



U.S. Department  
of Transportation

**National Highway  
Traffic Safety  
Administration**

# ODI RESUME

**Investigation:** PE 15-008  
**Date Opened:** 02/27/2015  
**Investigator:** Peter Kivett  
**Approver:** Otto Matheke  
**Subject:** Front suspension ball joint failure

**Date Closed:** 11/20/2015  
**Reviewer:** Bruce York-B

## MANUFACTURER & PRODUCT INFORMATION

**Manufacturer:** Pierce Manufacturing  
**Products:** 2004 - 2015 Pierce fire trucks with the TAK-4 suspension  
**Population:** 7,588  
**Problem Description:** Failure of front ball joints that can result in a wheel separation event.

## FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
<b>Complaints:</b>	1	0	1
<b>Crashes/Fires:</b>	3	5	5**
<b>Injury Incidents:</b>	0	0	0
<b>Fatality Incidents:</b>	0	0	0
<b>Other*:</b>	0	307	307

\***Description of Other:** Warranty Claims

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

## ACTION / SUMMARY INFORMATION

**Action:** This Preliminary Evaluation is closed with a Safety Recall 15V-615

### Summary:

On February 27th 2015, the Office of Defects Investigations (ODI) opened Preliminary Evaluation PE15-008 to investigate front steer wheel separations on 2004 model year Pierce fire trucks (manufactured with TAK-4 independent front suspensions) caused by ball joint failures. The investigation was based on one steering related consumer complaint, three media reports alleging front steer wheel separation incidents, and a service bulletin outlining the maintenance requirements for the ball joints used in the TAK4 suspension.

The consumer complaint (ODI #10671053), received on January 8th 2015, alleged a 2007 Pierce TAK-4 equipped fire truck "was not steering correctly". The three media reports of Pierce TAK-4 equipped fire trucks that experienced front steer wheel separation events included two in Baltimore, MD (July and August 2014) and a third in Anne Arundel County, MD (December 2014). The technical service bulletin (#355 issued 12/15/2014) was intended to be a reminder for subject vehicle owners to inspect their TAK-4 suspension and ball joints pursuant to Pierce's published maintenance schedule. The bulletin outlined how improperly maintained subject ball joints could wear or become damaged during normal use and then potentially separate. A diagram of the TAK-4 front suspension (Figure 1) illustrates the location of both ball-joint assemblies on the suspension that connect the wheel spindles to the A-arm assemblies.

(Continued on page 2)

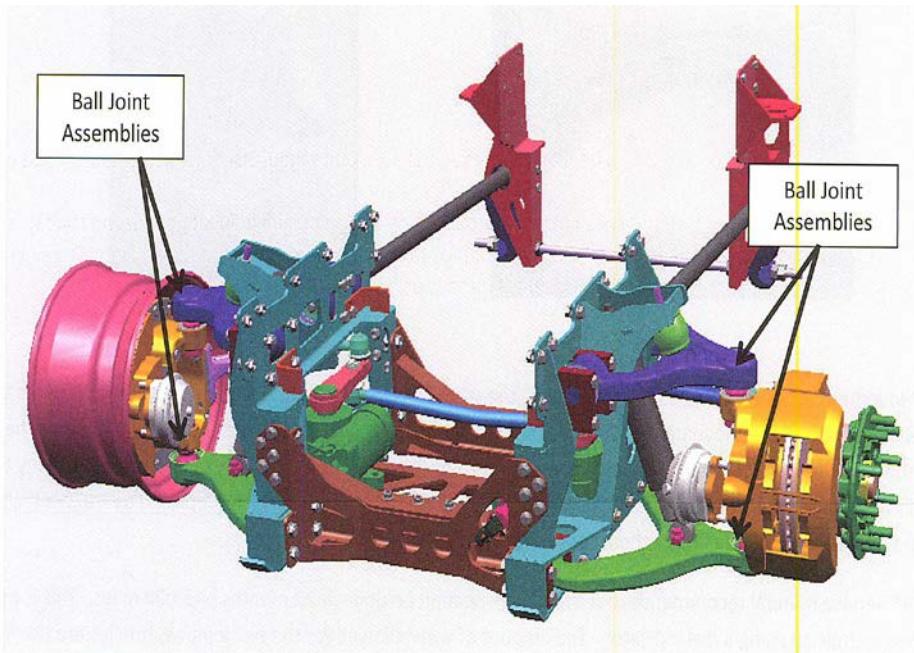


Figure 1

During the course of the investigation Pierce informed ODI that the TAK-4 suspension had been equipped with two different design ball joints since its inception. The first generation ball joint (Figure 2.) was installed on the subject vehicles from MY 2004 to MY 2013 and was designed to be serviceable. This design allowed maintenance personnel to adjust ball and socket endplay with stack-up shims. Starting MY 2014, a second generation ball joint was installed that implemented a sealed, pre lubricated, one piece, maintenance free design.



Figure 2

Responding to an ODI Information Request (IR) letter, Pierce provided vehicle production and failure data for both ball joint designs used in the TAK-4 suspension. This response indicated that Pierce manufactured 7,588 vehicles equipped with the TAK-4 suspension from the start of production on January 1, 2004 through August 6, 2015. Pierce identified 19 reports describing ball joint separations on the subject vehicles. Five of these resulted in wheel separation events. Pierce submitted 427 warranty claims on the subject ball joints of which 307 are attributed to having torn boots.

ODI discussions with Pierce following the IR response revealed that Pierce had identified a failure trend linked to the "first generation" ball joint. This trend was supported by warranty and field reports.

Pierce found that "first generation" ball joints were installed on all of the vehicles that experienced a joint or wheel separation event. Pierce also found the warranty claim rate for replacement of the protective boots on some of the first generation ball joints was elevated when compared to the second generation joints.

Pierce later informed ODI that two boot designs were used on the first generation ball joints. Pierce identified a defect that could occur in the earliest design ball joint boots. During the molding process when the boot was removed from the mold, some post molding work occurred – specifically removing the "flash" or waste left on the part that forms between the two molded halves. Pierce's stated the waste material was removed manually and this manual operation could cause damage to the part. Once the boot lost its integrity, it could allow water and other contaminants to enter the ball joint. The contaminants could ultimately create a corrosive and abrasive environment that accelerated the wear of the ball joint components. This accelerated wear could continue until a significant amount of material had worn from the joint components potentially resulting in a separation.

The photograph below (Figure 3) shows a first generation ball joint (removed from a subject vehicle) that demonstrates the premature wear that can result from a torn boot.



Figure 3

Although Pierce believes the ball joint failures could be prevented if maintenance was performed pursuant to their published maintenance schedule, due to the frequency and severity of the failing joints they have decided to conduct a safety recall (15V-615). The recall will include 910 vehicles manufactured during the 2006 and 2007 model years. Of the 307 boot warranty claims and 5 wheel separation events reported on the entire 12 model year subject vehicle population, 78% of the claims and 60% of the wheel separations occurred on the 2 model years of vehicles subject of the Pierce recall. The recall remedy includes inspecting and replacing torn boots and prematurely worn ball joints on the vehicles manufactured with first generation joints. If during the inspection, the joint wear level is within the expected range, Pierce will provide the customer information regarding the inspection and maintenance schedule.

ODI is closing this PE with Pierce's voluntary safety recall. With the recall action taken by Pierce, this investigation is closed as further use of agency resources does not appear to be warranted.

The ODI reports cited above can be reviewed at:

<http://www-odi.nhtsa.dot.gov/owners/SearchNHTSAID>

using the following complaint identification numbers: 10671053