



U.S. Department  
of Transportation  
**National Highway  
Traffic Safety  
Administration**

# ODI RESUME

Investigation: EA07-019  
 Prompted by: PE07-044  
 Date Opened: 12/11/2007  
 Principal Investigator: John Abbott  
 Subject: Power Sliding Door  
 Date Closed: 02/23/2009

Manufacturer: General Motors Corporation  
 Products: Model Year 2005-2007 General Motors Mini Vans  
 Population: 187,937

Problem Description: Power sliding door opening while vehicle is in motion

## FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
Complaints:	36	263	299
Crashes/Fires:	0	0	0
Injury Incidents:	0	1	1
# Injuries:	0	1	1
Fatality Incidents:	0	0	0
# Fatalities:	0	0	0
Other*:	0	60,799	60,799

\*Description of Other: Warranty claims

Action: Close Investigation

Engineer: John Abbott *JA*

Date: 02/23/2009

Div. Chief: Thomas Z. Cooper

Date: 02/23/2009

Office Dir.: Kathleen C. DeMeter

Date: 02/23/2009

Summary: ODI evaluated General Motor's (GM) data, conducted consumer interviews, inspected and tested MY 2005-2007 GM minivans with regard to the alleged defect of a power sliding door (PSD) opening while the vehicle is out of PARK. ODI identified a high warranty claim rate. However, these claims are related to various problems associated with doors not properly opening or closing and not specifically to doors opening while driving. The condition of the PSD reversing direction during the closing sequence is consistent with an obstruction of the door, or with improper alignment of the door, and this is addressed in GM technical service bulletin # 07-08-64-007 and bulletins # 07-08-64-007A through D. ODI's evaluation of the PSD system notes numerous safeguards to preclude both unintentional and intentional power opening of the PSD while the vehicle is in motion.

A safety-defect trend has not been identified at this time. Accordingly, this investigation is closed.

**BASIS:** This investigation was opened as Preliminary Evaluation PE07-044 on August 16, 2007, based on nine vehicle owner's reports alleging that a power sliding door (PSD) opened, without command, while the vehicle was being driven. Many of the reports also indicated that the PSD was difficult to close, or would reverse direction during the closing sequence. Based on additional consumer reports and information provided in GM's PE response, the investigation was upgraded to Engineering Analysis EA07-019 on December 27, 2005, and the scope was expanded to include the 2007 model year vehicles.

**SUBJECT VEHICLES:** The subject vehicles included in this investigation are GM minivans produced for model years (MY) 2005 through 2007. The vehicles are equipped with a PSD on the driver's side, or the passenger's side, or both. Table 1 identifies the subject vehicles by make/model, model year, and vehicle production. For reference, Photo 1 is a MY 2006 Uplander.

<b>Table 1. Subject Vehicles</b>				
Make/Model	MY 2005	MY 2006	MY 2007	Total
Chevrolet Venture	17,887	NA	NA	17,877
Chevrolet Uplander	37, 268	20,853	15,358	73,479
Pontiac Montana	5,990	NA	NA	5,990
Pontiac Montana SV6	16,728	17,101	0	33,829
Buick Terraza	19,848	10,103	7,574	37,525
Saturn Relay	12,858	3,778	2,591	19,227
Total	110,579	51,835	25,523	<b>187,937</b>



Photo 1 MY 2006 Chevrolet Uplander

**ALLEGED DEFECT:** The alleged defect is unintended or unexpected opening of the power sliding door while the vehicle is in motion.

**PSD SYSTEM CONTROLS:** The following provides a brief description of PSD system controls:

- Remote Keyless Entry Transmitter (Key fob)
- Overhead Console Enable Switch (on/off)
- Overhead Console Open/Close Switch
- “B” Pillar Open/Close Switch
- Interior/Exterior Door Handle (for manual operation)

**PSD SYSTEM COMPONENTS:** The following provides a brief description of PSD system components:

- PSD Module (PSDM)
  - Receives, interprets, and stores door position information
  - Applies programmed logic to control the drive unit, latch release actuator, and warning chime
  - Power is supplied to the PSDM by the Body Control Module (BCM) when in “PARK”
- Drive Unit Assembly (Motor)
  - Moves the door by a cable attached to the center roller hinge
- Front and Rear Door Mounted Latches
  - Front latch has primary (latched) position only
  - Rear latch has secondary and primary positions
  - Latch strikers are body mounted
- Detent Switch
  - Part of rear latch assembly
  - Provides a latch position signal to the PSDM; latched (primary), ajar (secondary), or open (unlatched)
- Electrical Contact Plungers and Pads
  - Provide an electrical path from the door to the body harness for all PSD signal and ground circuits
  - Plungers are on the door and the pads on the “B” pillar
- Lock/Unlock Actuator
  - Unlocks/locks the door latch
  - Controlled by the BCM
  - Locks automatically above 3 mph
  - Provides a mechanical disconnect of the unlatch actuator and latch
- Unlatch Actuator
  - Responsible for unlatching the PSD
  - Controlled by the PSDM
- PSD Position Sensors
  - Used to determine position, direction, and rate of door travel
  - Sends signal pulses to the PSDM when door is moving
  - Pulses allow the PSDM to calculate door position
  - If signal pulses slow below a specified limit it is recognized as an obstacle

**PSD OPERATIONAL SEQUENCE:** The following provides a brief summary of the power operational sequence of the PSD.

Power open from a fully closed and latched position:

In the power open sequence the PSD module (PSDM)<sup>1</sup> receives a signal to open the PSD from either the key fob, overhead console open/close switch, or the “B” pillar open/close switch. The PSDM then checks to assure the following: (1) a valid Body Control Module PARK signal (12 volts at the park interlock) and a valid PRNDL message (in “P”); (2) a valid vehicle speed sensor message (<2 mph); (3) proper battery voltage (9.5 to 16V); (4) the enable switch signal is on; and (5) no active Diagnostic Trouble Codes (DTC) relative to PSD operation. If all of the above conditions are met, the PSDM activates the unlatch actuators for the front and rear latches, engages the drive unit to open the PSD, monitors the optical sensor signals, and controls the PSD opening speed until it reaches a full open signal count or full open stop. The PSD will stop (abort) if the optical sensor signals slow below a specified limit (obstacle detected), if a DTC is set, or if a subsequent activation signal is received while the PSD is in motion (interpreted as an intent to abort).

Power close from a fully open position:

In the power close sequence the PSDM receives a signal to close the PSD from either the key fob, overhead console open/close switch, or the “B” pillar open/close switch. The PSDM then checks to assure the following: (1) proper battery voltage (9.5 to 16V); (2) the enable switch signal is on; and (3) no active Diagnostic Trouble Codes (DTC) relative to PSD operation. If all of the above conditions are met, the PSDM activates the drive unit to close the PSD, monitors the optical sensor signals, and controls PSD closing speed. As the PSD closes and makes contact with the front and rear latch strikers, the “fork bolt” in the latches pivots around the strikers<sup>2</sup>. During this process, the “detent switch” in the rear latch transitions to the secondary latch position (ajar) and signals the drive motor to increase power until the primary latch position (fully closed and latched) is reached. When the primary latched position is reached, the detent switch signals the drive motor to stop. If the optical sensor signals slow below a specified limit (obstacle detected), the PSD stops and reverses to the fully open position and stops.

The following is a brief description of PSD movement when an obstacle has been detected in the close sequence under various conditions:

In PARK:

- The PSD stops and reverses to full open and stops
- The warning chime is constant as the PSD is reversing
  - Chime stops when the PSD stops
- The Driver Information Center (DIC) displays “Door Ajar”
- The overhead console lamp is illuminated

---

<sup>1</sup> The PSDM controls the operation of the PSD. It receives, interprets, and stores door position information, applies programmed logic to control the drive unit, latch release actuator, and warning chime. Power is supplied to the PSDM by the Body Control Module (BCM) when the vehicle is in “PARK”. When out of “PARK” the system still has power to close the PSD.

<sup>2</sup> The front latch has only one position (primary), the rear latch has two, secondary and primary.

Out of PARK and vehicle speed less than 2 mph:

- The PSD stops and reverses to full open and stops
- The warning chime is constant as the PSD is reversing
- The warning chime continues even when the PSD is full open
- The DIC displays “Door Ajar”
- The overhead console lamp is illuminated

Out of PARK and vehicle speed greater than 2 mph:

- The PSD reverses to full open and will attempt to close up to 3 times
- After the third unsuccessful attempt to close, the PSD reverses to full open and stops
- The warning chime is constant as the PSD is attempting to close
- The warning chime continues even when PSD is full open
- The DIC displays “Door Ajar”
- The overhead console lamp is illuminated

**PROBLEM EXPERIENCE:** There are 299 non-duplicative reports relating to the alleged defect. GM provided 263 reports (owner & field) and ODI received 36 owner reports. Table 2 shows the number and rate of reports by vehicle model year.

<b>Table 2. Owner Reports</b>				
Model Year	2005	2006	2007	Total
Reports	207	58	34	299
Population	110,579	51,835	25,523	187,937
Complaint/100k	187	112	133	159

**INJURY:** GM stated it had received one report of an injury associated with the alleged defect. The vehicle involved was a 2005 model year Chevrolet Uplander and the incident occurred in calendar year 2007. In this incident, it is alleged that while driving approximately seven (7) mph around a curve, the driver’s side PSD opened and an unrestrained 3 year old standing on a child restraint fell out of the vehicle onto a gravel road. The child received scratches and abrasions to its face and hands.

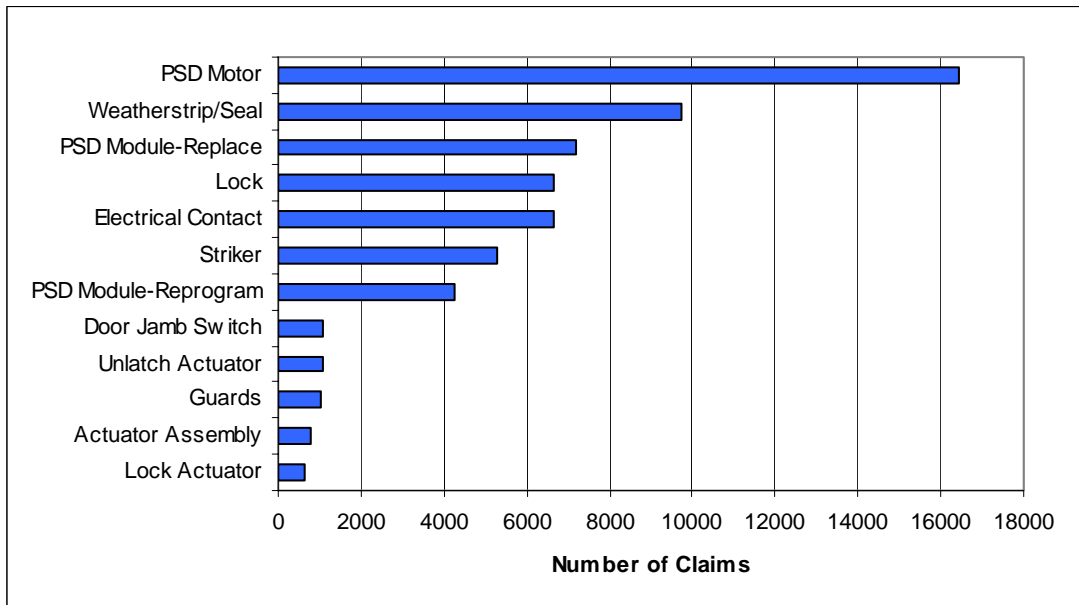
**WARRANTY:** From GM’s data, ODI finds a high number of warranty claims (60,799) associated with PSD operation and repair in the subject vehicles. Very few of the warranty claims provide any type of narrative description as it relates to the alleged defect. However, when analyzing the claims by labor operation code they do provide information as to component repair and or replacement. This is summarized in the warranty claims analysis below.

Warranty Claims Analysis:

GM reported 60,799 regular warranty claims (as of mid-October 2008) that may be related to the alleged defect in the subject vehicles. These warranty claims or repairs were made on almost 40,000 subject vehicles (about one fifth of the subject vehicles). Approximately 21,000 warranty claims involved subsequent repairs after an initial warranty repair. Table 3 (on page 6) shows the number and rate of the warranty claims by vehicle model year.

<b>Table 3. Warranty Claims by Vehicle Model Year</b>				
Model Year	2005	2006	2007	Total
No. of Warranty Claims	38,236	10,648	11,915	60,799
Claims per 100 Vehicles	34.6	20.5	46.7	32.4

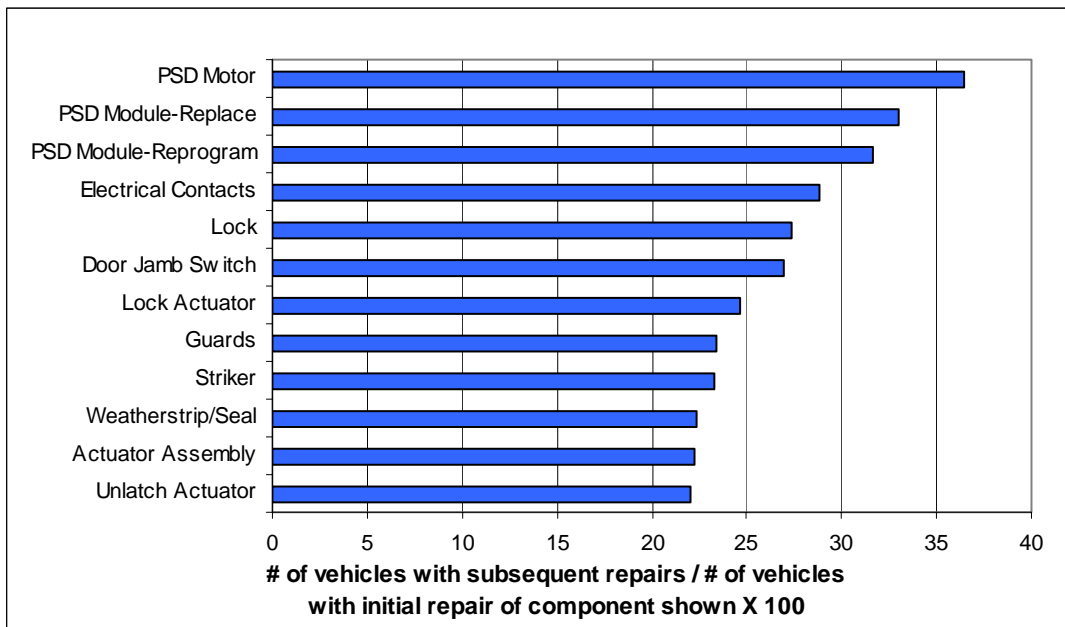
GM's warranty submissions provided labor codes which identify the component replaced or repaired. By using the labor codes listed for the 60,799 warranty claims, ODI determined the number of PSD related components replaced or repaired (see Figure 1). The data show that the PSD motor was replaced most often. However, ODI does not believe that a failure or malfunction of the motor would cause or contribute to the alleged defect condition. Various other components were also replaced.



**Figure 1. Repaired Component Using Warranty Labor Codes**

Given the large number of multiple or subsequent repairs on the same vehicle, ODI evaluated the data to determine whether or not any specific PSD or related component repair may be an effective repair remedy. If the initial repair is an effective remedy then a subsequent repair would not be needed.

Approximately 38,000 warranty repaired vehicles had a single component replaced or repaired on the initial visit and approximately 11,000 of these vehicles had subsequent repairs. Using this data, ODI determined the rate of subsequent repairs by component (see Figure 2, on page 7). This means, for example, 36 percent of vehicles with an initial PSD motor replacement had subsequent repairs.



**Figure 2. Subsequent Repair Rate**

The subsequent repair rates range from 22 to 36 percent with the PSD motor and module repairs having the highest rates (32-36 percent). The repairs of the unlatch actuator, actuator assembly and weather-strip/seal have the lowest rates (all at 22 percent) and may be more effective remedies than other repairs.

**SERVICE BULLETINS:** ODI is aware of seven Technical Service Bulletins (TSB) issued on the subject vehicles that relate to PSD operation. Table 5 lists the bulletins by date, bulletin number, and subject. None of the bulletins specifically point to a problem of door opening while driving. However, one of the bulletins (**07-08-64-007**) relates to proper diagnosis and repair of the PSD and has been issued five times in the past two (2) years. Each subsequent bulletin (A-D) provides additional and updated information to the previous bulletin and instructs dealer technicians on the proper diagnosis and repair of the PSD. While these bulletins do not address the alleged defect, they do address issues of the PSD reversing direction during the closing sequence (see failure mode discussion below).

<b>Table 5. GM Technical Service Bulletins Related to PSD Operation</b>		
<b>Date</b>	<b>Bulletin Number</b>	<b>Subject</b>
May-05	05-08-64-013	PSD Bounces When It Stops, Does Not Achieve Full Open Position, Driver Information Center (DIC) Message Displayed (Reprogram PSD Module)
<b>Mar-07</b>	<b>07-08-64-007</b>	<b>General PSD Diagnosis/Repair Procedures</b>
Apr-07	07-08-64-008	PSD Increased Effort While Opening
<b>Nov-07</b>	<b>07-08-64-007 A</b>	<b>General PSD Diagnosis/Repair Procedures</b>
<b>Apr-08</b>	<b>07-08-64-007 B</b>	<b>General PSD Diagnosis/Repair Procedures</b>
<b>May-08</b>	<b>07-08-64-007 C</b>	<b>General PSD Diagnosis/Repair Procedures</b>
<b>Jul-08</b>	<b>07-08-64-007 D</b>	<b>General PSD Diagnosis/Repair Procedures</b>

**FAILURE/MALFUNCTION MODES:** GM has identified several conditions that can occur with a malfunctioning PSD including the following:

- PSD reverses
- PSD starts to close then reopens
- PSD reverses prior to making contact with the pads and plungers<sup>3</sup>
- PSD reverses after making contact with the pads and plungers

**CONTRIBUTING FACTORS:** Some contributing factors to a malfunctioning PSD include the following:

- Door striker to latch misalignment
- Electrical plunger to contact pad misalignment
- Door roller to track misalignment, damage or interference
- Body weather strip to door misalignment, interference/ friction
- Overall poor door fit
- Shifting out of PARK or driving away before the PSD is fully closed and latched

**WARNING:** The PSD system utilizes an audible warning chime as well as lighted visual warning indicators. The visual indicators include the overhead courtesy light (on when the door is open) and a lighted “door ajar” indicator in the dash mounted Driver’s Information Center.

**TESTING:**

**GM Tests/Analysis:** In response to this investigation, GM conducted three actions as part of their testing and analysis of the alleged defect (Table 6). These actions included complainant surveys (GM and ODI complainants), vehicle inspections, and assessment of replaced actuators from warranty repairs, and GM made a technical presentation to ODI. These actions did not discover any specific PSD system components or component failures that explain the reports of the alleged defect. Rather, GM states “...unintended or unexpected opening of the closed PSD while the vehicle is in motion is actually the result of driving away before the door is closed and latched.”

<b>Table 6. GM Test and Analysis Actions</b>			
Action	Date	Title	Summary
8-A	8/07	Vehicle Inspections and customer contacts	Inspection of three vehicles did not exhibit the alleged defect. Customer survey indicates opening of the PSD was result of driving away before PSD closed and latched.
8-B	9/07	Warranty Parts Return	26 unlatch actuators inspected and all functioned correctly
8-C	1/08	Survey of ODI complainants	Additional information from five complainants indicates the PSD did not open when out of PARK or placed vehicle in motion before PSD was closed

<sup>3</sup> Provides an electrical path from the door to the body harness for all PSD signal and ground circuits



ODI Tests/Analysis: On March 11, 2008, ODI requested the National Highway Traffic Safety Administration's Vehicle Research and Test Center (VRTC) to conduct testing of the subject vehicles in an effort to reproduce the alleged defect. As part of the test program, VRTC inspected two ODI complaint vehicles. The first vehicle inspected was a 2005 Chevrolet Uplander and the inspection took place on August 3, 2007. The vehicle owner reported that when closing the right PSD electronically, the door would close and then immediately reopen. It was also reported that the door had opened once while the vehicle was in motion. VRTC could not duplicate the PSD opening while the vehicle was out of PARK. However, on one occasion VRTC did confirm or witness the PSD close and then immediately reopen. There were no further abnormal conditions noted. The second vehicle inspected was a 2006 Pontiac Montana and the inspection took place on March 26, 2008. The vehicle owner reported that when closing the right PSD electronically the door would sometimes close and then immediately reopen. VRTC could not duplicate the condition and the door operated normally.

To further test the subject vehicles VRTC purchased a 2005 Buick Terraza. VRTC was not able to reproduce or create a condition by which a fully closed and latched PSD would power open when the vehicle is out of PARK<sup>4</sup>.

**MANUFACTURER'S EVALUATION OF THE ALLEGED DEFECT:** GM states that *"The PSD will not open if the door is closed and latched when the transaxle has been shifted out of PARK."* And, *"When the vehicle is driven before the sliding door has been power closed and latched and the audible warning chime has been ignored, the unlatched door may reverse open due to forces created by vehicle movement. Consequently, the condition described by customers as unintended or unexpected opening of the closed PSD when the vehicle is out of PARK is actually the result of driving away before the door is closed and latched."*

GM believes that the PSD in the subject vehicles are not defective and do not pose an unreasonable risk to motor vehicle safety and offers the following as its basis:

- Successful validation testing of the PSD system without incident
- Verification of the safeguards that prevent inadvertent unlatching
  - Doors automatically lock when vehicle speed is above 3 mph., providing a mechanical disconnect between the unlatch actuator and the door latches
  - The PSDM only allows power to the unlatch actuator when in PARK
  - The PSDM requires a Vehicle Speed Sensor message of less than 2 mph.
- There are multiple warning indicators that a PSD is not fully closed and latched
- Testing and analysis of 26 warranty return unlatch actuators did not identify a defect and all worked correctly
- Inspection of three (3) complaint vehicles could not verify or duplicate PSD opening when out of PARK
- GM's technical assistance with its dealers has not verified or duplicated any PSD opening when out of PARK
- There is no defect trend related to the unlatch actuator or unlatch actuator assembly

---

<sup>4</sup> See VRTC Test Report #VRTC-DCD-8127

**ODI ANALYSIS:** Consumer interviews, inspection and testing of the subject vehicles by both VRTC and GM have not established the existence of the alleged defect. Even though the warranty experience is high, the claims involve numerous repairs that we could not link to the alleged defect.

Also, many of the owner reports indicated that the PSD was difficult to close, or would reverse direction during the closing sequence. The condition of the PSD reversing direction during the closing sequence is consistent with an obstruction of the door, or with improper alignment of the door, and is addressed in GM Technical Service Bulletin # 07-08-64-007 and bulletins # 07-08-64-007A through D.

**REASONS FOR CLOSING:** A safety-related defect has not been identified at this time and further use of agency resources does not appear to be warranted. Accordingly, this investigation is closed. The closing of this investigation does not constitute a finding by NHTSA that a safety-related defect does not exist. The agency will take further action if warranted by the circumstances.