



U.S. Department  
of Transportation

**National Highway  
Traffic Safety  
Administration**

# ODI RESUME

**Investigation:** PE 13-014  
**Date Opened:** 05/07/2013  
**Investigator:** Derek Rinehardt  
**Approver:** Frank Borris  
**Subject:** Alleged Loss of Steering  
**Date Closed:** 01/31/2014  
**Reviewer:** Jeff Quandt

## MANUFACTURER & PRODUCT INFORMATION

**Manufacturer:** Ford Motor Company  
**Products:** MY 2008 Ford F250 / F350 Super Duty Trucks  
**Population:** 336,667  
**Problem Description:** Complainants allege an internal failure of the steering gear box results in a loss of steering capability.

## FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
<b>Complaints:</b>	6	19	24**
<b>Crashes/Fires:</b>	2	4	6
<b>Injury Incidents:</b>	0	0	0
<b>Fatality Incidents:</b>	0	0	0
<b>Other*:</b>	0	149	149

\*Description of Other: Warranty claims.

\*\* Total eliminates duplicates received by ODI and manufacturer.

## ACTION / SUMMARY INFORMATION

**Action:** This Preliminary Evaluation is closed.

### Summary:

The Office of Defects Investigation (ODI) opened PE13-014 after identifying five complaints alleging steering gear failure in model year (MY) 2008 Ford F-250 and F-350 Super Duty pick-up trucks and to evaluate the relationship between the design history of the steering gear assembly and the alleged defect.

As background, ODI investigated steering gear sector shaft fractures in approximately 1.3 million MY 1999 - 2001 Ford Super Duty pick-up trucks and MY 2000 - 2001 Ford Excursion sport utility vehicles in Engineering Analysis EA01-009. The investigation determined that the sector shaft failures were "the result of extraordinary, possibly multiple, impacts and not the result of fatigue." No defect in design, manufacturing or materials was identified in the sector shaft. EA01-009 was closed August 19, 2003 with 169 complaints, resulting in a rate of 12.9 incidents per 100,000 vehicles after approximately one year of service.

Ford increased the diameter of the sector shaft from 1.375 inches to 1.625 inches at the start of MY 2005 production, increasing the resistance of the steering gear assembly to torsional overload by approximately 48% and changing the failure mode from sector shaft fracture to cracked or broken sector shaft gear teeth. The redesigned steering gear assembly was used in approximately 1.1 million MY 2005 through 2009 Ford Super Duty pick-up trucks, including the subject vehicles. Figure 1 shows the basic steering system design used in Ford Super Duty trucks investigated in EA01-009 and PE13-014. Figure 2 shows the locations of failures resulting from impact related torsional overloading of the sector shaft for the subject vehicles and the prior generation Ford Super Duty trucks investigated in EA01-009. Figure 3 shows an example of a failed sector shaft investigated in EA01-009 and comparisons of fracture surfaces of sector shafts failing from fatigue loading and from torsional overload.

Ford provided field return part analysis of failed steering gears from MY 2005 through 2009 Super Duty trucks found evidence of broken sector shaft gear teeth and piston damage consistent with incidents of single event overload (Figure 4). Laboratory analysis found no evidence of fatigue or material property defects in any of the fractures. Analysis of complaint rates by vehicle build month showed no patterns indicating potential manufacturing quality issues and no difference before and after Ford introduced design changes to the input shaft and sector shaft seals in July 2007 to address potential leak concerns (Figure 5). Analysis of failures by time in service indicates a random failure pattern/distribution, consistent with incidents of impact induced overload (Figure 6).

The complaint rate for the subject vehicles after approximately 5 to 6 years, 7.1 incidents per 100,000 vehicles, is lower than the rate observed in EA01-009. Furthermore, similar to the condition investigated in EA01-009, a number of incident records include evidence of impact loads (e.g., curb strikes) and several alleged crashes include incidents in which information suggests that the steering gear failure was most likely a result of crash forces, rather than the cause of the crash.

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.

The ODI complaints cited above can be reviewed at [www-odi.nhtsa.dot.gov/complaints](http://www-odi.nhtsa.dot.gov/complaints) under the following identification (ODI) numbers: 10512061, 10497982, 10494795, 10462146, 10284402, and 10331743

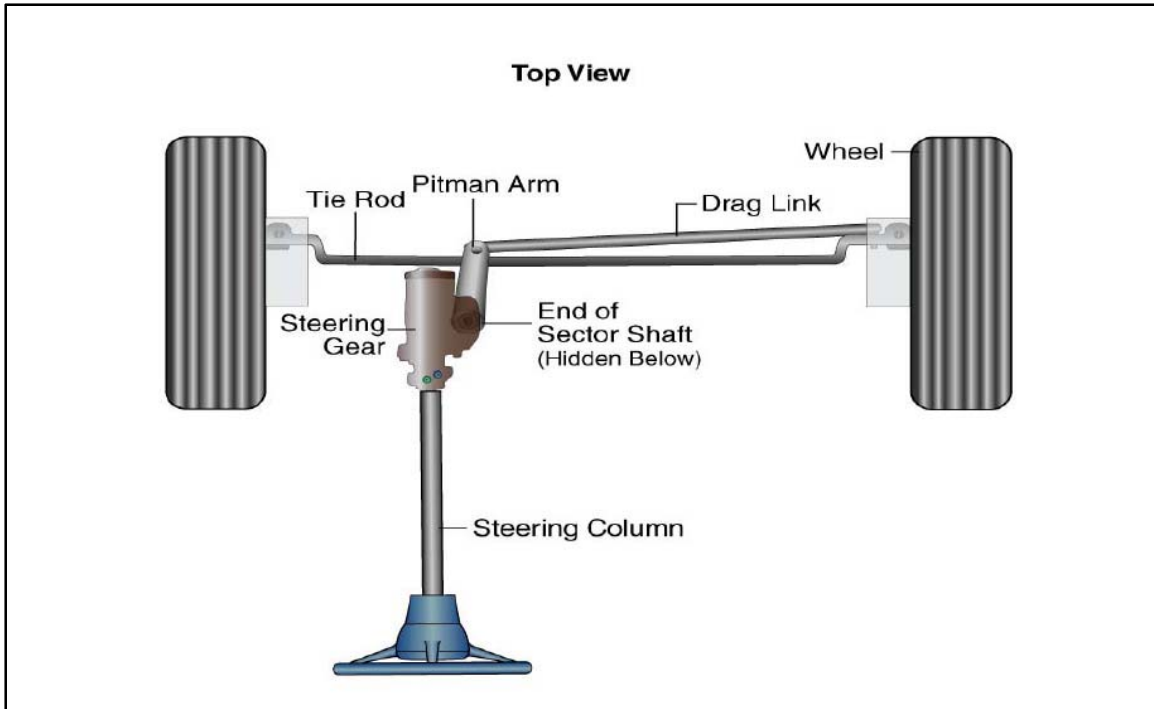


Figure 1. Ford F-Series Super Duty Steering System.

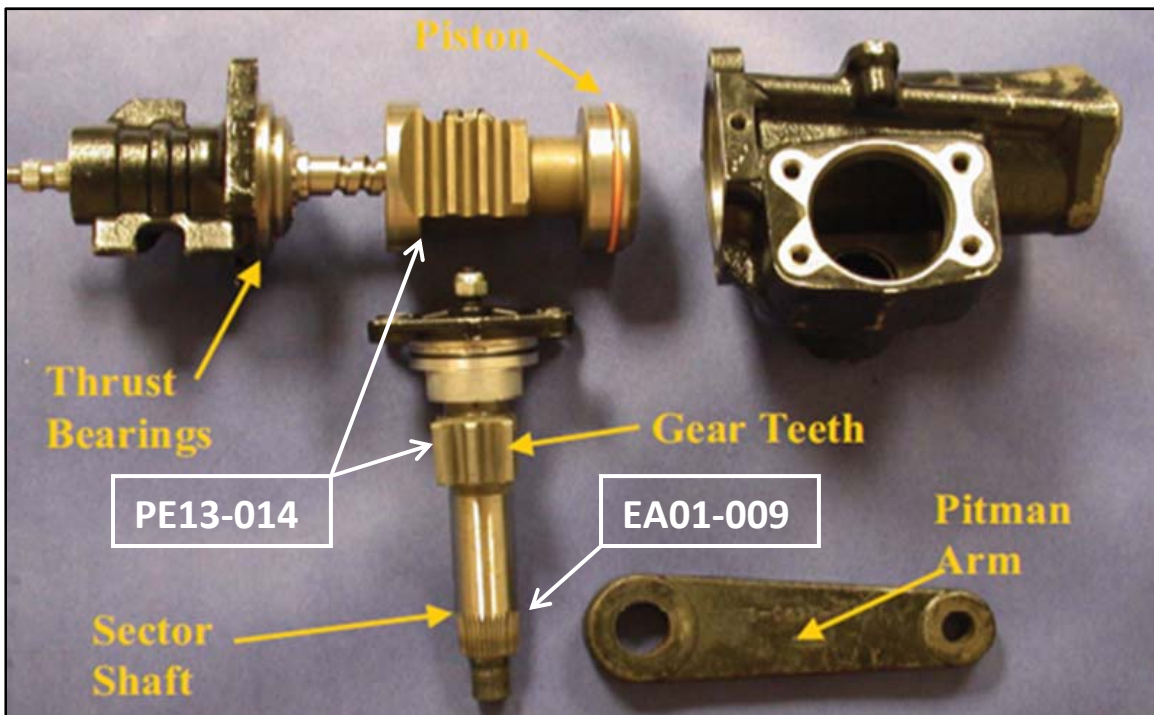


Figure 2. Ford F-Series Super Duty steering gear components and locations of overload failures for EA01-009 and PE13-014.



Figure 3. Steering gear sector shaft overload failure (left), MY1999-2001 Ford F-Series Super Duty, EA01-009. Sector shaft fracture surface for fatigue failure (upper right) and overload failure (lower right).



Figure 4. Steering gear teeth fracture overload failure, MY 2005-09 Ford F-Series Super Duty (PE13-014).

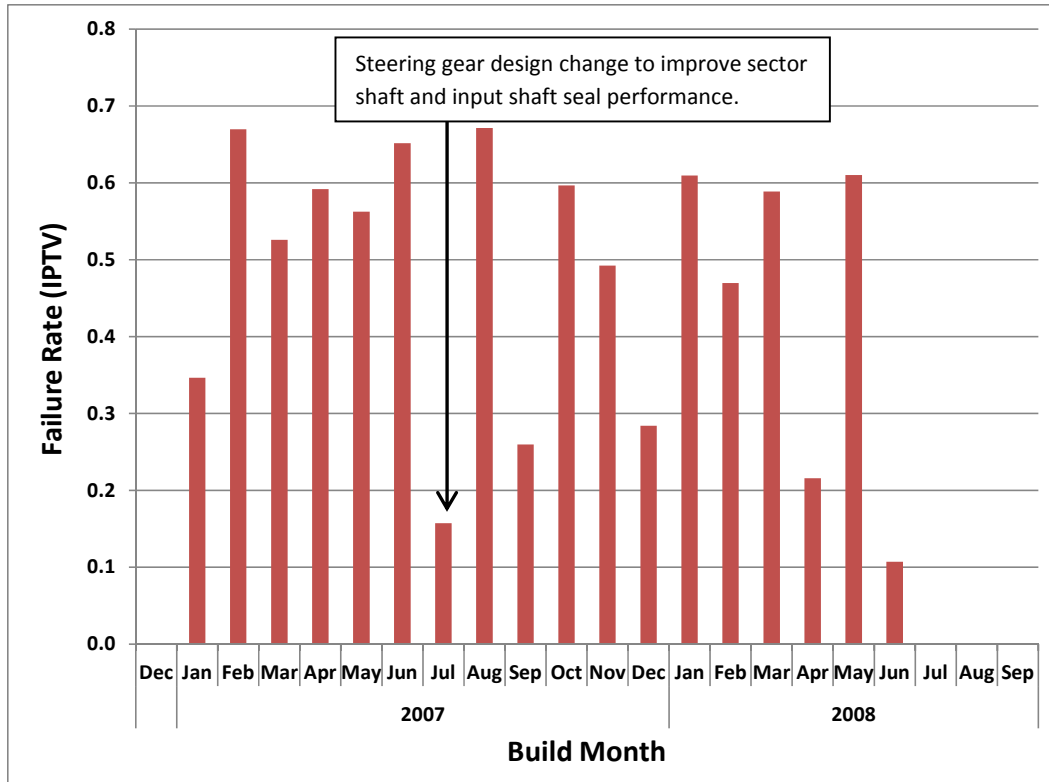


Figure 5. Steering gear failure rate by vehicle build month, MY08 Ford Super Duty.

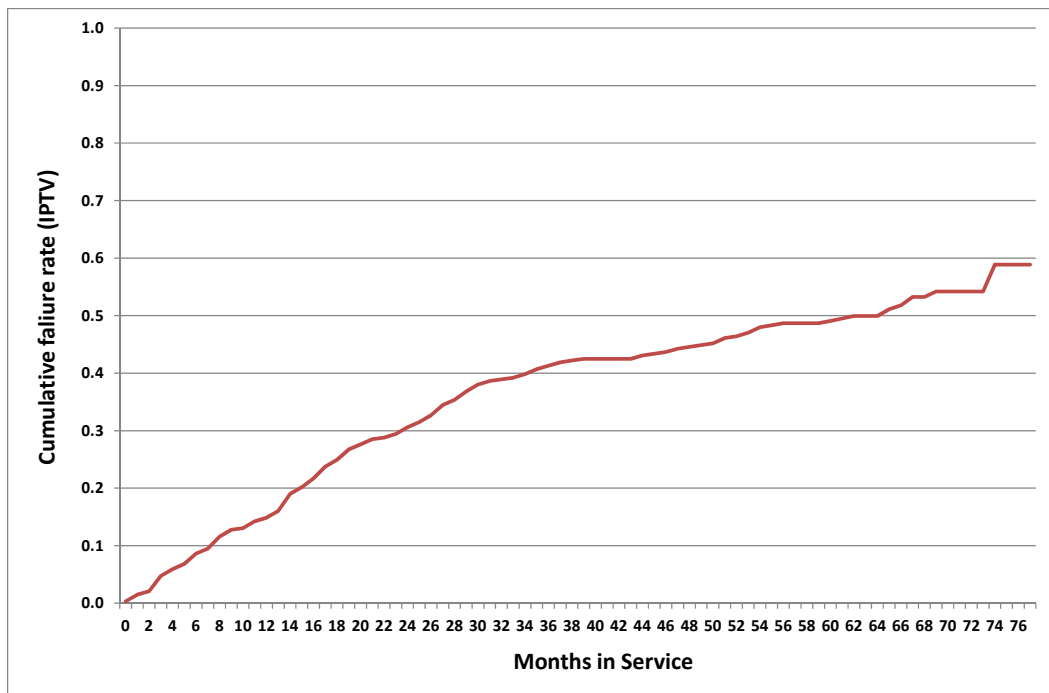


Figure 6. Failure rate by time in service, MY08 Ford F-Series Super Duty steering gear overload failure Using data from all sources, including complaints, field reports and warranty claims.