

**TOYOTA**  
**TOYOTA MOTOR NORTH AMERICA, INC.**

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*2/20/07*

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February 16, 2007

Mr. Jeffrey Quandt  
Chief – Vehicle Controls Division  
Office of Defects Investigation  
National Highway Traffic Safety Administration  
400 Seventh St., SW  
Washington, DC 20590

Re: NVS-213aan; PE06-055

Dear Mr. Quandt:

This letter is being sent in response to your December 12, 2006 letter regarding PE06-055. This submission is the final portion of our response. Enclosed you will find the updated response and a CD-ROM with the attachments. Two copies of these materials are being provided for your convenience.

Please note that portions of Attachment 8 are identified as confidential and a request for confidential treatment has been made to the Office of Chief Counsel. Copies of the attachments with all confidential information removed are included on CD-ROM with your copy of the response. Copies of the attachments with the confidential information included have been sent to the Office of Chief Counsel. All confidential material is being submitted electronically, on CD-ROM. Should you have any questions about this response, please contact Mr. Chris Santucci of my staff at (202) 775-1707.

Sincerely,



Chris Tinto  
Vice President  
TOYOTA MOTOR NORTH AMERICA, INC.

CT:cs  
Enclosure

1. State, by model and model year, the number of subject vehicles Toyota has manufactured for sale or lease in the United States. Separately, for each subject vehicle manufactured to date by Toyota, 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 1, Data Collection Disc, for a pre-formatted table which provides further details regarding this submission.

### **Response 1**

The number of MY 2006 Toyota Highlander HV vehicles Toyota has manufactured for sale or lease in the United States is 43931 vehicles.

In addition, detailed information for each vehicle is provided electronically on CD-ROM, in Microsoft Access 2000 format entitled "PRODUCTION DATA (PE06055).mdb" stored in the folder "Attachment-Response 1".

2. State the number of each of the following, received by Toyota, or of which Toyota 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. Reports involving a fire, 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;
  - e. Property damage claims; and
  - f. Third-party arbitration proceedings where Toyota is or was a party to the arbitration; and
  - g. Lawsuits, both pending and closed, in which Toyota is or was a defendant or codefendant.

For subparts “a” through “e,” 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 “g,” provide a summary description of the alleged problem and causal and contributing factors and Toyota’s assessment of the problem, with a summary of the significant underlying facts and evidence. For items “d/e/f” and “e/f/g,” 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.

## **Response 2**

- a. Using the counting methodology described in your question, there are 10 consumer complaint reports that may relate to the alleged defect in the subject vehicles. Since some customers complained about same incidents, the total number of unique vehicles in the consumer complaints is 8. This includes 2 vehicles which are duplicated with the NHTSA VOQs attached to the inquiry letter.
- b. There are 11 field reports that may relate to the alleged defect in the subject vehicles. This includes one vehicle which is duplicated with a consumer complaint report and one vehicle which is duplicated with both a consumer complaint and a NHTSA VOQ (as attached to the inquiry letter).
- c. In the consumer complaints, 4 incidents have been reported where a vehicle crash was alleged. One of these reports is duplicated with a field report and 3 of these reports have associated property damage claims. One of these reports is also duplicated with a NHTSA VOQ, as attached to the inquiry letter. There are no reports alleging that an injury or fatality had occurred.
- d. Toyota has not received any reports involving a fire that may relate to the alleged defect.
- e. Toyota has received 3 property damage claims that may relate to the alleged defect. These claims are duplicated with the consumer complaints and one of these claims is also duplicated with a NHTSA VOQ (as attached to the inquiry letter).
- f. There are no third party arbitration proceedings.
- g. There are no lawsuits in which Toyota is defendant.

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

Provide this information in Microsoft Access 2000, or a compatible format, entitled "REQUEST NUMBER TWO DATA." See Enclosure 1, Data Collection Disc, for a preformatted table which provides further details regarding this submission.

### **Response 3**

The information for each item (complaint, report, claim, notice, or matter) is provided electronically on CD-ROM, in Microsoft Access 2000 format entitled "REQUEST NUMBER TWO DATA (PE06055).mdb" stored in the folder "Attachment-Response 3".

4. Produce 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 Toyota used for organizing the documents.

### **Response 4**

A list of all of the consumer complaints stored in the database is provided electronically on CD-ROM, in Microsoft Excel format, stored in the folder "Attachment-Response 4". In addition, copies of the field reports, and documents related to the property damage claims are all provided electronically on CD-ROM in PDF or JPEG format stored in the folder "Attachment-Response 4".

(The list of the consumer complaints is stored in sub-folder "a. Consumer Complaint." Copies of the field reports are stored in sub-folder "b. Field Report". Copies of the documents for the property damage claims are stored in the sub-folder "e. Property Damage".)

5. State, by model and model year, a total count for all of the following categories of claims, collectively, that have been paid by Toyota to date that relate to, or may relate to, the subject system 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. This should include all claims for all labor operations involving EPS system components, including the Power Steering ECU.

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

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

Provide this information in Microsoft Access 2000, or a compatible format, entitled "WARRANTY DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table which provides further details regarding this submission.

### **Response 5**

The total counts of warranty claims and claims for good will services paid by Toyota for the subject vehicles that may relate to the "subject system" are provided electronically on CD-ROM, in Microsoft Excel 2000 format entitled "Total Count for Claims.xls" stored in the folder "Attachment-Response 5". Toyota has received no extended warranty claims which may relate to the subject system.

The detailed information for each claim is provided electronically on CR-ROM, in Microsoft Access 2000 format entitled "WARRANTY DATA (PE06055).mdb" stored in the folder "Attachment-Response 5".

6. Describe in detail the search criteria used by Toyota 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 Toyota 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 Toyota 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.

### **Response 6**

The search criteria used by Toyota to identify the claims is the following:

Toyota searched the warranty database for those claims that replaced any of the parts identified in Microsoft Excel file entitled "Search Criteria, Operation & Problem Codes.xls" stored in the folder "Attachment-Response 6" on CD-ROM. Toyota submitted all extracted claims in Response 5 regardless of the reason for the replacement. In addition, a list of all labor operations, labor operation descriptions, problem codes and problem code descriptions identified in these warranty claims are also provided in the same Microsoft Excel file described above.

The terms that Toyota offers for new vehicle warranty coverage is 36 months or 36,000 miles on MY 2006 Highlander HV vehicles from the vehicle's date-of-first-use, whichever occurs first.

There are some extended warranty coverage options that Toyota offered for purchase with the subject vehicles. Detailed information about these options is provided electronically on CD-ROM, in PDF format, entitled "Extended Warranty Option.pdf" stored in the folder "Attachment-Response 6".

The number of vehicles by option that are covered under each such extended warranty option, is provided as "Attachment-Response 6-1" in hard copy only. Please note that this "Attachment-Response 6-1" contains trade secret and commercial information, therefore, Toyota believes that this document must be afforded confidential treatment. A request for confidential treatment of this document has been sent to the Office of Chief Counsel. A public version of this document is included with this response.

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 Toyota 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 Toyota is planning to issue within the next 120 days.

### **Response 7**

Toyota has not issued any service or technical bulletins, advisories, or other communications to dealers, regional or zone offices, field offices, fleet purchasers, or other entities that relate to, or may relate to, the alleged defect in the subject vehicles.

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, Toyota. 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.

### **Response 8**

Toyota has summarized in a table the actions performed by Toyota. We are providing this information as "Attachment- Response 8" stored in the folder on CD-ROM. All of the documents related to these actions are being provided within "Attachment-Response 8". Please note that the documents provided in this portion of the response contain design and technical specifications, trade secrets and commercial information, therefore, Toyota believes that these documents must be afforded confidential treatment. A request for confidential treatment of these materials has been sent to the Office of Chief Counsel. Public versions of these documents are included with this response.

9. Describe all modifications or changes made by, or on behalf of, Toyota 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 Toyota is aware of which may be incorporated into vehicle production within the next 120 days.

### **Response 9**

All modifications or changes made by Toyota, or on behalf of Toyota in the design, material composition, manufacture, quality control or installation, which may relate to the alleged defect in the subject vehicles are provided as "Attachment-Response 9" in hard copy only.

Please note that some of the information included in "Attachment-Response 9" is confidential, and a request for confidential treatment has been submitted to the Office of Chief Counsel. A public version of "Attachment-Response 9" is included with our response to your office; please see the Office of Chief Counsel for the confidential version of this document.

10. State the number of each of the following that Toyota 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*):
- a. Subject component; and
  - b. Any kits that have been released, or developed, by Toyota for use in service repairs to the subject component/assembly.

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 Toyota is aware that contain the identical component, whether installed in production or in service, and state the applicable dates of production or service usage.



## **Response 10**

The number of subject components that Toyota has sold that may be used in the subject vehicles by component name and month/year of sale is provided electronically on CD-ROM, in Microsoft Excel 2000 format entitled "Number of components sold in the US.xls", stored in the folder "Attachment-Response 10". Please note that Toyota's part sales database does not have the data on the model and model year of the vehicle in which the sold component is used, therefore, the sales data includes the number of components sold for use not only in the subject vehicles but also in the vehicles that contain the identical components installed in production or in service. The lists of other vehicles that contain the identical components are also provided electronically on CD-ROM, in Microsoft Excel 2000 format entitled "Other vehicles using identical parts.xls", stored in the folder "Attachment- Response 10".

The information on the supplier for each component is provided electronically on CD-ROM, in Microsoft Excel 2000 format entitled "Supplier Information.xls", stored in the folder "Attachment-Response 10".

11. Furnish Toyota'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, including the change in steering effort for turning maneuvers in each direction at 5, 10, and 20 miles per hour;
- 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.

## **Response 11**

### **Overview**

Since the opening of this investigation, Toyota has been evaluating the issue from a quality standpoint, as well as the safety consequences related to a sudden loss of power assist to the steering control. This evaluation has included an analysis of all applicable field data that we have in our possession and a review of our design criteria, specifications, and testing we have used in developing the Electric Power Steering (EPS) of the subject vehicles. All of this information was utilized in evaluating the risk to motor vehicle safety, and at this time, Toyota does not believe that a safety-related defect exists with the Electric Power Steering system of the Toyota Highlander Hybrid.

## **Design**

Installed as standard equipment on the subject vehicles, the EPS utilizes an electric motor and reduction mechanism built into the steering gear housing to generate an assist torque to the worm gear of the steering rack. This assist torque reduces the driver's steering effort, much like a traditional hydraulic system. The EPS Electronic Control Unit (ECU) calculates the appropriate amount of power assist based on input from sensors and other ECUs, and commands the motor to provide the assisting torque.

The net effect of the system is similar to a traditional hydraulic power steering system. However, a mechanical linkage still connects the steering wheel through the steering column and intermediate shaft to the worm gear of the steering rack via the pinion. Therefore, when power assist is not available, the direct linkage still allows the vehicle's front wheels to be directed by the steering wheel. The benefits of an EPS include the physical elimination of hydraulic fluid, lines and the vane pump, as well as the associated parasitic drag of the pump on the engine. Improved fuel economy is achieved, because steering assist is generated only when it is needed via electric power.

Torque sensors in the steering shaft detect the driver's steering input and relay this information to the ECU. Using this information and the vehicle speed, the ECU calculates the amount of assist to provide and commands the motor to apply torque to steering rack. Assist can be reduced for higher speed driving, and boosted for low speed driving. The subject vehicles are also equipped with Toyota's Vehicle Dynamics Integrated Management (VDIM) system, a sophisticated Electronic Stability Control (ESC) system. The VDIM system can order the EPS ECU to vary the amount of assist directionally, in order to cooperate with the driver to reduce the possibility of a skid.

The EPS is driven by 288V DC power obtained by the Toyota Hybrid System propulsion battery. The 288V DC power is sent through a DC-DC converter, which supplies the required 42V DC power for the EPS. In the event of a system malfunction with the EPS, a power steering warning lamp can be illuminated within the instrument cluster. The telltale is "P/S" and is in red.

In addition, the EPS system has a fail-safe system, and when an electrical failure occurs, the system initiates a fail-safe mode to prevent any further steering abnormality. When an electrical failure occurs, or when the ECU believes a failure may occur, one of five fail-safe modes are initiated based on the type and condition of the failure, so that the vehicle can be steered in a safe and controlled manner.

1. Limit supplemental assist, but continue basic assist
2. Limit maximum assist
3. Slowly decrease and then shut down the assist
4. Quickly decrease and then shut down the assist
5. Shut down the assist immediately

## **Analysis of Failure Modes**

As described in our response, Toyota has found three potential issues that could result in a loss of power steering assist. Two are related to electrical current surges within the EPS ECU. The other is related to the magnets of the assist motor. Two of these issues can occur only when the vehicle is being parked or operated at very low speeds. The third issue could theoretically occur at any speed, but occurs as a result of a specific type of impact to one of the front wheels. In all cases, and during any loss of power assist to the steering, the front wheels can still be directed without assist, manually, via the steering wheel.

### **1. Integrated Circuit (IC) Failure Due to Internal Current Surge at Full Lock**

In situations where high assist is necessary, such as when turning the steering wheel to the full lock position, a current surge may be generated. Such current could flow through one of the ICs in the EPS ECU, and could result in a failure of the IC. If this condition occurs, the system will initiate fail-safe mode #5 and no assist is provided. This problem can only occur on those ICs that are of the lower end of the tolerance band for the resistive strength of the IC itself. In order to prevent this condition, Toyota changed a resistor connected with the IC in the ECU to reduce the amount of current which could flow into the IC when a surge occurs. This change was made in May 2005.

When considering the number of EPS ECUs for which the problem may potentially occur, the tolerance band of the resistive strength of the IC, and the magnitude of current which could flow through the IC and cause failure, Toyota believes that this issue is limited, considering that the failure mode is likely to happen early in the IC's service life (i.e., infant mortality). ECUs built in the lower tolerance band of resistive strength that are susceptible to failure due to the amount of current generated at a full lock most likely will have experienced a failure by this time if they haven't already.

In addition, since this problem can only be caused by a current surge generated at highest boost (i.e. full lock), the IC failure may occur only when the vehicle is parked or operated at a very low speed. Therefore, Toyota believes that the risk of a serious crash from this type of failure is highly unlikely.

### **2. Deterioration of Adhesive between Magnets and Motor Shaft of the Assist Motor**

As mentioned before, the EPS system provides steering assist by controlling the application of current through the motor coils, which then rotates the motor shaft on which the magnets are adhered. When a large amount of current is directed through the motor coils, high assist is generated.

In some cases, there is the possibility that the adhesive securing the magnets to the EPS motor shaft may fail, causing the magnets to move slightly. If the adhesion of the magnets deteriorates, there is a possibility that the adhesive may separate when a large force is applied to the magnets, causing the magnets to move. However, because the magnets stick to the motor shaft by their own magnetic force normally, even if the adhesion deteriorates, the magnets will not move unless a large force is applied to them. The condition in which a large force is applied to the magnets is when a large amount of assist is necessary. Again, this condition is only when a vehicle is parked or operated at very low speed

with the steering wheel held turned to lock position. In addition, vehicles experiencing this issue will not immediately lose full power assist, a certain amount of assist will still be provided, albeit at a lower overall level. Further operation in this condition will continue to degrade the maximum amount of assist, until, eventually, when assist can no longer be provided.

Toyota has experienced adhesive separation and magnet movement on a similar EPS system installed in other models due to improper manufacturing of the EPS linkage during a specific period of production. Toyota believes that if the EPS linkage is manufactured properly, the adhesive will not separate. However, to countermeasure against the movement of the magnets if the adhesive deteriorates, Toyota added separate protrusions between the magnets on the motor shaft for all EPS systems in production in September 2006. At this time, Toyota is still investigating the cause of adhesion deterioration on the subject vehicles.

### 3. IC Failure by Regenerative Current Surge

In the event that the steering wheel is rotated due to the input from the wheel and tire (i.e. curb strike), the EPS motor will become an electrical generator. This type of regenerative current can flow to the DC-DC converter via the ECU. If the current generated is over the capacity for absorbing a regenerative current in the DC-DC converter, there is the possibility of IC failure within the ECU.

Toyota has received some field reports which indicate that a loss of EPS assist occurred after a minor accident. Toyota conducted duplicate tests and could confirm the condition during a bench test, but has not been able to reproduce the problem during actual vehicle tests. However, under some specific conditions, such as hitting the tire to the curb at a certain speed and angle, it was confirmed that there is still a design margin for regenerative current absorption. However, Toyota is still investigating the issue and may improve the absorption capacity of the DC-DC converter.

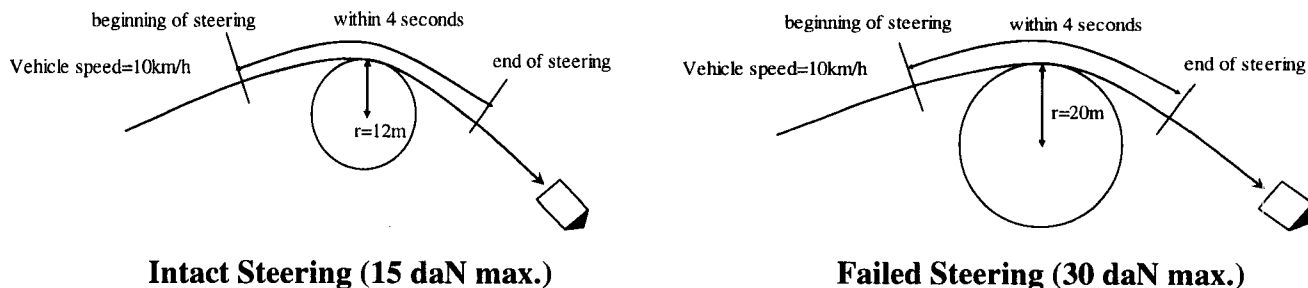
### Effect on Driver Input – Steering Effort

As mentioned in our response, the Highlander Hybrid is equipped with a speed sensitive power steering system. At lower vehicle speeds, a higher level of assist is generated. At higher vehicle speeds, a lower level of assist is generated. This is because at higher speeds, smaller inputs are made to the steering to affect vehicle control. At lower speeds, larger steering inputs are made, and so more assist is desired to reduce driver effort. When power steering assist is lost, the linkages of the system and the steering wheel allow the driver to turn the front wheels via mechanical advantage.

While steering effort is not regulated in the United States, the European Union (through the United Nations) has ECE 79 for vehicles sold in those countries. As prescribed in ECE 79, a vehicle of the Highlander Hybrid class (M1) would need to maneuver into a 12 m turning circle by steering the vehicle within 4 seconds with a steering input force of less than 15 daN with a normally functioning power steering system and into a 20 m turning circle within 4 seconds with a steering input of less than 30 daN when the system has failed. The Highlander Hybrid fully complies with ECE 79 with ample margin (50%) in effort, and, therefore, meets an accepted requirement for steering effort in the event of

a loss of power steering assist.

### ECE 79 Steering Effort Test



For the test, the vehicle is loaded to the Gross Vehicle Weight Rating (GVWR) with the front axle is loaded to its rated capacity. Force measurements are calculated at the steering wheel rim. The vehicle speed is very low, 10 km/hr, as a loss of power steering assist is most affecting during low speed operation. At high speed, since boost is already reduced, and inputs are small, a complete loss of power assist does not affect driver effort significantly. At low speeds, driver effort will increase, but well within the limits prescribed by ECE 79. While not required, Toyota also evaluated the Highlander Hybrid without power steering assist through the 12 m maneuver. The resulting steering effort was measured at slightly over 15 daN, which is the compliance limit of the regulation for a normally functioning steering system.

### Risk to Motor Vehicle Safety

When considering the three failure modes, the conditions in which they may occur, and the increase in vehicle steering effort that results, at this time, Toyota has not determined the existence of a safety related defect in the Highlander Hybrid electric power steering system. In this response, three types of failure modes have been presented that Toyota believes could result in a loss of power steering assist. For failure modes 1 and 2, the operating condition in which these failures can occur is with the steering wheel turned to full lock. Generally, vehicle maneuvers at full lock are conducted at very low speeds, typically when parking the vehicle. For these failure modes, the risk of a serious crash is limited. This is evidenced in the reports submitted with this response, which allege low-speed, minor crashes had occurred without injury. The third failure mode is the result of tire or wheel impact. Toyota considers the loss of power steering assist in such an instance to be a secondary factor resulting from the primary crash (i.e., ancillary damage).

In addition, Toyota believes that even with no available power steering assist, sufficient steering effort remains for proper vehicle operation. This opinion is based on the ECE 79 testing submitted with this response, considering the Highlander Hybrid's performance when tested without power steering assist in the more difficult 12 m maneuver. While we understand that this regulation is only in effect

outside of the United States, since the FMVSS currently does not regulate steering effort, we utilize the criteria as reference data.

Finally, since the EPS lacks any flammable fluid for operation, as found in a traditional hydraulic power assisted steering system, there is no risk of fire. Toyota has not received any reports of fire associated with a failure of the EPS system installed on the subject vehicles. In prior agency investigations, fire has been a potential concern when traditional power steering systems fail due to fluid leakage.

### **Conclusion**

In summary, while Toyota has identified three potential issues with the electric power steering that could result in a loss of power steering assist, at this time Toyota has not determined the existence of a safety-related defect. This is because Toyota believes that even with a complete loss of power steering assist the vehicle remains controllable and sufficient steering effort remains for proper vehicle operation. This is evidenced by the vehicle performance in the 12 m maneuver of the ECE 79 test submitted with this response. In addition, Toyota has not identified any potential issue with the EPS system that could result in a fire occurring in the subject vehicles.

Furthermore, in the case of failure mode 1 (as identified above), this failure mode can only occur when turning the vehicle at full lock. Typically, these maneuvers are made at low speeds, and so the potential for a serious crash occurring is limited. While this is also the case with failure mode 2, this failure mode is also of a progressive nature, with a degradation of the assist amount over time that is noticeable to the driver.

In the case of failure mode 3, while vehicle travel speed is not necessarily a limiting factor, Toyota considers the failure to be of a kind caused by an impact to the wheel and tire. As such, it is secondary to the crash, and does not necessarily influence or cause a crash to occur due to a sudden loss of power steering assist. In addition, Toyota is still evaluating the factors which could cause this potential type of failure mode to occur, and at this time has not been able to reproduce this failure mode in vehicle testing.

For these reasons, Toyota has not at this time determined that a safety related defect exists in the Highlander Hybrid Electric Power Steering system. We believe the agency will come to the same conclusion, based on the testing performed and the conclusions made in the investigation into the EPS of the Chevrolet Malibu, EA04-018. Toyota is currently preparing a test vehicle for your office to evaluate in a technical demonstration. We look forward to discussing this issue with your office in the near future.

\* \* \*

Regarding privileged documents that may be responsive to this information request, Toyota understands that it is acceptable to the Agency at this stage for Toyota to identify categories of privileged documents rather than any specific document within those categories. These categories include (a) communications between outside counsel and employees of Toyota's Law Department, other Toyota employees, or employees of parties represented by Toyota in litigation or claims; (b) communications between employees of Toyota's Law Department and other Toyota employees or employees of parties represented by Toyota in litigation or claims; (c) notes and other work product of outside counsel or employees of Toyota's Law Department, including work product of employees or consultants done for or at the request of outside counsel or Toyota's Law Department. For any privileged documents that are not covered by these categories, if any, Toyota will provide a privilege log identifying any such documents under separate cover. Toyota is not claiming a legal privilege for any documents provided with this response; however, Toyota does not waive the legal privilege or work product protection with respect to other documents that may have been prepared in connection with a specific litigation or claim. In addition, Toyota may assert the attorney client privilege or claim protection under the work-product doctrine for analyses or other documents that may be prepared in connection with litigation or claims in the future.

Toyota understands that NHTSA will protect any private information about persons that is contained in the Attachments to this response, based on privacy policy considerations. Such private information includes data such as names, addresses, phone or fax numbers, email addresses, license plate numbers, driver's license numbers and last 4 digits of the vehicle's VIN.

Data provided in this document is current as of the following dates:

- Response 1 : Production Data (January 12, 2007)
- Response 2 - 4 : Consumer Complaint (December 19, 2006)
  - Field Report (December 25, 2006)
  - Lawsuit (January 10, 2007)
- Response 5 : Warranty claims (December 27, 2006)
  - Goodwill & Extended warranty claims (January 9, 2007)
- Response 7 : Dealer communications (January 17, 2007)
- Response 8 : Actions (January 19, 2007)
- Response 9 : Modifications/changes (January 19, 2007)
- Response 10 : Parts sales (January 11, 2007)