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

ODI RESUME

Investigation: PE04-052
Prompted By: NCAP Testing, Consumer Complaint
Date Opened: 07/22/2004 Date Closed: 11/01/2004
Principal Investigator: Kyle Bowker
Subject: Rear Suspension Toe Control Link

Manufacturer: General Motors Corp.
Products: 2002 - 2004 Saturn VUE
Population: 234,025

Problem Description: Rear suspension toe control link may fail when subject to forces beyond its design capacity.

FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
Complaints:	0	0	0
Crashes/Fires:	0	0	0
Injury Incidents:	0	0	0
# Injuries:	0	0	0
Fatality Incidents:	0	0	0
# Fatalities:	0	0	0
Other*:	2	0	2

*Description of Other: NHTSA New Car Assessment Program (NCAP) test incidents.

Action: This Preliminary Evaluation has been closed.

Engineer: *Kyle M. Bowker* KMB Date: *11/01/2004*
Div. Chief: *Jeffrey L. Quandt* Date: *11/01/2004*
Office Dir.: *Kathleen C. DeMeter* Date: *11/01/2004*

Summary: The Office Of Defects Investigation (ODI) opened this Preliminary Evaluation to investigate allegations of rear suspension failure in the subject vehicles during certain severe driving maneuvers. The investigation was prompted by NHTSA-conducted NCAP dynamic rollover test incidents involving MY 2004 Saturn VUE vehicles and one consumer complaint that alleged that when recovering from a road edge departure, the left-rear wheel of a MY 2003 Saturn VUE "bent underneath the vehicle," resulting in a rollover crash.

ODI analysis indicates that rear suspension failure during the NCAP tests was the result of wheel rim-pavement contact transmitting significant compressive forces to the toe control link, thus causing it to buckle. This failure occurred at low speed during a severe test used to assess roll stability. The forces generated during this type of wheel-rim pavement contact are more than six times the greatest forces measured during GM's most severe vehicle development and validation testing. ODI inspection and analysis of consumer complaint vehicles showed that damage to the toe control link appeared to be the result of vehicle crashes and did not precipitate the crashes. To date, ODI is aware of no vehicle crashes or rollover incidents related to the alleged defect. Additionally, the manufacturer has notified the agency that it is conducting a voluntary customer satisfaction service campaign to strengthen the rear suspension of the subject vehicles.

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.

See summary report attached for further detail.

KMB
11-1-04

PE04-052 SUMMARY REPORT

SUBJECT: Rear suspension toe control links on certain model year (MY) 2002 through 2004 Saturn VUE (GMT315) vehicles may fail when subject to forces beyond their design capacity.

BASIS: Initial Evaluation IE04-048, which formed the basis for PE04-052, was prompted by NHTSA New Car Assessment Program (NCAP) test incidents and by one consumer complaint.

NCAP: On June 18, 2004, NHTSA conducted NCAP dynamic rollover testing of a MY 2004 Saturn VUE 4-wheel drive sport utility vehicle. The left-rear suspension failed in overload during the 45-mph fishhook maneuver portion of the testing, causing the wheel to collapse beneath the vehicle. A subsequent fishhook test of a two-wheel drive MY 2004 Saturn VUE resulted in similar rear suspension failure.

ODI analysis indicates that rear suspension failure during the NCAP tests was the result of wheel rim-pavement contact transmitting significant compressive forces to the toe control link that exceeded the original design requirements, thus causing it to buckle. Other suspension components, including the upper camber link and the rear trailing arm, were subsequently damaged.

The subject test vehicles exhibited divergent roll oscillations during the reverse steer maneuver portion of the fishhook test, resulting in wheel rim-pavement contact. The wheel rim-pavement contact occurred late in the test sequence and at near zero velocity. The compressive forces recorded at the toe link during this type of wheel rim-pavement contact are more than 6 times greater than those measured during all of GM's development and validation of the subject vehicles.

Beginning on July 31, 2004, new Saturn VUE vehicles manufactured by GM incorporated the complete rear suspension assembly from the Chevrolet Equinox (GMT191). While both the Saturn VUE and Chevrolet Equinox share similar platform architecture and rear suspension layouts and geometry, the Chevrolet Equinox rear suspension assembly was manufactured using more robust components to accommodate its longer wheelbase and higher gross axle weight rating (GAWR). A comparison of the Saturn VUE and Chevrolet Equinox toe control links is shown below:

Toe Link Design	Part No.	Material	Gage (mm)	Calculated Compression Load Capacity (kN)
GMT315 (Pre 7/31/04)	22692550	SAE 1008	3.2	19.5
GMT191 & GMT315 (Post 7/30/04)	22678193	SAE 950	3.5	27.0

In August 2004, NHTSA conducted NCAP dynamic rollover testing of both 2- and 4-wheel drive MY 2004 Saturn VUE vehicles equipped with the new rear suspension assembly now shared with the Chevrolet Equinox. In addition, the subject test vehicle's FMVSS compliance label/tire placard was revised to indicate higher tire inflation pressures than previously

recommended (35psi front/rear vs. 30psi). While both test vehicles experienced wheel rim-pavement contact, there was no evidence of rear suspension failure.

CONSUMER COMPLAINTS: At the time PE04-052 was opened, ODI was aware of one consumer complaint that alleged that when recovering from a road edge departure, the left-rear wheel of a MY 2003 Saturn VUE "bent underneath the vehicle," resulting in a rollover crash. ODI, in conjunction with an expert from the National Center for Statistics and Analysis (NCSA) Special Crash Investigations (SCI) Program, examined the subject complaint vehicle and collected detailed crash data. The complaint vehicle was procured and transported to NHTSA's Vehicle Research Test Center (VRTC) for further study and comparison to the subject NCAP test incident vehicles. NHTSA analysis indicates no evidence of wheel rim-pavement contact and that damage to the toe control link appears to be the result of the vehicle crash and did not precipitate the crash.

During the course of the investigation, ODI received additional consumer complaints that alleged (or expressed concern about) rear suspension failure that resulted (or could possibly result) in a crash. Additionally, the agency broadcast an alert to field personnel (including National Automotive Sampling System (NASS), Crash Injury Research and Engineering Network (CIREN), and SCI personnel) requesting assistance in locating subject vehicles of interest. Only 1 additional vehicle crash was identified that might possibly be related to the alleged defect. Again, an expert SCI crash investigator examined the vehicle and collected detailed crash data. As before, analysis indicates no evidence of wheel rim-pavement contact and that damage to the toe control link appears to be the result of the vehicle crash and did not precipitate the crash. To date, ODI is aware of no vehicle crashes or rollover incidents related to the alleged defect.

NCSA CRASH DATABASE STUDY: ODI requested NCSA's assistance to compare the normalized single-vehicle rollover rate for the subject vehicles to a group of 13 peer vehicles (chosen to represent comparable vehicles with respect to: vehicle type, market factors, curb weight, wheelbase, suspension type, rear track width, and Static Stability Factor). NCSA queried and analyzed the following crash databases: Fatality Analysis Reporting System (FARS), NASS General Estimates System (GES), NASS Crashworthiness Data System (CDS), and available State databases. NCSA's analysis found no evidence to suggest that the rollover rate for the subject vehicles is significantly greater than for similar peer vehicles. Preliminary analysis suggested that the rollover rate may be better for the subject vehicles compared to peer vehicles, however, there are an insufficient number of subject vehicle crashes to obtain statistically significant results.

GM VOLUNTARY SERVICE CAMPAIGN: On August 5, 2004, GM announced that it would conduct a voluntary customer satisfaction service campaign to strengthen the rear suspension system on all Saturn VUE vehicles built prior to July 31, 2004. The campaign will include replacing the existing toe control link with a stronger toe control link (from the GMT191 and post 7/30/04 GMT315) that has been modified with a slit sleeve bushing to accommodate the original M12 sized fastening hardware. In addition, a revised tire inflation specification label will be affixed to the vehicle advising owners that the recommended cold tire inflation pressure is now 35psi for both the front and the rear tires.

CONCLUSIONS AND REASON FOR CLOSING: The compressive force measured at the toe control link during fishhook maneuvers where wheel rim-pavement contact occurred is more than 6 times the greatest force measured during GM's most severe vehicle development and validation testing. There is no evidence that indicates the subject vehicles experience a significantly greater propensity to roll over than comparable peer vehicles and, to date, ODI is aware of no vehicle crashes or rollover incidents related to the alleged defect. In addition, GM is conducting a voluntary customer satisfaction service campaign to strengthen the rear suspension of the subject vehicles.

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.

Kyle M. Bowker

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Vehicle Control Division

11-1-04
Date

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Date

Kathleen C. DeMeter, Director
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