U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

Memorandum

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Subject: FINAL REPORT: VRTC-DCD-8127 "Evaluation of Power Sliding Door Opening Without Command 2005 – 2007 General Motors U Body Van"

Date: FEB 2 3 2009

From: Don Willke
Acting Director, Vehicle Research and Test Center

Reply to Attn. Of: NVS-310

To: Kathleen DeMeter
Director, Office of Defects Investigation

NVS-210

The subject final report is submitted with this memorandum.

Enclosure:
Draft Report

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MEMORANDUM REPORT VRTC-DCD-8127
EA07-019
Evaluation of Power Sliding Door Opening Without Command
2005 – 2007 General Motors U Body Van

Background

This alleged defect involves Mini Vans built by General Motors under the names of Chevrolet Uplander, Pontiac Montana SV6, Buick Terraza, and Saturn Relay equipped with Power Sliding Doors (PSD) and Power Door Locks (PDL). Consumer complaints claim that the PSD may open without command from the operator. Instances of opening have been reported with the vehicle stationary and unattended (came out from shopping to find the door open), stationary and attended (attempted to close the door and it opened as soon as it reached the closed position), and while being driven (self-actuated after driving for approximately five minutes).

Complaint Vehicle Inspections

Two complaint vehicles have been inspected by VRTC personnel.

Inspection Notes from Complaint Vehicle #1

VIN: 1GNDV23L15D286839 Mfg Date: 5/05
Inspection Date: 8/3/07 VOQ #: 10170922
2005 Chevrolet Uplander

The owners stated that sometimes, when closing the door using the power feature, the right door will close and then immediately reopen. They stated that this condition has existed since the vehicle was new and has never presented itself on the left door. The owners also stated that this phenomenon has also occurred once while the vehicle was in motion. The owners stated that they have a relative with the same vehicle that has the same problem. During the one-hour inspection, the door exhibited this phenomenon one time. The owners stated that they have tried to determine if there was any way to predict when the phenomenon would occur but have concluded that it is a totally random occurrence.

Listed below are the conditions noted during this inspection.

- The power doors only operate when the vehicle is in Park. Unsuccessful attempts were made to operate the doors when the vehicle was running and in Drive, Reverse and Neutral.

- In normal operation, the right door will open or close electrically with no warning chime. In the one instance where the door was personally observed to malfunction, it closed and then immediately reopened, whereupon a warning chime sounded as it began to open. This chime also activated when the door was purposefully blocked from closing and reversed direction.
- When the right door is closed and latched, it appears to pull in toward the body of the van a bit more than does the left door. When the latch is operated to open the door, the door seems to spring outward more in the initial movement than does the left door.
- When viewing the rear of the sliding doors in the open position, the latch mechanism on the right door is adjusted slightly higher in the latch slot of the door than is the mechanism in the left door.
- When the doors are closed and latched, the top rear corner of the right door is slightly below the adjacent body panel, whereas the top rear corner of the left door is virtually even with the adjacent roof panel.
- The complaint vehicle was equipped with seven electrical contacts between the door and the B-pillar. An exemplar vehicle with non-powered doors only has five such contacts.
- There is a latch and striker on both the front and rear of the sliding doors. This vehicle exhibits different wear patterns between the left and right strikers.

Documentary photographs taken during this inspection are included in Appendix I.

Inspection Notes from Complaint Vehicle #2

VIN: 1GMDX33L36D148466 Mfg Date: 10/05
Inspection Date: 3/26/08 VOQ #: 10218136
2006 Pontiac Montana Odometer: 32,426

The owner stated that when closing the right door using the power feature, the door will sometimes close and then immediately reopen. This condition has existed since she bought the vehicle (purchased used with 6,xxx miles) and has never presented itself on the left door. While the door has never opened while the vehicle was in motion, she did return to the vehicle after shopping to find the door open. The last time that the door malfunctioned was the previous morning. She believes that when the door malfunctions, the drive motor will continue to run after the door appears to be latched and the door will then reopen. She has tried to determine if there was any way to predict when the phenomenon would occur but has concluded that it is a

totally random occurrence. The door-opening has occurred in warm, cold, wet, and dry weather conditions as well as on level and angled parking surfaces.

Listed below are the conditions noted during this inspection.

- The door was operated approximately ten times during the inspection and did not exhibit any inappropriate operation.
- The rear of the right door is misaligned vertically. When the doors are closed and latched, the top rear corner of the right door is slightly below the adjacent roof panel, whereas the top rear corner of the left door is even with the adjacent roof panel.
- Both sliding doors are misaligned horizontally. When closed and latched, the rear of the right door is slightly inboard of the adjacent body panel, whereas the left door is slightly outboard of the adjacent body panel.
- The vehicle is equipped with seven electrical contacts between the door and the B-pillar. The pads on both B-pillars exhibit evidence of contact with the mating buttons on the door. The pads on the right door show that the buttons make marginal contact with the pads, near the top edge of the pads, whereas the pads on the left door show that the button contact point is almost perfectly centered.
- The striker plate on the right B-pillar exhibits wear evidence that are somewhat more evident that those on the striker on the left B-pillar. Both sets of wear markings are in the same location on the striker.
- The striker on the body on the right side exhibits less wear than does the striker on the left side.
- There is a latch and striker on both the front and rear of the sliding doors. This vehicle exhibits different wear patterns between the left and right strikers.
- The motor drive on both the left and right doors sounded the same and appeared to operate the same.
- All three of the channels that carry the weight of the door when it is moving are clean and free of debris. The right door exhibits white grease on the rollers, latches, tracks, and locating pins.

Documentary photographs taken during this inspection are included in Appendix II.

Testing of Exemplar Vehicle

An exemplar vehicle (2005 Buick Terraza, VIN: 5GADV23L65D237517) was purchased for testing. The test vehicle is equipped with both the PSD feature and the PDL system.

Description of Normal System Operation

The PSD can be operated by 1) a keyless remote entry transmitter, 2) buttons located on the overhead console, and 3) buttons that are located on the adjacent B-pillar. The PSD system can also be turned off, whereupon the doors can be operated manually.

There are two choices for PDL operation. They may be set either to lock automatically when the transmission is shifted out of Park, or to lock automatically when the vehicle attains a speed of 2 mph. The PDL cannot be completely disabled.

Thus, whenever the vehicle is in motion above 2 mph, all of the doors, including the PSDs are locked. In order for the PSD to open, three separate events must occur: 1) the PDL must receive a signal to unlock; 2) the PSD door latch must receive a signal to unlatch; and 3) the PSD drive unit must receive a signal to open the door.

Simulated Electrical Contact Failure

Initial testing was performed by temporarily disconnecting single circuits, and combinations of circuits, that pass through the spring-loaded electrical contacts between the PSD and the B-pillar. This was done to simulate a loss of contact between the pins and pads. Two examples of the cause for loss of contact could be misalignment or corrosion. The function of the various pins is described below.

Pin	Wire Color	Function
A	Gray	Door Lock Actuator Lock Control
B	Tan	Door Lock Actuator Unlock Control
C	Black	Ground
D	Black	Ground
E	Yellow	Detent Switch Signal
F	Yellow	Detent Switch Signal
G	Black	Latch Motor Control

One condition was found that only existed when the vehicle was in Park. Upon intentional grounding of pins E & F, the PSD would open from a fully latched position. Permanently grounding the circuit caused the PSD to open as soon as it became closed and latched. If the circuit made intermittent contact (e.g. a chafed wire), the door activation was delayed until the circuit became grounded. This condition only existed when the vehicle was in Park. A warning chime activated and the "door ajar" warning was illuminated on the instrument panel when the door began to open.

Two conditions were found where the PSD would open when the vehicle was in motion, but these only existed if the PSD was in the process of closing when the operator placed the vehicle in motion. When either of these conditions existed, a warning chime activated and the "door ajar" warning was illuminated on the instrument panel when the door began to open.

1) With the circuit to pins E & F interrupted (they are tied together electrically in the vehicle and both must lose contact), the PSD would fully close and latch, and then immediately unlatched and fully opened.
2) With the circuit to pin G interrupted, the PSD approached the closed position but reversed and fully opened before becoming latched.

In both of these situations, the door continued to cycle open and closed approximately five (5) times and then remained in the open position. It could then be closed manually.

Low Voltage Testing

Testing was performed to determine if low battery voltage affected the operation of the PSD. When the PSD was activated and in motion, and then the voltage was reduced to ~9 VDC as the PSD was closing, (simulating starting the engine with a weak battery while closing the PSD), the PSD continued to close and latch. If the voltage was reduced to ~9 VDC before activating the PSD, the PSD did not activate. When the voltage was below 5 VDC, the PSD was inoperative under either scenario.

Manual Operation Testing

Since the door extends outward into the wind stream when the vehicle is in motion, the PSD was deactivated, the door was placed in a position where it was almost closed but still unlatched, and the vehicle was gently accelerated. The door remained in place without opening up to 50 mph. The test was terminated at 50 mph because the wind noise from the open door was deemed sufficient to cause an operator to notice that the door was partially open. Throughout this test, the "door ajar" warning was illuminated on the instrument panel.

Using the same conditions as the test describe above, a second test was initiated that involved a harder acceleration of the vehicle. In this test, the door immediately slid to the fully open position. A moderate application of the brakes then caused the door to slam shut and become latched in the closed position. Again, the "door ajar" warning was illuminated on the instrument panel until the door slammed closed.

Summary

Although the PSD could be tricked into an unintended opening condition through artificial manipulation of electrical circuits, VRTC was unable to create a condition where the properly functioning PSD would activate from a fully latched position when the vehicle was out of Park.

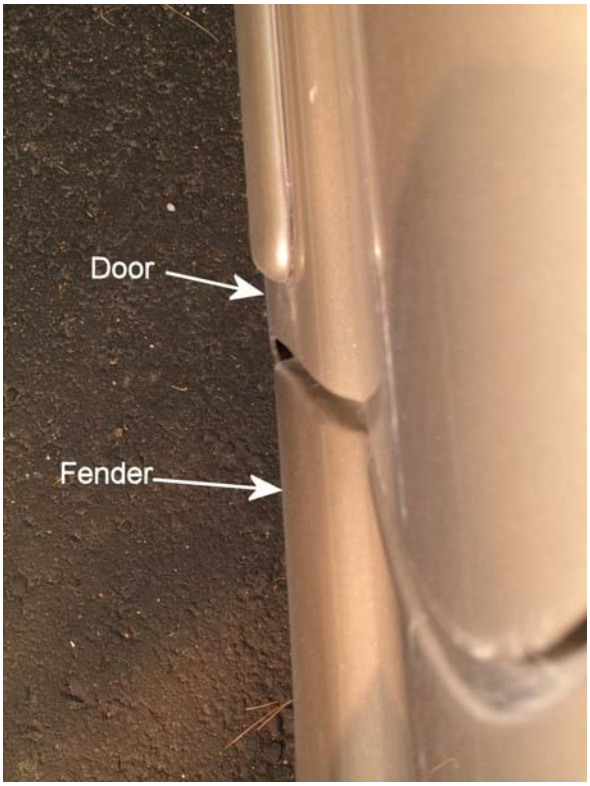
APPENDIX I

PHOTOGRAPHS OF FIRST VOQ INSPECTION

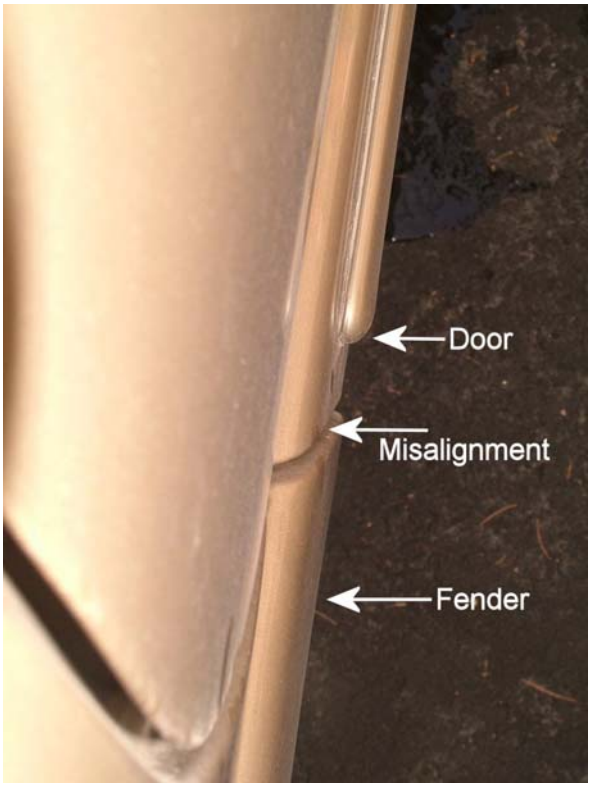
VIN: 1GNDV23L15D286839

Electrical Contacts on B-Pillar for Right PSD

Electrical Contacts on Front of Right PSD

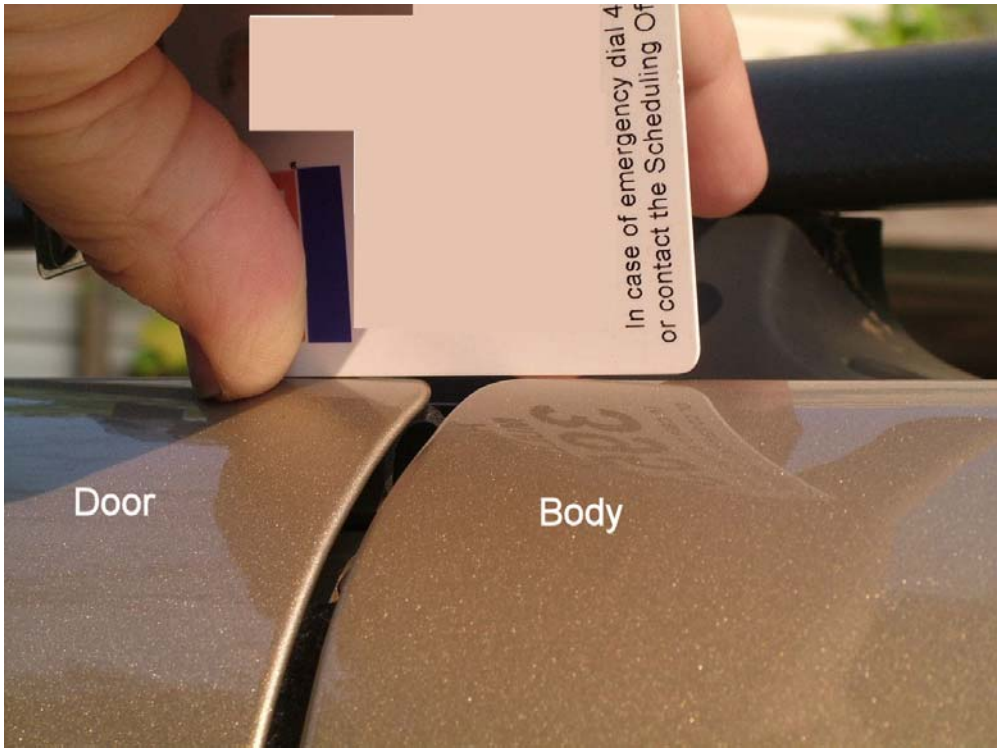


Vertical View of Proper Transverse Alignment



Vertical View of Transverse Misalignment

of Left PSD of Right PSD



Proper Vertical Alignment Top Rear of Left PSD with Roof

Vertical Misalignment of Top Rear of Right PSD with Roof

Striker on Body at Rear of Left PSD

Striker on Body at Rear of Right PSD

Striker on Body at Front of Left PSD

Striker on Body at Front of Right PSD

Latch Mechanism at Front of Left PSD

Latch Mechanism at Front of Right PSD

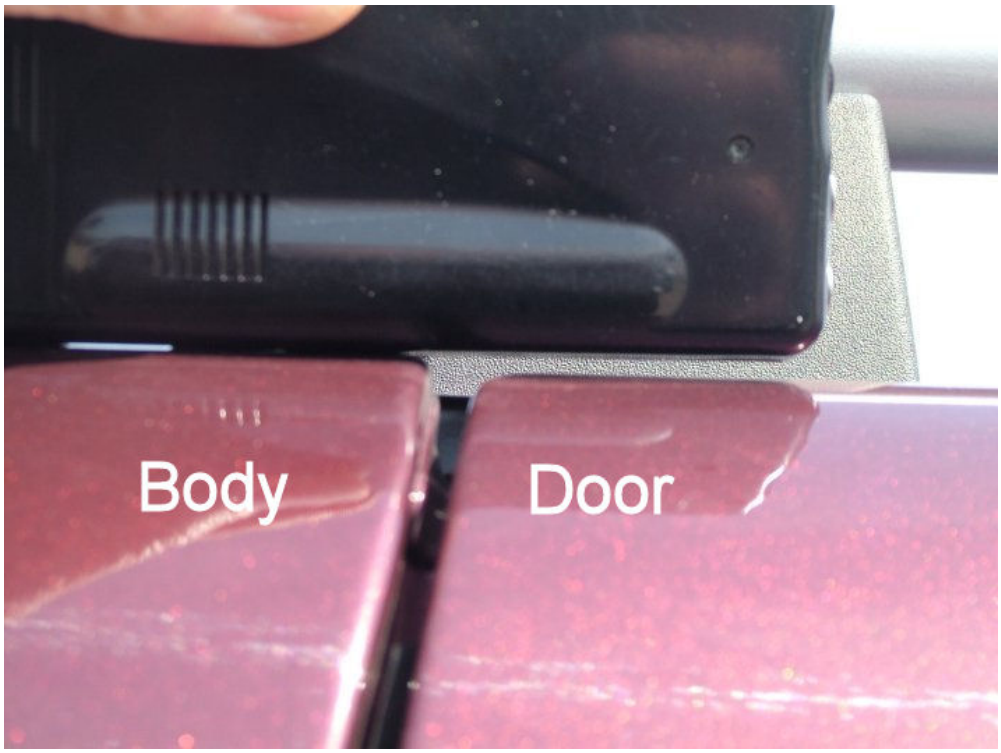
APPENDIX II

PHOTOGRAPHS OF SECOND VOQ INSPECTION

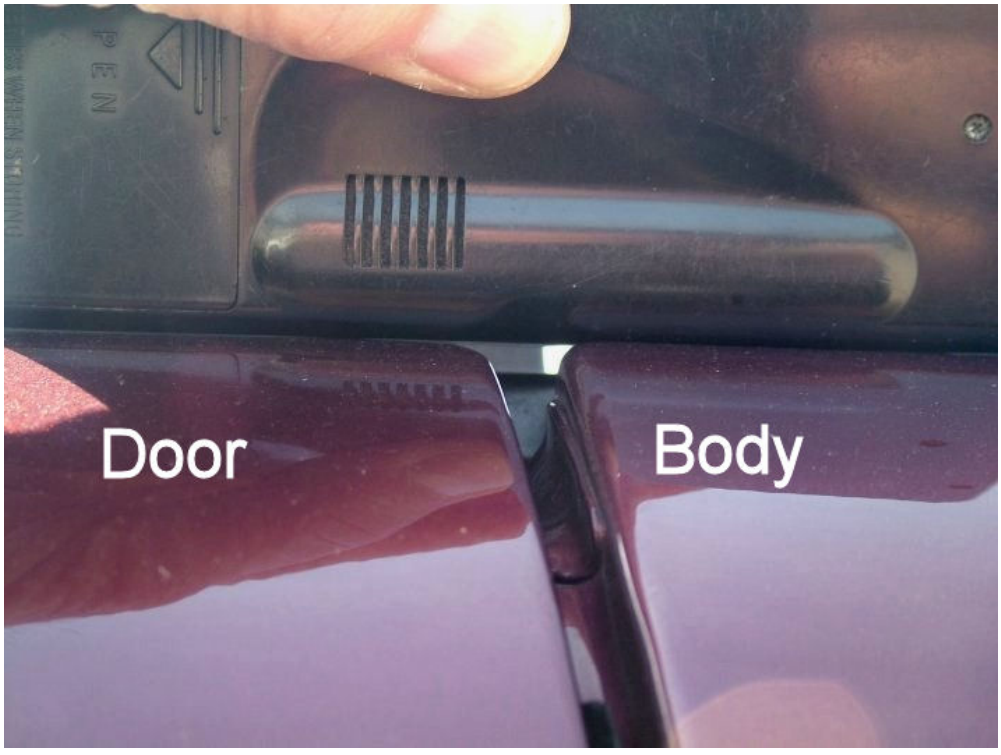
VIN: 1GMDX33L36D148466

Electrical Contact Pads on Left PSD

Electrical Contact Pads on Right PSD



Vertical Misalignment of Top Rear of Right PSD with Roof



Proper Vertical Alignment of Top Rear of Left PSD with Roof

Striker on Body at Rear of Left PSD

Striker on Body at Rear of Right PSD

Striker on Body at Front of Left PSD

Striker on Body at Front of Right PSD