



U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

ODI RESUME

Investigation: EA07-017
 Prompted By: PE07-037
 Date Opened: 12/07/2007
 Principal Investigator: Stephen McHenry
 Subject: Rear drivetrain component failure.

Manufacturer: General Motors Corp.
 Products: 2004 – 2006 Cadillac CTS-V
 Population: 7,612

Problem Description: The rear drivetrain components (e.g., rear differential carrier housing, rear axle half shafts) may fracture while driving causing a loss of motive power and vehicle disablement.

FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
Complaints:	16	19	35
Crashes/Fires:	0	0	0
Injury Incidents:	0	0	0
# Injuries:	0	0	0
Fatality Incidents:	0	0	0
# Fatalities:	0	0	0
Other*:	0	128	128

*Description of Other: Warranty claims

Action: An Engineering Analysis has been opened.

Engineer: Stephen McHenry *SMcH*
 Div. Chief: Jeffrey L. Quandt
 Office Dir.: Kathleen C. DeMeter

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Summary: The Model Year (MY) 2004 through 2006 Cadillac CTS-V are very high performance vehicles that are equipped with manual transmissions and the 400 horsepower LS6 5.7l V8 engine that can produce 395 ft-lbs of torque. ODI and GM have received complaints from owners alleging incidents of rear drivetrain component failure (e.g., cracked rear differential carrier housing, fractured rear axle half-shafts), resulting in a loss of motive power and vehicle disablement.

GM maintains that the rear drivetrain component failures have resulted from the cumulative effects of high loads/stresses on the components that occur during severe snap clutch events from a stop that induce power hop. GM defines snap clutch engagement as "when the foot is slipped off a fully depressed clutch pedal at high engine rpms with the vehicle at rest." Power hop (also referred to as "wheel hop," "rear axle hop," or "rear suspension bounce") is a rapid vertical oscillation of the rear suspension as the rear tires lose and regain traction during hard accelerations.

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GM indicated that snap clutch events apply "significant torsional impact forces to the rear differential," which try to separate the gears within the differential and results in tensile loading of the differential housing. According to GM, if the vehicle experiences power hop during a snap clutch event, the resulting forces can be great enough to overload and crack the rear differential housing or fracture the outboard stem of one of the half shafts. GM also stated that, in general, it takes multiple snap clutch events with power hop to cause such failures.

GM implemented changes during MY 2005 and 2006 production to improve the ability of the rear differential housing and half shafts to withstand loads produced during snap clutch events that include power hop. GM also revised the suspension mounts and powertrain calibration to reduce the potential for power hop to occur.

In July 2005, GM released a Technical Service Bulletin (#05-04-114-001a) titled, "Drivetrain - Wheel Hop on Full Throttle Acceleration," for MY 2004 and 2005 CTS-V vehicles. The bulletin describes power hop, which it associates with "very aggressive driving," and releases a service kit to provide "an incremental improvement in reducing the tendency of the rear suspension to wheel hop." The kit consists of a revised set of firmer rear sub-frame bushings.

ODI's preliminary analyses of complaint and warranty claim data indicate that GM's design changes do not appear to have been completely effective in eliminating either power hop or rear drivetrain component failures. In addition, many of the owners interviewed by ODI have alleged power hop events and rear drivetrain component failures while driving (during gear shifts) and not necessarily induced by a "snap clutch" event.

ODI has upgraded this investigation to an Engineering Analysis to assess the driving conditions that can produce power hop, the effects of power hop on rear drivetrain component loads/stresses, and the frequency, trend and safety consequences of loss of motive power incidents caused by rear drivetrain component failures.

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