



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

# ODI RESUME

Investigation: EA 06-002  
 Prompted By: PE05-054  
 Date Opened: 01/24/2006      Date Closed: 02/05/2007  
 Principal Investigator: Derek Rinehardt  
 Subject: Rear coil spring fracture

Manufacturer: Ford Motor Company  
 Products: 2000 & 2001 Ford Taurus / Mercury Sable  
 Population: 411779

Problem Description: The alleged defect is rear suspension coil spring fracture causing damage to the adjacent tire and resulting in a sudden air loss or loss of vehicle control.

## FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
Complaints:	395	629	1024
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	1020	1020

\*Description of Other: Warranty claims

Action: Engineering Analysis is closed.

Engineer: Derek Rinehardt *DR*  
 Div. Chief: Jeffrey L. Quandt  
 Office Dir.: Kathleen C. DeMeter

Date: 02/05/2007  
 Date: 02/05/2007  
 Date: 02/05/2007

Summary: ODI's analysis identified a high complaint rate for the rear coil springs in the salt belt states (approximately 250 per 100,000 vehicles). Approximately 59 percent of the complaints alleged that the coil spring failure caused damage to the adjacent rear tire, with about half of these (30 percent of total complaints) alleging that the damage resulted in air loss. Because air loss from a rear tire can result in changes in vehicle handling characteristics, ODI examined field data, test data and interviewed consumers to assess the safety consequences of such failures in the subject vehicle population.

Analysis of all available field data did not identify any crashes or injuries resulting from the alleged defect in the subject vehicles. VRTC testing conducted to simulate a coil spring induced rear tire failure did not result in a loss of vehicle control. When interviewed by ODI, none of the consumers who experienced incidents of tire air loss due to the alleged defect indicated that the failures caused a loss of vehicle control. Tire damage resulting from the alleged defect has involved rubbing/abrasive wear of the inner tire sidewall with the potential for air loss from pin-hole sized leaks in the wear "groove". There is no evidence that the alleged defect has caused any sudden, catastrophic tire failures in either straight or turning maneuvers.

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 monitor this issue and reserves the right to take further action if warranted by the circumstances.

See document file for additional information regarding this resume.

**ENGINEERING ANALYSIS CLOSING REPORT**

**SUBJECT:** Rear coil spring fracture

**EA No:** EA06-002

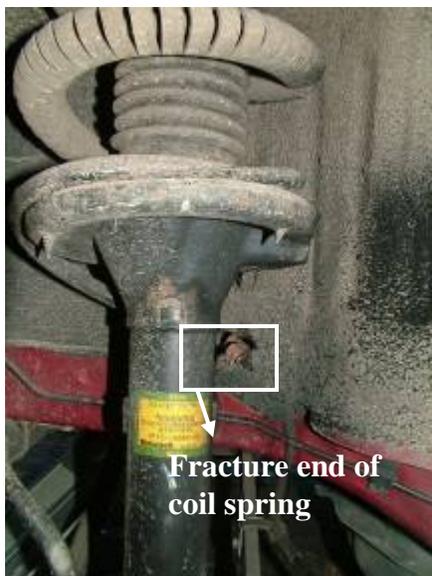
**DATE OPENED:** 24-Jan-2006

**DATE CLOSED:** 05-Feb-2007

**SUBJECT VEHICLES:** Model Year (MY) 2000-2001 Ford Taurus and Mercury Sable Sedan vehicles manufactured for sale or lease in the United States.

**SUBJECT COMPONENT:** Rear suspension coil springs.

**ALLEGED DEFECT:** The alleged defect is a fracture of the rear suspension coil springs causing damage to the adjacent tire (see figures 1 and 2), resulting in a sudden air loss or loss of vehicle control.



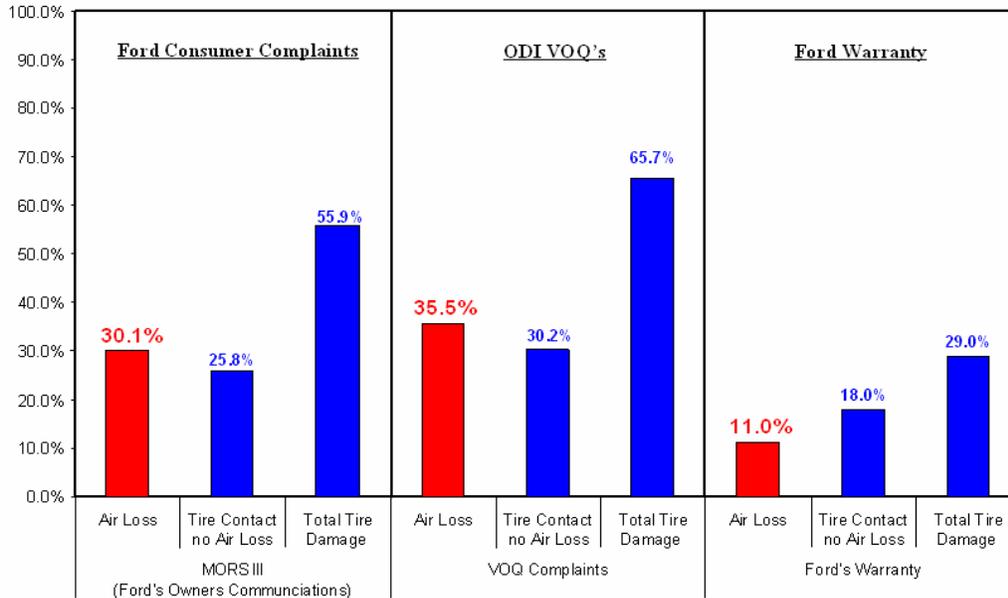
**Figure 1**



**Figure 2**

**BASIS:** An Engineering Analysis (EA), EA06-002, was opened as a result of upgrading a Preliminary Evaluation (PE), PE05-054. The Office of Defects Investigation (ODI) opened PE05-054 based on 131 complaints of rear coil spring fracture. Fifty-one of the 131 complaints alleged that a rear coil spring fracture caused a puncture of the adjacent tire and subsequent air loss. Nineteen of the complaints alleged that the air loss was rapid. Additionally, forty-four of the 131 complaints alleged a rear coil spring fracture that damaged the sidewall of the adjacent tire. Although none of the complaints alleged a crash, injury or fatality, rapid air loss in a tire could cause loss of vehicle control and result in a crash.

As part of PE05-054, an Information Request (IR) letter was sent to Ford Motor Company on 17-Oct-2005 and a response was received on 22-Nov-2005. At the end of PE05-054, analysis of Vehicle Owner Questionnaires (VOQ) complaint data and Ford Complaint and Warranty data showed that a significant percentage (see Chart 1) of consumers alleging rear coil spring fractures also alleged that the adjacent tire was punctured, causing air loss. To further assess if a safety related defect trend existed in the subject vehicles, ODI opened EA06-002.



PE05-054 Data Sources

Chart 1

**COMPONENT DESCRIPTION:** Rear Suspension Coil Spring

**VEHICLE POPULATION:** The subject vehicle population is 411,779, sold or leased in the following saltbelt states CT, DC, DE, IA, IL, IN, KY, MA, MD, ME, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, WI and WV. See Table 1 below.

Model	2000 MY	2001 MY
Mercury Sable Sedan	44,782	51,946
Ford Taurus Sedan	154,856	160,195
<b>Total</b>	<b>199,638</b>	<b>212,141</b>

Table 1

**SERVICE BULLETINS:** Ford has not issued any technical service bulletins related to the alleged defect in the subject vehicles.

**CORRESPONDENCE:**

Date	Description
9/27/2005	Preliminary Evaluation (PE) Opening Resume
10/13/2005	PE Information Request (IR) Letter (from ODI to Ford Motor Co.)
11/22/2005	PE IR Response (from Ford Motor Co. to ODI)
1/24/2006	PE Closing Resume and Engineering Analysis (EA) Opening Resume

Table 2

**PROBLEM EXPERIENCE:** ODI has received 395 complaints and Ford has received an additional 629 unique complaints, totaling 1,024 complaints that are related to the alleged defect in the subject vehicles. In total, 97% of all complaints come from saltbelt state vehicles. Twenty-eight percent of complaints allege the adjacent tire was damaged (without air loss) as a result of a rear coil spring fracturing. An additional 30% allege there was air loss as a result of a rear coil spring puncturing the adjacent tire.

Of the total vehicle population, 0.3% had a fractured rear coil spring replaced under warranty. Of the vehicles with the rear coil spring replaced under warranty, 11% alleged air was lost in the adjacent tire and 18% alleged the adjacent tire was damaged.

**DESIGN, MATERIAL AND/OR PRODUCTION MODIFICATIONS:** The only design change noted by Ford was a temporary deviation to the released design due to a material availability issue. From 11/13/00 through 2/13/01, approximately 9,000 of the subject springs were temporarily produced with 12.05mm diameter wire instead of 11.9mm diameter wire. The rate and load of the springs were maintained by adjusting the number of coils.

**VRTC (VEHICLE RESEARCH TEST CENTER) TESTING:** In support of the investigation, testing was conducted at VRTC to gather more information concerning the alleged defect in the subject vehicles.

- **Ohio Area Survey** - VRTC performed a survey of Ohio area residents, based on current vehicle registration, to gather information concerning the alleged defect beyond the data gathered from the VOQs and the complaint and warranty data provided by Ford (See Table 3 for a summary).

EA06-002 Ford Coil Spring Ohio Questionnaire		
General Survey Information	Raw Numbers	Percentage of Valid Responses
Questionnaires Sent	306	
Valid Responses	99	
- No longer owned vehicle at time of survey	14	14.1%
- Did not experience the alleged defect	68	68.7%
- Already had vehicle repaired for alleged defect at the time of the survey	17	17.2%
Statistics of Consumers w/Alleged Defect	Raw Numbers	Percentage of Vehicles Repaired
- Respondants that alleged tire damage due to the alleged defect	10	58.8%
- Respondants that alleged there was air loss in the adjacent tire due to the alleged defect	4	23.5%
- Respondants that alleged <i>loss of vehicle</i> control due to the alleged defect.	0	0.0%
- Respondants that alleged a <i>crash</i> due to the alleged defect	0	0.0%
Vehicle Statistics		
Average Current Vehicle Mileage (All Valid Responses)	78,895.6	
Average Mileage of Vehicle @ Repair	92,328.3	
Average Age of Vehicle @ Repair (Months)	66.6	

**Table 3**

- **Simulation of Tire Air Loss While Driving**

A pair of coil springs (one fractured, one unfractured) was obtained from a consumer that filed a complaint with ODI alleging that one of the rear coil springs fractured on his vehicle. At VRTC, both springs were installed on a representative subject vehicle. The vehicle was then driven with the

spring rubbing against the inner sidewall of the tire from the starting point. The vehicle was driven 3.8 miles before there was air loss in the tire. During the drive evaluation, the driver reported no loss of vehicle control, however the driver indicated the smell of rubber was apparent. After installing the space-saver spare tire, there was no contact between the broken spring and the tire. Examining the full size tire after the testing was completed, the tire experienced similar damage as found in data submitted by Ford and information submitted by consumers to ODI. On the sidewall the depth of the groove caused by the fractured coil spring was approximately 7/32", however the hole through the inner wall was small (see Figures 3 and 4).



**Figure 3**



**Figure 4**

**FORD'S POSITION:** Ford's position is that rear coil fracture in the subject vehicles does not present an unreasonable risk to motor vehicle safety. Ford's analysis of the alleged defect is primarily focused on its analysis of customer complaints, warranty data, the failure mode associated with the alleged defect, the design of the rear suspension, warning signs and the age of the subject vehicles that experienced the alleged defect.

- **Consumer Complaints**

Ford contends that the recent increase in complaints related to alleged rear coil spring fracture is primarily due to the announcement of field service action<sup>1</sup> in 2004 regarding the front coil springs on the subject vehicles (see Chart 2). Ford believes that consumers whose vehicles have required rear coil spring replacement are contacting Ford to inquire about opportunities for financial assistance or to inquire if their vehicles are covered by any field service actions, since they are aware of the action being taken on the front coil springs. Ford contends that it has not received any reports of crashes, fatalities or injuries related to the alleged defect in the subject vehicles.

---

<sup>1</sup> Ford announced a recall (NHTSA # 04V-332) in 2004 of MY 1999 through 2001 Ford Taurus and Mercury Sable sedans for front coil spring fracture originally sold in saltbelt states.

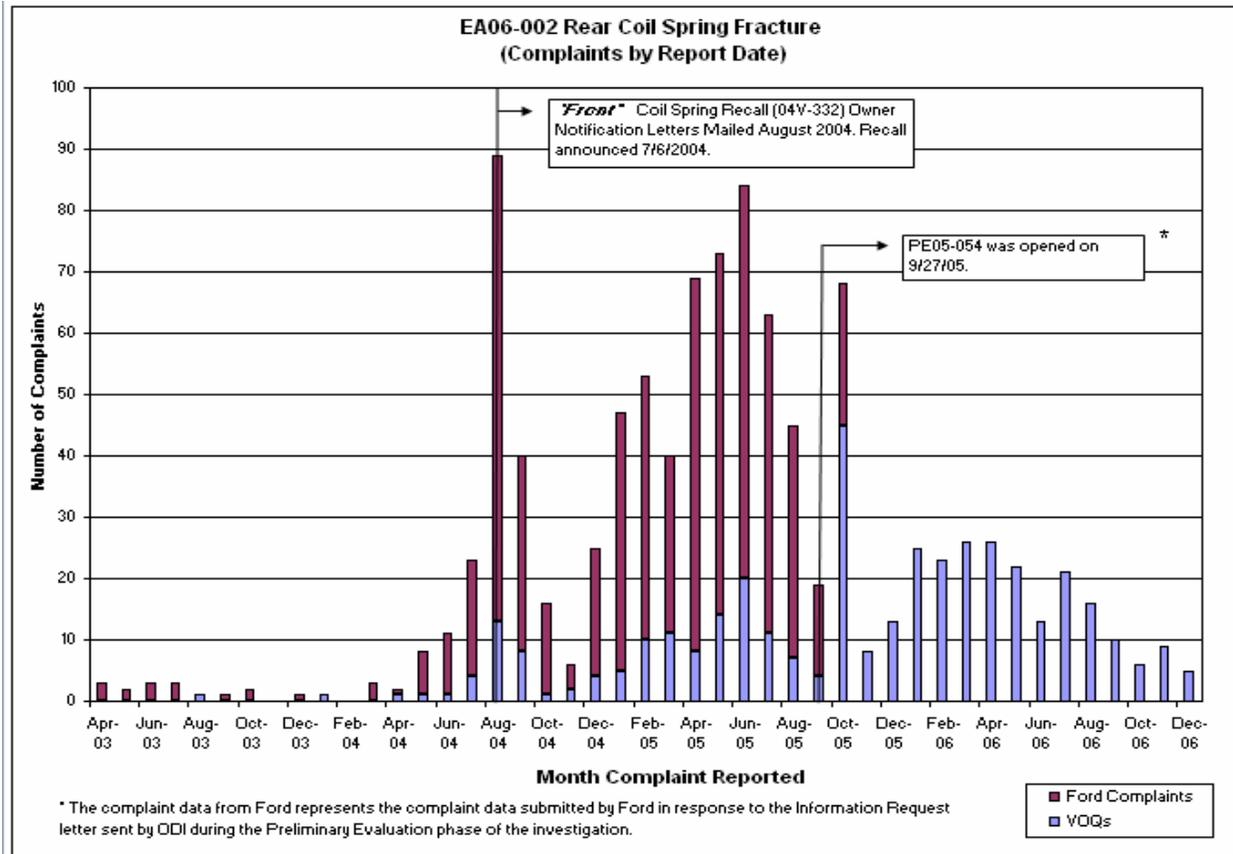


Chart 2

- **Vehicle Design**

The rear coil spring design consists of a fixed upper spring seat, a straight cylindrical coil spring, and a lower spring seat design with minimal side load compensation. The front coil spring design by contrast includes a rotating upper spring seat, a semi-barrel shaped coil spring, and a lower spring seat with a greater side load compensation than the rear coil spring seat. Ford contends the design of the rear coil spring is likely to inhibit rotation of a fractured spring, inhibit a fractured spring from falling below the spring seat, and limit the outboard movement of the fractured spring end.

- **Failure Mode**

Ford contends that the majority of the responsive reports allege that a rear coil spring fracture did not result in tire contact. Ford also contends that when there is air loss due to contact from a fractured rear coil spring, the most likely event is for the coil spring to rub against the side wall for a period of time until the sidewall is eventually penetrated and a slow loss of air occurs (see Figures 5 and 6).



Figure 5



Figure 6

Ford believes that if the subject vehicles experience air loss due to the alleged defect, it is a slow loss like a typical flat tire that can occur from a variety of causes. Ford further contends that “Even in the unlikely event of a rapid air loss event, passenger cars such as the Taurus and Sable, are very stable”.<sup>2</sup>

- **Crash Experience**

Ford contends that the alleged defect is an apparent source of consumer dissatisfaction to owners however; it has not posed any risk to the safe operation of the vehicles. As support, Ford cites that there have been no reported crashes, injuries or fatalities related to the alleged defect in the subject vehicles some of which have been in service for more than six years.

- **Warning**

Ford contends that several warning signs may alert the consumer that there is a problem with the subject prior to air loss. Among these are noises from the rear suspension, visible leaning or sagging of the vehicle. Ford contends that responsive reports from consumers noting such warnings are indicative that the consumer had sufficient time to have the vehicle serviced prior to any air loss from the tire.

### **ODI DISCUSSION:**

- **Injuries, Fatalities, and Crashes**

As of 12/27/2005, ODI is not aware of any injuries, fatalities or crashes associated with rear coil spring fracture in the subject vehicles after a review of over 1,050 warranty claims and 1,020 consumer complaints (complaints to Ford and ODI combined).

- **Loss of Vehicle Control**

An analysis of over 1,020 complaints received by Ford and ODI, revealed that no loss of control was noted in vehicles with a rear coil spring fracture only (no tire contact) or a vehicle with a rear coil spring fracture and tire contact with no air loss. Although three VOQs noted “Loss of Control” in the description of incident, ODI’s interviews with these consumers could not verify a single loss of control event. Two of the consumers specifically stated that there was no loss of vehicle control.

- **Warning:**

Of the VOQs and consumer interviews that alleged a fractured rear coil spring caused the adjacent tire to lose air, approximately 40% indicated that there were one or more warning signs of a problem in the rear of the vehicle prior to any air loss in the tire. The majority of these consumers indicated hearing a rubbing sound from the rear of the vehicle. Other warning signs noted by consumers were “smells” of heated rubber, “feeling” the vehicle shaking, loud “banging” or “creaking” sounds, and visual signs of tire

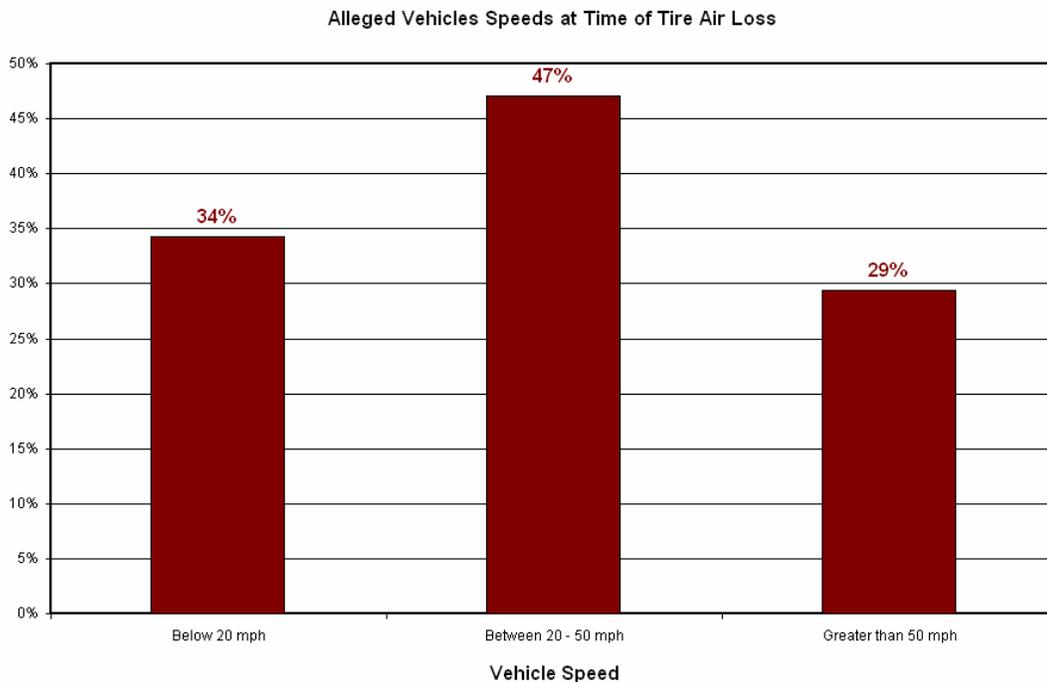
<sup>2</sup> Statement made by Ford in the Information Letter Response during the PE level of the investigation.

damage (typically a circumferential groove worn on the sidewall of the tire), discovered by the consumer or a mechanic during routine vehicle maintenance or inspection. In general, these were not sufficient to result in the driver's exiting the roadway.

Slightly more than 40% of consumers who alleged tire air loss, alleged there were no warning signs prior to the air loss. Of these consumers, none reported a crash or a loss of vehicle control with the exception of the three consumers mentioned in the "Loss of Vehicle Control" section of this report.

- **Vehicle Speed:**

Of consumers experiencing the alleged defect and where there was air loss, approximately 29% alleged experiencing air loss while driving over 50 mph (see chart 3). None of these consumers alleged a crash or loss of vehicle control associated with the alleged defect. Likewise, consumers traveling at speeds less than 50mph have not alleged a crash or loss of control with the exception of the aforementioned consumers.



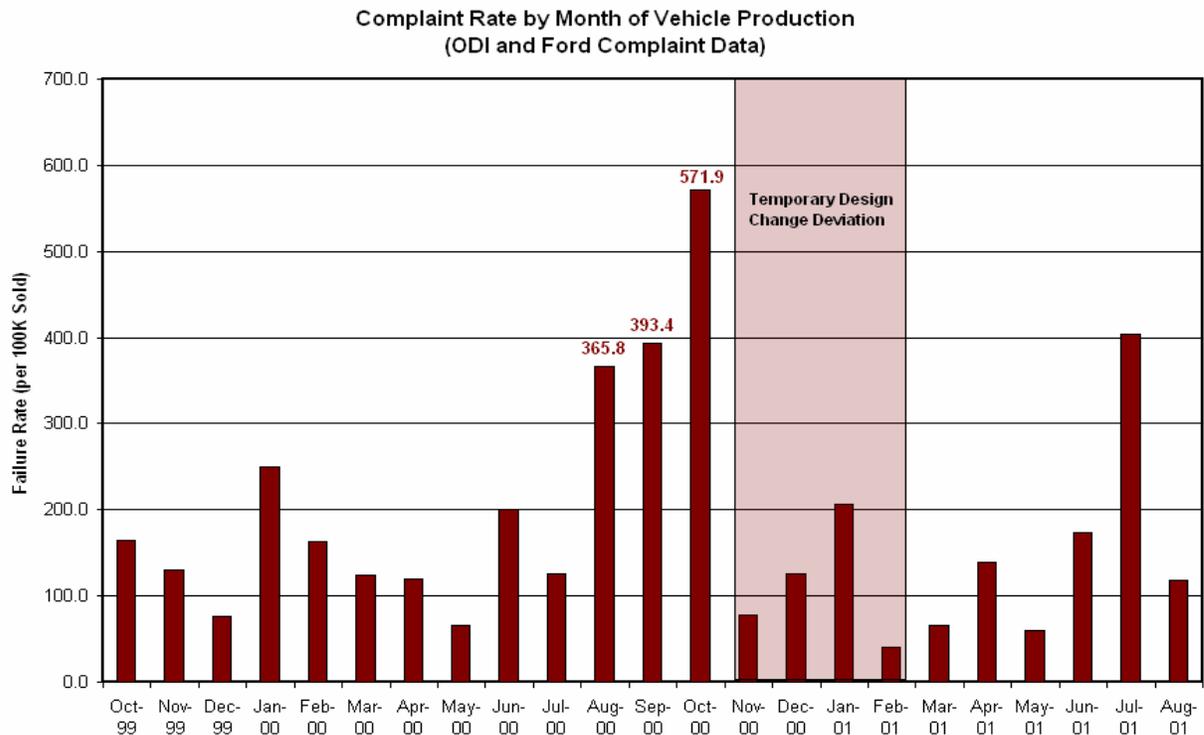
**Chart 3**

- **Complaint Rates**

The overall complaint rate (rear coil spring fracture, ODI and Ford combined) based on the salt belt population is 249.4 per 100K. The complaint rate of complaints that also alleged air loss as a result of the subject defect is 50.5 per 100K.

- **Design, Material and/or Production Modifications**

Ford implemented a temporary design deviation in the rear coil springs from 11/13/00 through 02/13/01 as noted previously in this report. Chart 3 below shows the rear coil spring failure rate by month of production based on consumer complaints. Although there is a drop in failure rate from October 2000 to November of 2000, the complaint rate in November of 2000 is similar to prior months of production in 1999 and early 2000. Also, when the released design change was put back into production, the failure rates remained consistent. Based on failure rate data, ODI could not draw a conclusion that the temporary design change was related to the alleged defect.



**Chart 3**

- **Front Coil Spring Discussion**

Ford announced a recall<sup>3</sup> of Ford Taurus and Mercury Sable vehicles in 2004 due to front coil spring fracture. In Ford's Owner Notification letter to consumers about the recall concerning the front coil spring fracture, Ford notes "There is a potential for a fractured spring [front] to move past the spring seat and contact a front tire. If a spring should fracture and come in contact with a tire, the tire may rupture resulting in rapid air loss, which could increase the risk of a crash without warning".

Conversely, Ford contends, in the PE IR response for the rear coil investigation, that the design of the rear coil springs is likely to: inhibit rotation of the fracture spring, inhibit a fractured spring from falling below its seat and limit the outboard movement of the fractured spring end. Ford contends that these factors minimize the opportunity for tire interaction from a fractured spring. ODI's analysis of complaint and warranty data does not support this contention.<sup>4</sup> However a review of complaints of alleged front coil spring fracture in the subject vehicles did highlight failure effects that were not alleged in any of the rear coil spring fracture complaints. Among the alleged failure effects due to front coil fracture based on consumer complaints are: the front end of the vehicle contacting with the road surface<sup>5</sup>, damage to the front ABS wheel speed sensor<sup>6</sup>, and puncture of the spare tire after replacement of original tire<sup>7</sup>.

<sup>3</sup> NHTSA Recall# 04V332 was initiated in 2004 by Ford, recalling MY 1999 – 2001 Ford Taurus and Mercury Sable sedans, sold in saltbelt states for front coil spring fracture.

<sup>4</sup> Based on complaint data (ODI and Ford combined), approximately 60% of the consumers alleged rear coil spring to tire contact as a result of rear coil spring fracture.

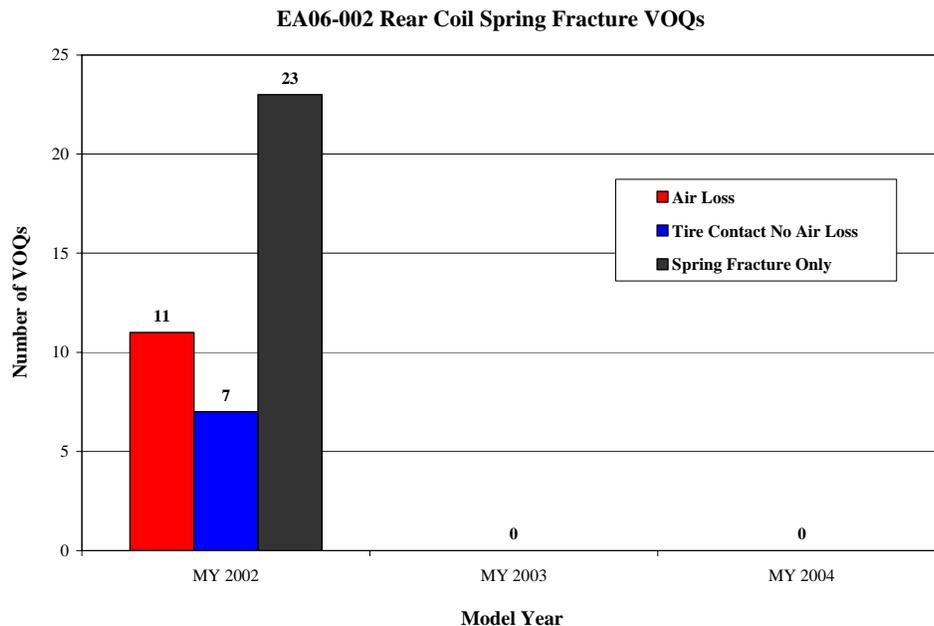
<sup>5</sup> Alleged by consumers in VOQs 10062177, 10104513, and 10115498.

<sup>6</sup> Alleged by a consumer in VOQ 10057660.

<sup>7</sup> Alleged by a consumer in VOQ 10158715. In review of complaints of rear coil spring fracture, 17 consumers noted they were able to install the space saver spare tire and drive the vehicle without damage from the fractured coil spring. During testing at VRTC the spacer saver spare tire was also installed with no rear spring to tire interaction.

- Complaint Summary of Model Years beyond the Scope of EA06-002**

The scope of EA06-002 encompassed MY 2000 and 2001 based on known complaint information at the time of opening. ODI also did a review of complaints of model years beyond the scope of the investigation (MY 2002, 2003 and 2004). Chart 4 below summarizes the data. The review of the complaints did not reveal any allegations of crashes, injuries, fatalities or loss of vehicle control.



**Chart 4**

**REASON FOR CLOSING:**

ODI's analysis identified a high complaint rate for the rear coil springs in the Salt Belt states (approximately 250 per 100,000 vehicles). Approximately 59 percent of the complaints alleged that the coil spring failure caused damage to the adjacent rear tire, with about half of these (30 percent of total complaints) alleging that the damage resulted in air loss. Because air loss from a rear tire can result in changes in vehicle handling characteristics, ODI examined field data, test data and interviewed consumers to assess the safety consequences of such failures in the subject vehicle population.

When interviewed by ODI, none of the consumers who experienced incidents of tire air loss due to the alleged defect indicated that the failures caused a loss of vehicle control. Tire damage resulting from the alleged defect has involved rubbing/abrasive wear of the inner tire sidewall with the potential for air loss from pin-hole sized leaks in the wear "groove" as depicted in this report. There is no evidence that the alleged defect has caused any sudden, catastrophic tire failures or rapid air loss in either straight or turning maneuvers. VRTC testing conducted to simulate a coil spring induced rear tire failure did not result in a loss of vehicle control. Analysis of all available field data did not identify any crashes or injuries resulting from the alleged defect in the subject vehicles.

Based on this information, 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 reserves the right to take further action if warranted by the circumstances.