including the specific topics referenced in your request, and then provide Ford's assessment of the alleged defect.

Generic Valve Information

Industry standard model numbers are used to describe tire valves. For instance, TR413 and TR414 valves are industry standard, low pressure application, "snap-in" valves with prescribed lengths of 1.25 inches and 1.5 inches, respectively. There are a number of valve manufacturers worldwide that produce a particular standard model number valve and while essentially dimensionally equivalent, these valves may have very different material properties. For example, a TR413 valve from one manufacturer may be predominately EPDM while another manufacturer may utilize some percentage of natural rubber with EPDM. Additionally, different types and levels of additives may be included in the compound for protection against ozone. Other chemicals also may be added to gain some other desirable material property. More significantly, a valve manufacturer can produce valves that differ significantly in material composition depending on a specific customer's specifications.

Valves are not traceable by part or serial number. As the agency is already aware, Shanghai Baolong typically marks the underside of their valves with a triangle shape. A Shanghai Baolong valve is available in the U.S. through importers (for instance Tech International), and

except for slight dimensional differences they are virtually indistinguishable from the same model number valves produced on tooling for producing valves for Ford. Other designations on the valve underside indicate mold and cavity numbers, without any reference to date of manufacture. Ford has some indication that the material properties of the non-Ford valves produced by Shanghai Baolong for other OEMs or imported for distribution to aftermarket tire businesses in the U.S are different than those produced for Ford. These different material properties can lead to very different performance in the field.

Ford specified the performance requirements for the subject valves in lieu of specifying the specific material formulation used to produce the valves. For example, a proposed valve material compound would have been tested utilizing Ford's Design Validation testing methodology. If that compound met the durability and performance criteria specified by Ford it was expected that the valve manufacturer would produce valves in that manner without deviation unless first obtaining approval from Ford to deviate from the approved process and/or compound. In-process testing is required of the valve manufacturer to demonstrate continued compliance to Ford's specifications.

Chemical compounds are added to protect against ozone damage to the valve exterior. The valve material also can be damaged by strong acidic or alkaline compounds. Damage to bonds between the natural rubber and EPDM materials that can result in cracks or "checks" in the valve material can result from such exposure. Such cracks originate on the valve's exterior surface and may propagate through valve material in the presence of continued chemical exposure. Improper valve installation, or incorrect material or manufacturing processes also may make the valves more susceptible to chemical degradation. Valve damage due to these conditions may be exacerbated by physical cycling of the valve during tire rotation, depending on the envelope of unconstrained motion.

Ford Valve Information

Ford predominately uses TR414 model valves in the production of vehicles using low pressure snap-in tire valves. Only the Lincoln Town Car, produced at Ford's Wixom assembly plant, utilized TR413 valves for the 2006 and 2007 model years. The Town Car production was moved to the St. Thomas assembly plant for the 2008 model year and TR414 valves were used for production. In December, 2004, Ford's primary supplier of low pressure valves (Eaton) announced their intention to permanently exit the tire valve business. During the summer of 2005, Ford's supplier (Dill, owned by Eaton) was purchased by Shanghai Baolong. The tooling and manufacturing of Ford's tire valves was relocated from the U.S. to Shanghai Baolong's facilities in China during the fall and winter of 2005.

Ford's Automotive Safety Office, during a review of TREAD data, and Product Design (PD) engineering, identified a higher than expected number of reports relating to cracked or leaking tire valves during the summer of 2008. As Ford investigated the reports it was apparent that a significant portion of the reported valve leaks were being identified during routine vehicle maintenance, during tire rotations, during routine owner maintenance and inspection for proper tire inflation, and during repairs for unrelated road hazards. In other cases they were identified when a slowly leaking tire was presented for repair. Many of the reports indicated a slow air leak with repeated inflation over days or weeks, and sometimes for an even longer period prior to repair being sought. As Ford continued its investigation it was noticed that the reports appeared to involve vehicles produced during a specific production period. Communication with Shanghai Baolong concerning Ford's observations led to the information that valves produced on a few certain days of production at Shanghai Baolong may not be of the same quality as valves produced on other days. Without further details of the specific manufacturing issues

Ford undertook laboratory testing to try to better understand the specific issue with the valves in question. Ford was able to locate a small number of uninstalled valves in a parts depot that were produced on one of the days mentioned by Shanghai Baolong; these valves were tested to evaluate their performance. Ford also had valves specifically produced with varying amounts of material, such as EPDM, for comparison testing to the production valves in question.

Based on its laboratory testing Ford believes that the valves indicated by Shanghai Baolong as possibly having lower than expected quality were likely inadvertently produced without the expected level of anti-ozone chemical agent.

No standard testing method exists to simply test a part and determine its exact material formulation at the time of production. Due to the reactive nature of the materials involved, testing of "virgin" production valves to determine what materials and the amounts of those materials that were present at the time of manufacture is inconclusive. Because the anti-ozone additive is consumed when the valve material is in the presence of ozone, and a subsequent inert compound is formed on the exterior surface of the valve (that also protects the valve from further ozone damage), an estimation of the additive present at the time of manufacture would require very precise knowledge of the levels and times of exposure in order to make an accurate estimate. Further, the natural rubber and other materials may degrade over time at a rate that is highly dependent on the operating environment to which they are exposed, resulting in imprecise estimates regarding their constituent material content at the time of manufacture. Also, the rubber blend is non-homogenous, meaning a sample that is measured for constituent raw material make-up is an average and at best provides a range of material content throughout the valve.

As a result of Ford's ongoing investigation into reports of valve cracking, Ford undertook steps to improve valve component and manufacturing process robustness. Certain tests were developed that Ford believes are new to the industry and, in fact, has requested patents to be issued in some cases. A list of the testing, both completed and on-going is provided in response to Request 8 in Appendix K. Ford has put additional in-process testing in place at the valve manufacturer as well as added material specifications to supplement the performance specifications that were previously in place.

Ford's investigation was made more difficult in that the parts, as previously described, are not traceable once they are removed from their original shipping container. Valves on vehicles in service (after having been removed from the original shipping container, mixed in stock hoppers and randomized in bowl feeders at the vehicle assembly plant) are indistinguishable from not only the day of manufacture, but also the month or even the year.

The valves used in Ford vehicles are imported by Shanghai Baolong and staged at a location in Michigan. Shanghai Baolong distributes the valves from the staging location to Ford customers (assembly plants, FCSD, prototype build facilities, etc.) as they are ordered. Shipping records provided by Shanghai Baolong (received by Ford subsequent to the date of this inquiry and are not included in response to this inquiry) indicate the valves produced on the days of interest were distributed to Ford assembly plants between October 2006, and March, 2007. The shipping information also indicates that the valves produced on the days of interest were shipped along with valves produced on other days and thus mixed in the shipments to the assembly plants. Once received at the vehicle assembly plants the valves are typically fed into storage hoppers that feed bowl feeders for automatic installation and hence are further mixed. The reports identified by Ford show a trend of higher than expected tire valve complaints for vehicles produced between November, 2006 and May, 2007. Production information provided to Ford by Shanghai Baolong supports this observation.

Ford vehicles manufactured during this time were typically designated as 2007 model year vehicles with the exception of the Ford Escape/Mercury Mariner that had a January, 2007 Job#1 date for the 2008 model year, causing the 2008 model year Escape/Mariner vehicles to appear as anomalies if the report data is sorted by model year.

It is noted that FCSD did not receive any of the TR414 valves produced on the days Shanghai Baolong has identified as in question, and FCSD typically makes TR413 valves available for dealers to purchase in service. We are not aware of any elevated rate of reports related to TR413 valves produced for Ford, nor has the supplier indicated any potential issues related to those valves.

Non-Ford Valves

Ford is aware of both Tech International's and Dill ACP's "safety recalls" for valves reportedly manufactured by Shanghai Baolong. Though the valves subject to these recalls were apparently produced by the same manufacturer that produces valves for Ford, Ford has no information regarding what led Tech International or Dill ACP to their decisions to conduct "safety recalls." Ford is aware that valves produced for Ford by Shanghai Baolong are produced on Ford specific tooling to Ford's specifications. Because Ford does not have information regarding the materials, specifications or production methods utilized for non-Ford valves, we can draw no conclusions related to the non-Ford valves, how the performance of those valves compares to the performance of valves used by Ford, or the basis for the decisions leading to these "recalls."

VOQs

The agency provided 67 VOQs with the information request. Ford notes that 23 of the VOQs did not contain VINs. Based on the limited information available, Ford identified what it believes are correct VINs for 17 of those 23. For the six VOQs that are not identified by VIN, Ford is unable to determine a VIN from the information provided. We were unsuccessful in obtaining further information from the agency and as a result unable to search our records for related reports. The VIN recorded in one of the VOQs appears to be incorrect. The vehicle listed as 1FTPW12514KD [REDACTED] is for a 2004 F-150 vehicle, not the 2007 Expedition described in the VOQ.

Approximately 15% of the VOQs report tire replacement related to a leaking valve. It is noteworthy that those reports indicating a tire replacement typically report tire structural concerns due to operating in an underinflated condition, and none indicate any actual structural failures of the tires or loss of vehicle control.

Several of the VOQs allege a slow leak related to a cracked valve. The VOQ related to VIN 1FTPW12V97KC [REDACTED] mentions that the TPMS indicator activated at some point during an approximately 200 mile trip. The operator reports continuing to their destination before checking the tires to find one tire at 10 psi. The VOQ related to VIN 3MEHM07Z27F [REDACTED] indicates experiencing a "slow leak" and having to "refill every few days." This person goes on to say the reason they contacted the agency was because "they heard about the valves," although the vehicle apparently has not been inspected or repaired to diagnose the cause of pressure loss. The VOQ related to VIN 1FMEU63E07UA [REDACTED] reports that "the valves on my tires are causing constant low tire pressure, to the point that one of my tires now has a hole in it." It is not clear that the reported damage is even due to a leaking valve or what is meant by "hole" in the tire.

The VOQ related to VIN 1ZVHT85H17 reports "... I have to constantly keep adding air to the tires." This owner continues to state that they have heard about the valves and think that they "could" be affected. Apparently the valves have not been inspected on this vehicle and the issue has not risen to the urgency that would cause the owner to have the vehicle inspected and, if necessary, repaired.

The tone of the VOQs does not appear to represent a concern for vehicle safety, or in many cases any urgency. Rather, these reports convey dissatisfaction or disappointment with any associated inconvenience. Ford already provides an appropriate solution to the issue under its warranty policy.

This investigation concerns two issues: 1) whether valves are cracking and causing loss of air pressure at a significantly higher rate than the typical rate of air loss for any and all reasons; and 2) whether cracks in valves create some failure mode that poses an unreasonable risk of accidents or injuries. The data and analysis generated in response to this inquiry show that answer to both issues is "no."

1. The rate of air loss reports due to valve cracks is not significant.

Common experience and the data presented in this response shows that loss of tire air pressure occurs frequently for a wide variety of reasons. The need to repair or change a tire due to air loss is so common that almost all vehicles sold in the United States have repair or replacement equipment as standard features. To determine whether cracks in valves have resulted in a significant increase in the rate of air loss reports, the report information in the context of the typical number of air loss events during normal operations must be evaluated.

While the number of tires that suffer air loss over the life of a tire is not known, the tire industry has estimated that 85% of air loss is due to a slow leak resulting from any variety of climatic and road conditions and only 15% of air loss are more rapid due to large punctures from road hazards. Assuming that these estimates hold true for the more than one million vehicle population involved in this inquiry, the frequency of air loss due to valve cracks is not significant in this population. Ford notes that for the population of vehicles reviewed for response to this inquiry, it received approximately 468 reports of customer contacts related to inquiries on tire warranty due to damage from road hazards. The nature of these contacts is typically a simple inquiry concerning if there are any applicable warranties that may pay for the repair of a tire damaged by a road hazard. The number of reports associated with tires damaged due to road hazards is certainly substantially underreported because these reports are only the customers who contacted Ford to inquire about any warranties (Ford standard warranties do not cover tires for road hazard damage or abuse). Nonetheless, it is noteworthy that the number of owner reports related to tire leaks due to cracked or leaking valves is less than 25% of the number of owner reports related to tire damage and deflations due to typical road hazards that could lead to more rapid tire deflation while operating.

Now, in a most extremely conservative estimation, if the 468 reports related to road hazards represent only 15% of the incidents of air loss in this vehicle population, the total population of air loss events would be at least 3600. The number of air loss reports potentially related to valve cracks is not significant compared to the overall air loss events typically experienced in this vehicle population. Further, we know that publicity related to valve field actions by aftermarket sellers Tech International's and Dill ACP caused an increase in valve reports. Ford notes that of the 67 VOQs attached to the inquiry, 26 (nearly 40%) were received in a short

period of time immediately following the agency's announcement of the inquiry and corresponding media coverage.

Ford believes that implementation of tire pressure monitoring systems helps drivers identify loss of air pressure even when the condition is not detectable due to other symptoms and makes the report rate related to valve cracks more complete. In recent years vehicles have been required to be equipped with Tire Pressure Monitoring Systems (TPMS) to alert drivers when the pressure in the vehicle's tires is approaching a level at which permanent tire damage could occur as a result of heat buildup and tire failure is possible. As the agency states in the Final Rulemaking for TPMS (70FR 18148, April 8, 2005) "... this low level of inflation pressure generally results from a more measured pressure loss (produced over weeks or months) caused by a slow leak, defective valve, or diffusion." The agency also indicates in the rulemaking that "{A}ccording to the tire industry, approximately 85 percent of all tire pressure losses are slow air losses that occur over hours, weeks, or months of vehicle use." Slow leaks in tires where the leak is described as having to add air a couple times per week, or TPMS activation every few days, do not rise to the level of urgency of complete and sudden tire deflation while operating. In fact, during the review of reports to respond to this inquiry it was noted that owners often reported having to add air every couple days or repeated TPMS activations over a period of days or even weeks (in a couple cases months) prior to even having the issue addressed for repair.

Several other factors show that Ford's very broad interpretation of the agency's definition may actually inflate the number of air loss reports that may be related to valve cracks. Several reports indicate that a foreign object (road hazard) was found in the tire resulting in a tire leak, along with the allegation of a cracked valve. Examples of road hazard damage along with reports of cracked valves can be found in the customer contact related to VIN 2FMDK49C77E [REDACTED] and warranty reports related to VINs 1ZVHT82H0752 [REDACTED] and 2FMDK48C37BA [REDACTED]. An added complication is that Shanghai Baolong parts produced for other OEMs or aftermarket suppliers, as previously described, are only slightly different from Ford valves dimensionally (though they may have substantially different material properties), and are easily confused during visual inspection if the difference is not known. Consequently, reports of leaking valves on Ford vehicles received even from Ford technicians may or may not involve original Ford valves. In fact, some field return parts that Ford has received have been identified as not being Ford parts, but rather other valves produced by Shanghai Baolong for other customers.

Similarly, comments in certain VOQs indicate that the issue reported did not occur with the original equipment installed on the vehicle at the factory. The VOQ related to VIN 1ZVHT82H6551 [REDACTED] indicates the owner of this 2005 MY vehicle (the model year was reported as 9999 in the VOQ) purchased aftermarket wheels in 2007 for this vehicle. It is very unlikely the valves from the original wheels were removed and reinstalled in the new wheels because the valves are typically damaged during removal, and it's against common industry (and Ford) practice to reuse valves in such a manner. The VOQ related to VIN 1FTRF122X7NA [REDACTED] indicates the owner believes that they have "Tech International valves model TR414" on the vehicle. If this is correct, the valves are not the original equipment. A similar issue is represented by the VOQ related to VIN 2MEFM75V17X [REDACTED] in that the owner reports that they have "Tech International, model TR413 valves" installed on the vehicle. If this is accurate, these are not the original equipment in that they are not only parts not produced on equipment for Ford, but also they are a different length from those originally installed at the vehicle assembly plant.

Reports of valve damage must be carefully investigated before the agency can conclude that the damage is related to the alleged defect in this investigation. A valve may be damaged for reasons unrelated to the valve material properties. Improper valve installation in the wheel can damage the valve's exterior. Installation of improper aftermarket accessories, such as heavy decorative valve caps, can cause unintended flexing of the valve during tire rotation and initiate cracking in the valve exterior (reference the customer contact related to VIN 1ZVFT85H865 [REDACTED] and the Litigation Prevention file provided in Appendix D). Ford also found valve contacts in which, upon further review, the valve damage resulted from tire/wheel contact with a curb during a parking maneuver.

Ford notes that snap-in valves are typically destroyed (torn) during removal and the actual failure mode after the valve has been removed is often difficult to determine, and may lead an owner to erroneously think the valve had actually cracked or separated during operation. Often it is incorrectly concluded that the extent of valve damage observed on a valve that has been removed from a wheel is the same as prior to its removal. Consequently, a valve may be reported as having "blown off", "broken" or separated "on a vehicle" when in fact, the valve was intact until the removal process.

2. A cracked valve does not result in a loss of vehicle control or unreasonable risk of accidents or injuries.

Ford has thoroughly evaluated the potential consequences of a valve crack resulting from the identified lack of anti-ozonant constituents in the chemical formulation. Unlike other tire investigations in which the structural integrity of the tire can be compromised resulting in a loss of vehicle control, this condition does not present any such risks. The condition causes a slowly propagating crack in the valves that can potentially, but not always, result in an air leak over a period of several minutes, or longer. A tire leak resulting from a slowly propagating crack in the tire valve does not result in sudden and rapid tire deflation, does not impair an operator's ability to safely control a vehicle, and does not present an unreasonable risk to vehicle safety. Steering and braking control are fully maintained even in the event that the leak causes a complete loss of pressure. The lack of reports of loss of control, accidents or injuries in the very large population of vehicles reviewed for response to this inquiry supports this conclusion. In fact, a review of the reports that indicate a tire was replaced due to damage resulting from operating underinflated for an extended period of time, finds not even one allegation of loss of vehicle control. This is not an unexpected result for several reasons. The progressive nature of valve cracks due to the improper material formulations can result in a slow air leak over time and a sudden, rapid, complete deflation of the tire is not likely to occur.

The surface cracks develop in the valve material as the bonds between the natural rubber and synthetic materials are broken down by chemical attack and cyclic loading of the material during wheel rotation. If not identified and addressed, the cracks can slowly propagate through the valve material until they breach the air channel and result in a slow air leak. Many of the reports, including VOQs, describe a leak as requiring air addition from between a couple times per week to daily additions. Reports of sudden, rapid, unexpected deflation are not supported by the data or the physical attributes of the mechanism by which cracks can originate and propagate. As the agency is aware, valves are often torn or destroyed during removal for replacement and the subsequent condition of the valve can be confused for the cause of the air leak.

During Ford's review of reports related to cracking or leaking valves it was noted that approximately 82 percent indicated valve replacement only, with no associated tire replacement for damage due to operating the tire in an underinflated condition. Other reports did indicate

that a tire was replaced as part of the repair, though in many cases there was no indication that the tire was actually damaged. It is noteworthy that 64 percent of reports involving tire replacement involve vehicles equipped with TPMS to indicate to the operator a tire air pressure loss. The vast majority of those reports simply indicate that service was sought upon activation of the TPMS system, and that the valve and tire were replaced. A couple of reports indicated that a TPMS indication was given (light and chime) but the operator was in an area where it was inconvenient to stop (e.g. a construction zone) and that by the time the customer pulled over the tire was damaged even though the vehicle apparently remained completely controllable. Those situations are understandable, and as expected, involve a very small number of the reports. Instances where the vehicle is operated after identifying a tire issue (e.g. a TPMS warning, repeat re-inflation, noise, or vibration) can be expected to damage the tires.

The majority of vehicles built within the timeframe in question were equipped with TPMS. In fact, of the 133 vehicles that reported a tire replacement related to a leaking valve, 85 were equipped with TPMS. Except for the couple of reports where the operator clearly stated that they chose not to immediately pull to the side of the road for inspection, it is not clear how the tires could have become damaged unless the operator ignored the TPMS indication and continued to operate the vehicle. Even then, as the agency is aware and has stated in the TPMS rulemaking "{T}he agency's tire research suggests that even in a 25-percent under-inflated condition, the vehicle can be operated safely for this detection time {20 minutes} without an appreciable risk of tire failure." The agency also stated that "... a variety of Standard Load P-metric tires at 20 psi with 100-percent load [were tested] at 75 mph for 90 minutes on a dynamometer and none of those tires failed." The agency concluded that "warnings at less severe conditions will give the drivers sufficient time to check and re-inflate their vehicles' tires before the tires experience appreciable damage." Thus a reasonable conclusion for the reports of sudden and rapid deflation along with tires believed to have been damaged from operating in an underinflated condition is that they either resulted from lack of attention to clear indication over a long period of time, the tire was damaged for some other reason, or are an exaggeration of the circumstances. This is supported by VOQs described previously where operators reported experiencing slow leaks over a long period but had not had the vehicles inspected or repaired.

As part of our assessment of the potential safety risks, we reviewed prior ODI investigations and safety recalls. Our conclusion in this investigation is consistent with prior agency conclusions in valve related issues. The agency has previously concluded that slow and even more rapid air loss due to a valve concern does not present an unreasonable safety risk in larger Ford vehicles. As stated in the closing resume for EA02-018 dated August 23, 2003, testing conducted jointly by Ford and ODI engineers to evaluate the effects of slow and rapid air loss related to the valve, in the front tires of larger F-Super Duty vehicles, did not present vehicle control issues. As the agency may recall, testing related to EA02-018 was conducted at Ford's Michigan Proving Grounds, under a variety of conditions and VRTC engineers as test drivers led to the agency's conclusion, "Both drivers concluded that, based on the dynamic handling test, the test vehicle presented no unusual or difficult controllability demands upon the driver when faced with either a slow or rapidly deflating front tire." This conclusion is further supported by the data contained in the reports related to this inquiry in that there are a very small number of unsubstantiated allegations of loss of control, or accident and no allegations of any injury, and is a lower rate of allegations than that identified in EA02-018. The subject vehicles in EA02-018 did not have TPMS. It is noteworthy that the agency chose the test parameters for the evaluation and chose to analyze the effects on front tires only. While many of the vehicles that were the subject of that evaluation were built with dual rear wheels, some variants only had single rear wheels. Presumably the agency expected that tire deflation on the front wheels was the worst case.

Another difference between the issue related to EA02-018 and the subject of this inquiry is that if the crack propagates to the point where a slow leak results, the leak will occur whether the vehicle is being operated or not. This is supported by the number of reports that indicated identifying a "flat" or "low" tire in a parking lot or driveway before operating a vehicle.

Our analysis is also consistent with those issues in which a recall was warranted. For example, Hyundai issued a recall in November, 2002, for valves that may have been damaged during installation on Class 4 trucks. This matter presumably related to a design issue because the remedy involved installing a different style of valve. The remedy for that recall was to replace the snap-in valves with a clamp-on style. Ford also issued a recall in February, 2001, for valves that could have been damaged during assembly on F-450 and F-550 vehicles with commercial truck tires containing steel cords in the sidewall. The primary concern associated with that action was that, due to the steel cords in the sidewall, continued operation at low pressure could result in a sidewall zipper failure that could occur during inflation of a damaged tire and result in personal injury. These two recalls pose very different circumstances than the crack propagation and leak condition in this investigation.

Ford valves already are covered under the vehicle's bumper-to-bumper warranty period (3 years/36k miles for Ford/Mercury, 4 years/50k miles for Lincoln). Tires on Ford vehicles are covered under the tire manufacturers warranty and may be administered by a Ford dealer. Ford's warranty policy allows for repairs of collateral damage if a warrantable part fails and subsequently damages another part. Thus, if a Ford dealer believes that that a tire may have been damaged due to a leaking valve, Ford will pay for repairs to both the valve and the tire. Examples of this are contained in the reports provided in response to this inquiry. Further, Ford dealers that do not service tires typically will direct owners to a local repair facility (another Ford dealer or tire store) to have the repairs completed; the Ford dealer will administratively process the repair to be covered under Ford's warranty program. Examples of this are contained in the warranty reports provided in response to this inquiry. Should an owner require emergency repairs and a Ford dealer is not conveniently available, the repairs may be completed at a non-Ford facility and the owner may subsequently present the repair information to any Ford dealer who can determine if the repairs should be covered under Ford's warranty and have the owner reimbursed for the repairs, even if not completed by a Ford dealer. There are examples of this included in the warranty reports provided by Ford in response to this inquiry.

Tires and tire valves are "wear" items and not expected to last for the life of a vehicle. Industry standard practice is to replace the valves whenever a tire is replaced, or if the valve becomes unserviceable for any number of reasons. This issue is clearly a source of some dissatisfaction for those who have experienced some type of pressure loss caused by a valve produced with lower than intended anti ozone protectant, perhaps even more so for those who may have chosen not to have the matter serviced in a timely fashion. While the rate of reports for cracked or leaking valves in a certain period of production is higher than expected, the overall rate is still extremely low. The majority of vehicles built within the particular production period were equipped with TPMS that will provide intended indication to a driver that a tire should be inspected and serviced. As noted previously, crack development and propagation requires the presence of ozone and valve material flexing. The valves flex under the cyclic loading that results from wheel rotation. Ford notes that certain wheel designs allow for a larger envelope of unconstrained valve movement during wheel rotation and the designs that allow for more movement appear to have higher rates of reports. Designs that allow only minimal cyclic loading appear unlikely to result in cracked valves even if the valve was produced with lower than intended anti ozone agent. Finally, vehicles remain controllable (and even driveable if the operator is unable to or chooses not to pull to the side of the road) even if the valves leak and the leak is not identified either before operating the vehicle, or before operating the tire in an

underinflated condition. This is supported by the vehicle evaluations on other larger vehicles and the complete lack of substantiated reports or even allegations indicating loss of control, attributed to this issue. Ford notes that valves and the costs associated with their repair are being appropriately addressed through Ford's warranty program.