2/28/07

Volvo Cars of North America, LLC

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Rockleigh, NJ 07647
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February 23, 2007

Mr. Jeffrey Quandt, Chief
Vehicle Control Division
Office of Defects Investigation
National Highway Traffic Safety Administration
Room 5326
400 Seventh Street, S.W.
Washington, D.C. 20590

NVS-213
EA06-006

Dear Mr. Quandt:

This letter and its enclosure comprise the partial response of Volvo Cars of North America, LLC (VCNA) to your request for information relating to Engineering Analysis EA06-006. This letter, which will be the Second submission, responds to the agency's request numbers 7 through 15 with information that was received by Volvo between December 1, 2005, and November 1, 2006. An extension to February 23, 2007 was granted by telephone for this response.

In order to respond to request #7 through 15 of EA06-006 Volvo (Volvo Car Corporation and VCNA) in good faith conducted a thorough and diligent search of Volvo systems. Our response is based upon this diligent and thorough search.

As requested, our answer follows a repeat of the question:

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

Volvo Response to Question 7:

Volvo has issued three (3) Tech Net-Notes or "TNN's" to the retailer network; copies of these documents can be found on the attached CD-ROM titled "Volvo EA06-006" within the folder named "Question 7 response". 1) TNN 37-150 Titled Recall 37-150 B+ Cable Clearance between the Cable and the Starter Motor Solenoid, 2) TNN 37-152 Titled Service Campaign 152 Tightening the B+ terminal nut at the starter motor, and 3) TNN 89-07 Jack handle Storage/Transport Switch Removal.

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, sorted by each failure mechanism, that are being conducted, are planned, or are being planned by, or for, Volvo. 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.

Volvo Response to Question 8:

The second of these tests was to show the robustness of the battery cable insulation on the wiring from the battery to the "main" fuse box. This test concluded that the Volvo cable, when tested according to the SAE J1127 Standard which requires >350mm average on 4 results that loads the cable with 4kg to moving sandpaper, substantially exceeded the SAE standard and is an extremely robust cable insulation.

9. Describe all modifications or changes made by, or on behalf of, Volvo in the design, material composition, manufacture, quality control, supply, or installation of the subject component, from December 1, 2005 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 Volvo is aware of which may be incorporated into vehicle production within the next 120 days.

Volvo Response to Question 9:

10. Paragraph three of page thirteen of Volvo's response to ODI's PE05-057 Information Request Letter, references a technical service bulletin, TNN 89-07 that instructs Volvo technicians, service and parts managers of proper positioning of the jack crank handle. Please provide the following:
    a. A copy of any owner notification or owner instruction issued by Volvo, similar to the instructions in TNN 89-07, instructing the owners of the proper position of the jack handle in relationship to the positive battery cable and/or warning owners of the risk of the improper placement of the jack handle.
    b. If Volvo did not notify owners of the proper position of the jack handle, explain why not.
    c. In the event that an owner replaces the battery, explain why an owner would position the jack handle on the top of the bracket (the proper position) rather than under the bracket.
    d. A summary of any Human Factors study or studies that Volvo may have conducted concerning the subject vehicles that is representative of consumer usage of the jack crank handle; i.e. removal and proper replacement of the jack crank handle.

Volvo Response to Question 10:

The Volvo XC90 owners manual describes how this component is held in place "behind the battery". The customer is not provided by Volvo the tools necessary to remove the bracket located over the battery, which would be required for mis-positioning of the crank. It is not necessary to remove the bracket in order to use the crank. In addition, none of the cases of misplaced jack handles that are known by Volvo were caused by faulty handling or placement by the customer. It is not intuitive to place

the handle under the bracket or under the plastic battery cover. The cover would need to be bent and pushed down prior to installing and mounting the attachment screws. Volvo has no Customer Complaints, Field reports, or Warranty claims related to mis-placement of the Jack handle within the period of this EA. Volvo deeply feels it is inappropriate to inform customers by letter of this issue. Volvo has not conducted any "Human Factor" studies related to this.

11. Provide the following in relation to the assembly plant installation process of the jack crank handle.
    a. A copy of any Process Failure Mode Effects Analysis (PFMEA) that may relate to the installation process of the jack crank handle.
    b. A copy of any assembly plant operation or process description sheet(s) applicable to the installation of the jack crank handle to the subject vehicles.

Volvo Response to Question 11:

12. Provide the following information in reference to the undertorqued positive battery cable to starter motor fastener issue on subject vehicles equipped with V8 engines:
    a. Volvo's assessment of the risk of a fire due to the undertorqued fastener condition and explain the basis for the assessment.
    b. A description of what Volvo considers "worst case" for the condition with regard to the effect on engine performance and risk to engine stall and state the basis for that statement.
    c. The typical circumstances under which a stalling event could occur (e.g. acceleration, deceleration, low speed, high speed, random, etc.)
    d. Volvo's assessment of the percentage of warranty claims that involve an engine stall while driving due to the undertorqued fastener and explain the basis for the assessment.
    e. Using warranty claim data identify the engine stalling rate of the subject vehicles at the following service intervals: (1) 12 months, (2) 36 months, (3) 60 months and (4) 120 months.

Explain in detail the statistical methods used to calculate these rates, whether they are based on actual failure data or statistical forecasting.

Volvo Response to Question 12:

12. Provide the following information in reference to the under torqued positive battery cable to starter motor fastener issue on subject vehicles equipped with V8 engines:

a. *The failure mode is reduced clamping force at the starter joint. Based on experience from field cases this failure typically leads to low charge status of the battery. Volvo has taken corrective action for this by issuing a Service Campaign (completion rate of >90%). In some cases symptoms of melted cables have been seen at the starter motor cable, however to Volvo's knowledge no fire has evolved due to this. The reason is that the cable insulation material is of quality SK115 (Volvo standard) which has excellent properties to high heat. The routing of the B+ cable is such that even if the SK115 insulation material would start to melt due to increased temperature, the wire is very short and routed in such a way that there is no combustible materials close by.*

b. A description of what Volvo considers "worst case" for the condition with regard to the effect on engine performance and risk to engine stall and state the basis for that statement. *Worst case according to Volvo would be if the joint relaxes causing a high resistance and/or insulation. If this condition occurs, the alternator will not be able to charge the battery. Driving the vehicle with no charge will of course discharge the battery. The battery discharge rate will increase with heavy electrical loads such as high fan speed, electrical seat heating and rear window electrical heating. In the event this occurs, the vehicle operator will receive a Warning symbol in the middle of the instrument cluster. In addition, the driver is provided with clear instructions within the owner's manual on what to do in the event of dashboard warnings (extracts of the owner manual related to Warnings can be found on the attached CD-ROM within the folder named "Response to Question 12b). For details on this scenario, please refer to "test 2006-02-22" (located on the enclosed CD-ROM within folder titled* 'Question 8 response'*) where the worst case was tested.*

c. The typical circumstances under which a stalling event could occur (e.g. acceleration, deceleration, low speed, high speed, random, etc.) *Volvo is not aware of any typical circumstance.*

d. Volvo's assessment of the percentage of warranty claims that involve an engine stall while driving due to the undertorqued fastener and explain the basis for the assessment. *See response to 12e.*

e. Using warranty claim data, identify the engine stalling rate of the subject vehicles at the following service intervals: (1) 12 months, (2) 36 months, (3) 60 months and (4) 120 months. Explain in detail the statistical methods used to calculate these rates, whether they are based on actual failure data or statistical forecasting. *We have in total 2 Warranty claims of alleged engine stall within a period of three years. Two cases are not enough information to draw a true scientific assessment. Volvo testing (see response to Question 8) shows that the driver would receive very clear warnings. Volvo has not investigated the details of these two reports*

13. Provide the following information in reference to the chafing concern of the positive battery cable to the main fuse box in the rear storage compartment:

a. Chronologically list and describe in detail all engineering, supplier quality and assembly plant cable routing or process changes from MY 2003 through MY 2006 that may have affected the positive battery cable in the area of the sheet metal flange.
b. Chronologically list and describe in detail any engineering and/or supplier related changes made to the main fuse box that may have influenced the spatial relationship of the main fuse box bracket and the positive battery cable.

b. Chronologically list and describe in detail any engineering and/or supplier related changes made to the main fuse box bracket that may have influenced the spatial relationship of the main fuse box bracket and the positive battery cable.
c. Provide a summary of any field visual inspection(s) conducted by Volvo of the positive battery cable chafing concern to include the VIN and mileage of each vehicle inspected. Provide copies of any pictures taken of the positive battery cable in relation to the inspection(s).

Volvo Response to Question 13:

13. Provide the following information in reference to the chafing concern of the positive battery cable to the main fuse box in the rear storage compartment:

a. Chronologically list and describe in detail all engineering, supplier quality and assembly plant cable routing or process changes from MY 2003 through MY 2006 that may have affected the positive battery cable in the area of the sheet metal flange.

There have been no engineering changes to the cable to the main fuse box. The supplier made changes according to Volvo requirements on taping corrugated hose, as answered in PE05-057.

b. Chronologically list and describe in detail any engineering and/or supplier related changes made to the main fuse box that may have influenced the spatial relationship of the main fuse box bracket and the positive battery cable. *No changes introduced.*

c. Chronologically list and describe in detail any engineering and/or supplier related changes made to the main fuse box bracket that may have influenced the spatial relationship of the main fuse box bracket and the positive battery cable. *No changes introduced.*

d. Provide a summary of any field visual inspection(s) conducted by Volvo of the positive battery cable chafing concern to include the VIN and mileage of each vehicle inspected. Provide copies of any pictures taken of the positive battery cable in relation to the inspection(s). *Volvo has not conducted any field visual inspections.*

14. Describe in detail any fusible links or other built-in positive battery cable failure safety mechanisms.

Volvo Response to Question 14:

15. For each failure mechanism or potential failure mechanism; (1) Undertorqued battery cable to starter motor attaching fastener; (2) jack handle miss-positioning; and (3) potential positive battery cable chafing condition on rear battery storage compartment flange, furnish Volvo's assessment of the alleged defect, including:

a. The causal or contributory factor(s);
b. The failure mode(s);
c. The risk to motor vehicle safety that it poses;
d. 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;
e. A discussion of possible or potential countermeasures DCX has identified or considered which may reduce or eliminate the occurrence of the alleged defect;
f. The reports included with this inquiry.

Volvo Response to Question 15:

Volvo has reviewed the reports the agency included with this inquiry. The only issue not addressed in our letter is related to the Rear Seat Entertainment system. These were identified by Volvo personnel. After reviewing these reports which were not customer contacts, we have concluded that this is a fuse protected circuit. This cable is in a fixed position which significantly reduces the risk of chafing.

For the three specific issues mentioned in this question, we have summarized the situation and our position follows.

(1) Undertorqued battery cable to starter motor attaching fastener

Volvo has achieved to date an extremely successful completion rate of 90% for Service Campaign 152 which addresses the Battery Cable to Starter Motor connection.
Based on actual testing performed (see response Q8) Volvo confirmed during internal testing that the operator would receive very clear warnings and messages within the Driver Information Module (DIM, e.g., dashboard), along with sufficient engine power (torque) in the event of 'Worst Case Scenario', allowing the driver to safely control the vehicle to a safe stop. In conclusion, based on the continued success of this Service Campaign, the clear driver warnings, and no reports of evolved fires, Volvo believes that the Service Campaign is the appropriate solution.
In an effort to achieve an even higher completion rate Volvo will perform a re-mailing to the approximate 850 remaining vehicles.

(2) Jack handle mis-positioning

During the period of this EA (December 1, 2005 > November 1, 2006),
Volvo has not received any additional reports related to the mis-positioning of the Jack Handle. This supports our conclusion made in our February 13, 2006 submission PE05-057 where we concluded that this was an early life condition and all vehicles already reached critical mileage. The longest days in service in which an incident occurred was 154 days. The average was 60 and there have been no such incidents since September 2005. None of the cases of misplaced jack handles that are known by Volvo were caused by faulty handling or placement by the customer. It is not intuitive to place the handle under the bracket or under the plastic battery cover, in that case the cover would need to be bent and pushed down prior to installing and mounting the attachment screws. We do not see this as a safety issue.

(3) Potential positive battery cable chafing condition on rear battery storage compartment flange

Volvo has not received any cases relating to this issue. Volvo has performed thorough testing that shows the robustness of the battery cable insulation on the wiring from the battery to the "main" fuse box. Testing concluded that the Volvo cable, when tested according to the SAE standard J1127 which requires >350mm average on 4 results that loads the cable with 4kg to moving sandpaper well exceeded the standard and is the most robust cable insulation available for Volvo. This cable is in a fixed position and there is no movement between the battery and the fuse box.
This is not a safety issue. Please see our answers to Question 13 for further information.

Based on the above letter and conclusions, this investigation should be closed. If you have any questions, please do not hesitate to contact me, or Adam Kopstein of my Staff.

Sincerely yours,

VOLVO CARS OF NORTH AMERICA, LLC
Customer Service

William Shapiro, P.E.
Manager, Regulatory and Product Compliance

Enclosure: CD-ROM

Volvo Cars of North America, LLC

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Rockleigh, NJ 07647
201 768 7300
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February 23, 2007

Chief Counsel
National Highway Traffic Safety Administration
Room 5219
400 Seventh Street, S.W.
Washington, D.C. 20590

Dear Chief Counsel:

This letter and its enclosures are submitted by Volvo Cars of North America, LLC (VCNA) in response to NHTSA's, request for information relating to Engineering Analysis EA06-006.

The information being submitted here is considered by Volvo to be confidential and an affidavit supporting that claim is enclosed. We firmly believe that release of this confidential information would compromise Volvo's position and make public Volvo vehicle specific information that could be used by our competitors. This confidential information includes engineering drawings, tests containing production data specifically determined to be confidential per 49 CFR Part 512 Appendix B.

Therefore, we request that the confidential information be treated within the meaning of confidential business information pursuant to 5USC 552(b)(4) and Section 112(e) of the National Traffic and Motor Vehicle Safety Act of 1966 as amended and implemented in 49 CFR Part 512.

In accordance with 49 CFR 512.4(a)(1) the top of each page containing confidential information has been marked "confidential" (the drawings are marked so that "confidential" is also seen in the lower center title block.)

If you have any questions, please contact me at (201) 767-4772 or Adam Kopstein of my staff at (201) 768-7300 ext. 7908.

Sincerely yours,

VOLVO CARS OF NORTH AMERICA, LLC
Customer Service

William Shapiro, P.E.
Manager, Regulatory and Product Compliance

Enclosure

CERTIFICATE IN SUPPORT OF REQUEST FOR CONFIDENTIALITY

I, William Shapiro, pursuant to the provisions of 49 CFR Part 512, state as follows:

(1) I am Manager, Regulatory and Compliance and I am authorized by Volvo Cars of North America, LLC (VCNA) to execute documents on its behalf;

(2) Volvo documents :

- *C8961-2002-0422-E.pdf*
- *c8961-2002_0324_1-3.pdf*
- *c8961-2002_0324_2-3.pdf*
- *c8961-2002_0324_3-3.pdf*
- *C8961-2002-0425-E.pdf*
- *c8961-2002_0425_1-3.pdf*
- *c8961-2002_0425_2-3.pdf*
- *c8961-2002_0425_3-3.pdf*
- *C8961-2002-0517-E.pdf*
- *c8961-2002-0517-t01-1.pdf*
- *7433.pdf*
- *507718.pdf*
- *Test Performed 20060222 V8.pdf*
- *Voltage_1*
- *Voltage_2*
- *Voltage_3*
- *Voltage_Bort_1*
- *Voltage_Bort_2*
- *Voltage_Bort_3*
- *Shortening Test*

have been marked "Confidential," and consist of Volvo proprietary product information which is being submitted with the claim that it is entitled to confidential treatment pursuant to 5USC 552(b)(4) and Section 112(e) of the National Traffic and Motor Vehicle Safety Act of 1966, as amended and implemented in 49 CFR Part 512;

(3) I hereby request that the information referenced in (2) above be protected indefinitely.

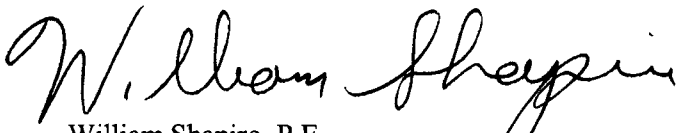
(4) I, or members of my staff, have personally inquired of the responsible VCNA personnel who have the authority, in the normal course of business to release the information for which a claim of confidentiality has been made, to ascertain whether such information has ever been released outside VCNA;

(5) Based upon such inquiries and to the best of my knowledge, information and belief, the information for which VCNA has claimed confidential treatment has never been released or become available outside VCNA, except as needed by VCNA to enter into appropriate confidentiality;

(6) I make no representations beyond those contained in the certificate and in particular, I make no representations as to whether this information may become available outside VCNA because of unauthorized or inadvertent disclosure; and

(7) I certify under penalty of perjury that the foregoing is true and correct, to the best of my information and belief.

Executed on this date, the 23rd date of February 2007.



William Shapiro, P.E.
Volvo Cars of North America, LLC
Customer Service
Manager, Regulatory and Compliance