

MULTIDISCIPLINARY ACCIDENT INVESTIGATION TEAM NARRATIVE/DIAGRAM

CHP 558D (Rev. 9-08) OPI 065 (MAIT use only)

DATE OF INCIDENT (MONTH-DAY-YEAR)	TIME (2400)	NCIC	OFFICER I.D.	NUMBER	MAIT CASE NUMBER	PAGE
07-23-2018	1310			NP18118462	NL-020-18	i

NL-020-18

National Park Service

MAIT SUPPLEMENTAL

This investigation was conducted by the California Highway Patrol (CHP) Northern Division Multidisciplinary Accident Investigation Team (MAIT).



MAIT PERSONNEL

Sergeant C. Dalin, ID 14647, Northern Division MAIT, Team Leader
Officer J. Rocha, ID 19447, Northern Division MAIT, Investigator
MCS-I J. Patton, ID A15962, Northern Division MAIT, Investigator

SUBPOENAS FOR MAIT PERSONNEL SHOULD BE DIRECTED TO:

California Highway Patrol
Northern Division MAIT
2485 Sonoma Street
Redding, California 96001
Attention: Sergeant C. Dalin

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Introduction

MAIT Notification

On Monday, July 23, 2018, at approximately 1310 hours, a fire began on State Route 299, east of Trinity Mountain Road, in an unincorporated area of Shasta County, California. California Department of Forestry and Fire Protection (CAL FIRE) personnel responded to the area and identified the potential cause of the fire.

A 2013 Forest River Grey Wolf travel trailer (Vehicle #1), in tow behind an unknown vehicle driven (b)(6) (b)(7)(c)(f), was traveling west on State Route 299. The Forest River had a mechanical failure, which potentially caused the fire.

On Tuesday, July 24, 2018, CAL FIRE requested a mechanical inspection of the Forest River. CHP Redding Area Acting Commander Lieutenant S. Fredrick, ID 15251, requested MAIT assistance on Tuesday, July 24, 2018, and CHP Northern Division Investigative Services Unit Coordinator, Lieutenant J. Carter, ID 13385, approved the request on the same day.

MAIT Response and Chronological Summary

On Wednesday, August 15, 2018, between approximately 0900 and 1500 hours, Sergeant Dalin and Investigator Patton conducted a mechanical inspection of the Forest River at (b)(6) (b)(7)(c)(f) (b)(6), (b)(7)(c)(f)

Issue

This MAIT supplemental investigation will be limited to the following issue:

- A mechanical inspection of the Forest River to determine if there were any pre-existing conditions that caused or contributed to the cause of the mechanical failure, which potentially caused the fire

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Mechanical Inspection

Forest River (Vehicle #1)

DATE OF INSPECTION: August 15, 2018

INSPECTION LOCATION: (b)(6), (b)(7)(c)(f)

REGISTERED OWNER: (b)(6) (b)(7)(c)(f)

YEAR: 2013

MAKE: Forest River, Cherokee

MODEL: Grey Wolf, T21RB

LICENSE: (b)(6) (b)(7)(c)(f)

VIN: (b)(6) (b)(7)(c)(f)

COLOR: White/Gray

EXTENT OF INSPECTION: Overview
Axles
Bearings
Suspension System
Braking System
Tires and Wheels
Vehicle Research

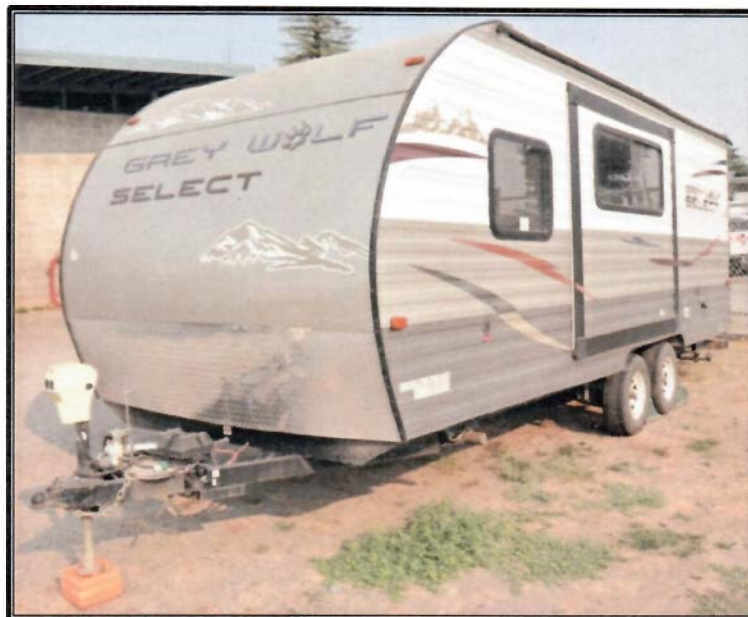
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Facts – Mechanical Inspection

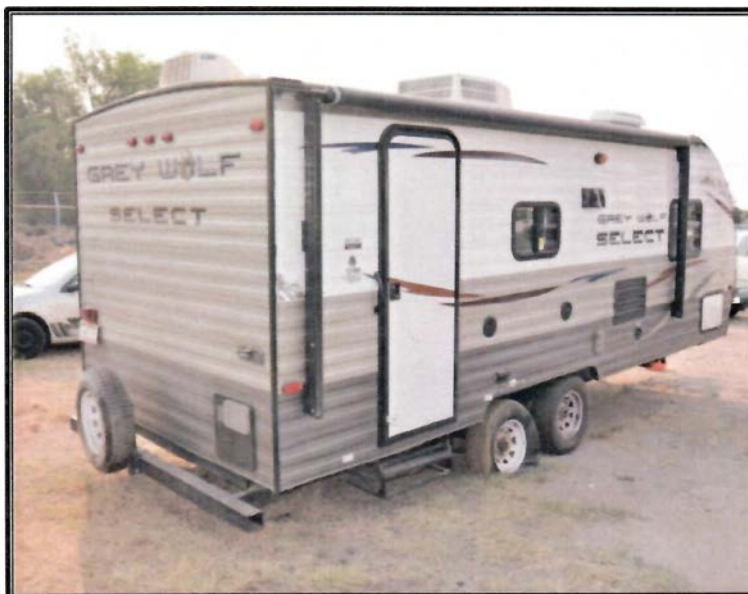
Forest River (Vehicle #1)

Overview

The vehicle was a 2013 Forest River, Cherokee, Grey Wolf, T21RB, bumper pull travel trailer.



Left Side



Right Side

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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Axles

The vehicle had two, 3,500 pound capacity axles with drum style brakes. The outer ends of the axles had machined spindles that were welded to the axle tubes. The bearing assemblies, which were housed inside the brake hub, were seated on the machined spindles. The bearing assemblies and brake hubs are discussed later in this report. The axle tubes between the spindles were unremarkable.



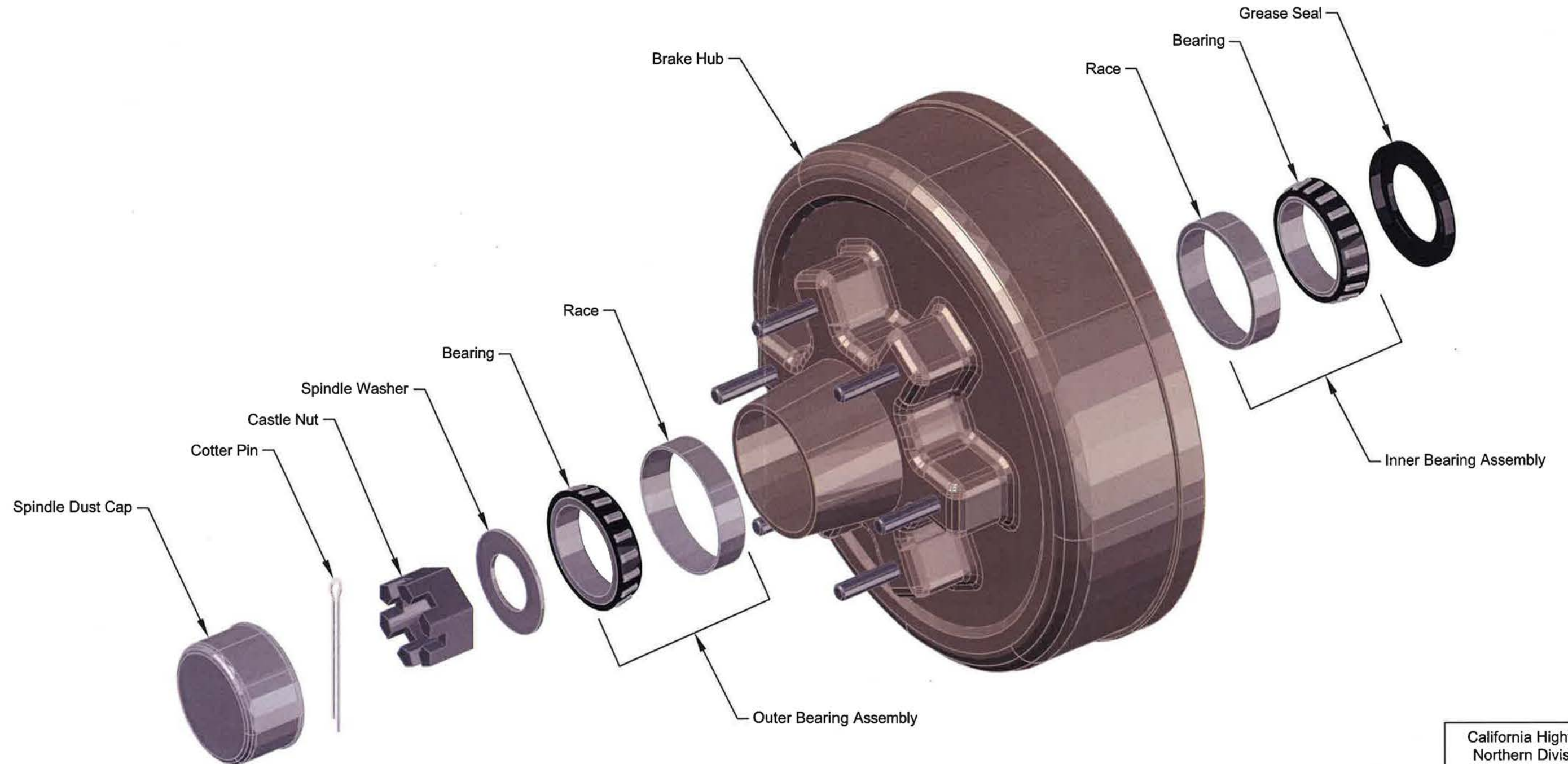
Left Side of the Axles



Right Side of the Axles

On the following page, an exploded diagram depicting components discussed in this report was prepared for a visual reference and is not to scale.

Brake Hub Assembly



California Highway Patrol
Northern Division MAIT

NL-020-18



Prepared by: J Rocha

Brake Hub Assembly Diagram

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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Axles (continued)

The ends of the spindles were threaded, allowing the brake hub to be held in place with a castle nut. There was a vertical, off center hole in the end of the spindles for a cotter pin. The cotter pins were intended to keep the castle nuts from loosening. The left-front and left-rear brake hubs rotated freely. The left-front and left-rear axle castle nuts were slightly over tight, and the brake hubs had no endplay.¹ The castle nuts should have been finger tight; pliers were needed to loosen the nuts.



Left-Front Spindle with Dust Cap Removed



Left-Rear Spindle with Dust Cap Removed

¹. End play is axial movement caused by clearances between components.

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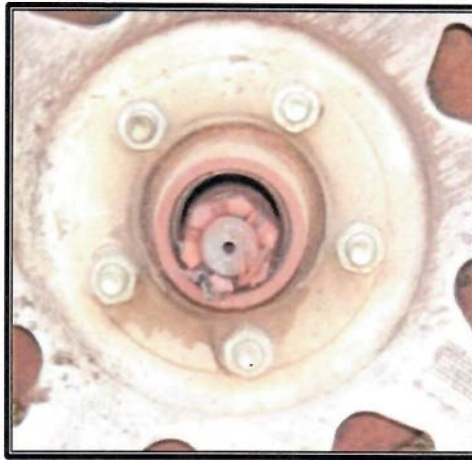
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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Axles (continued)

The right-front and right-rear axle, castle nuts, and cotter pins were damaged. The right-front castle nut was in contact with the brake hub, and the castle nut was fused to the spindle. An air impact wrench and socket were required to remove the castle nut.



Right-Front Spindle with Missing Dust Cap

The right-rear castle nut was in contact with the brake hub, and the castle nut was fused to the spindle. The right-rear axle cotter pin was sheared off. The right-rear brake hub had less damage to the bearing race and seat than the right-front brake hub. A socket could not be used to remove the castle nut. An air chisel was used to rotate the castle nut. The castle nut became stripped and could not be removed. The air chisel deformed the castle nut to the point that the brake hub could be removed with the castle nut still attached to the spindle.



Right-Rear Spindle with Missing Dust Cap

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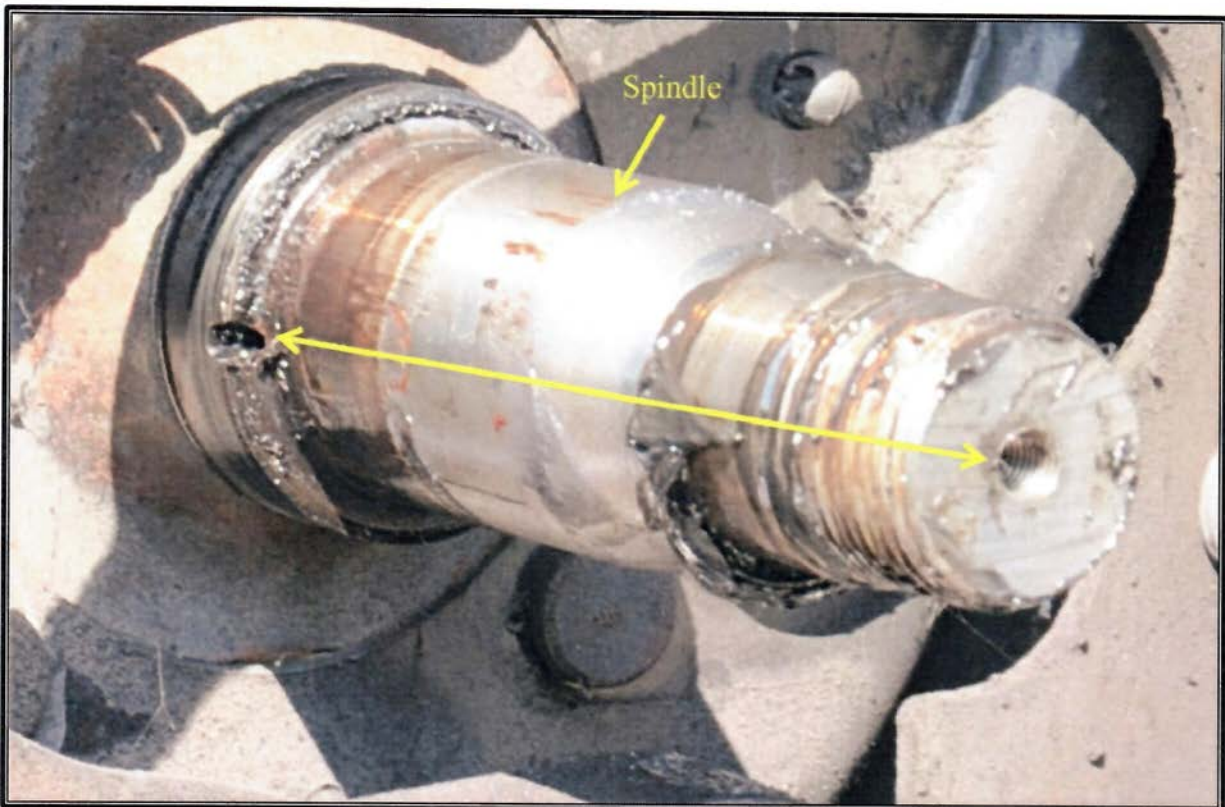
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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Axles (continued)

The outer faces of the spindles were threaded and had a horizontal channel that extended through the center of the spindles and exited where the rear bearing was seated. The threaded portion and horizontal channel were designed to have a grease fitting and allow new grease to be added to the bearings. All four spindles were missing the grease fittings. It was undetermined if the grease fittings were installed by the factory and were missing or if they were intentionally left out by the factory. The left-front and left-rear spindles were undamaged.



Undamaged Left-Front Spindle

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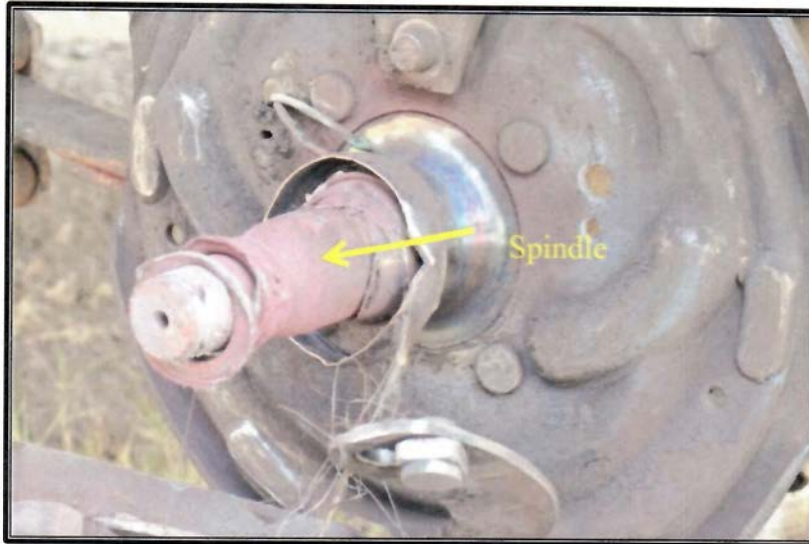
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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Axles (continued)

The right-front and right-rear spindles were discolored, pitted, and had damaged bearing components fused to them.



Damaged Right-Front Spindle



Damaged Right-Rear Spindle

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Forest River (Vehicle #1)

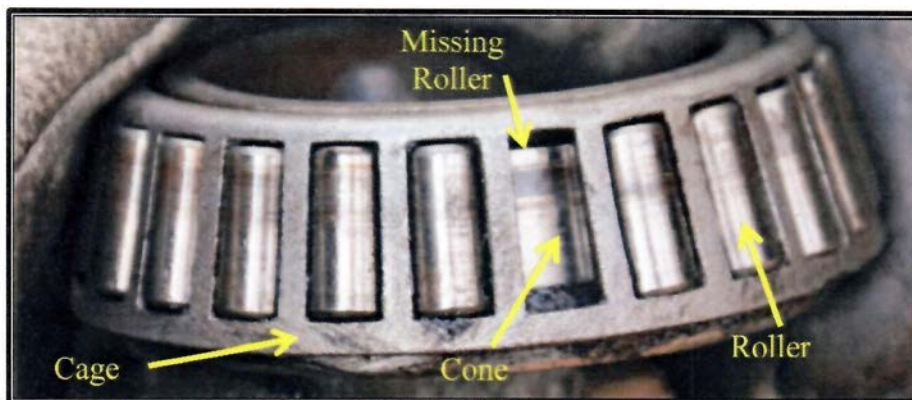
Bearings

The bearing assemblies were housed in the brake hubs. Each brake hub had two bearing assemblies; an inner and outer. The bearing assemblies centered the brake hubs on the spindle and managed the radial and axial load of the vehicle. The left-front-inner bearing, rollers and race were discolored. The photographs below show the grease removed from the surface.



Left-Front-Inner Bearing

The left-rear-inner bearing, rollers, cone, and race were discolored; and one roller was missing.

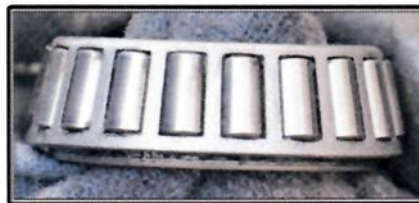


Left-Rear-Inner Bearing

The left-front-outer and left-rear-outer bearing assemblies were unremarkable.



Left-Front-Outer Bearing



Left-Rear-Outer Bearing

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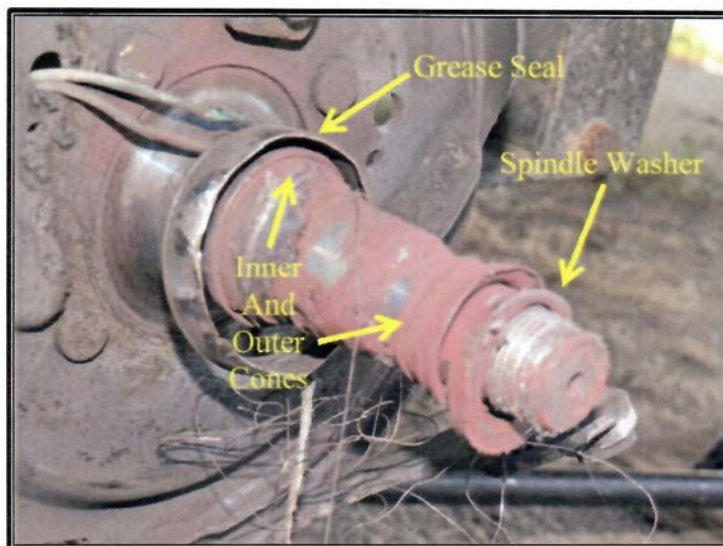
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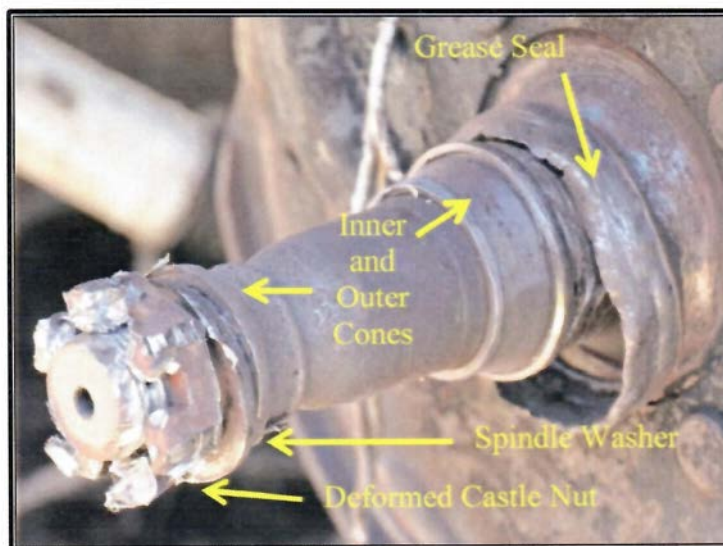
Forest River (Vehicle #1)

Bearings (continued)

The right-front and right-rear inner and outer bearing assemblies were severely damaged and were missing all of the rollers and cages. The inner and outer cones remained on the spindles.



Right-Front Spindle



Right-Rear Spindle

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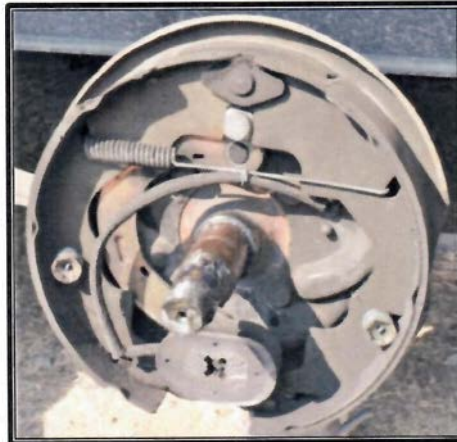
Forest River (Vehicle #1)

Suspension System

The vehicle had two solid axles in tandem. Each axle had two leaf spring packs, with four leaves each, with an equalizer between the axles. The leaf spring packs were attached to the axles with U-bolts. The suspension was unremarkable.

Braking System

The vehicle was equipped with electric, drum style brakes. There were two brake assemblies per axle, for a total of four brake assemblies. The grease on the left-rear brake drum surface occurred when Investigator Patton removed the grease from the inner bearing race. The left-front and left-rear brake assemblies were unremarkable.



Left-Rear Brake Assembly



Left-Rear Brake Hub

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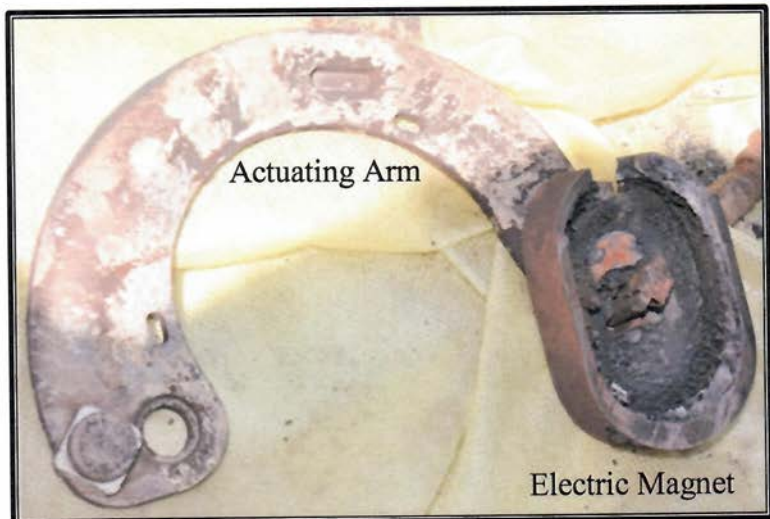
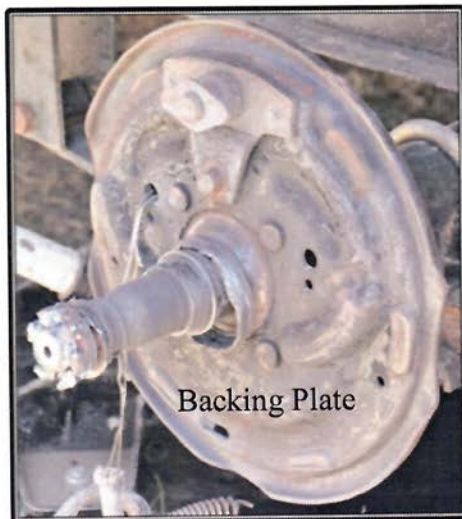
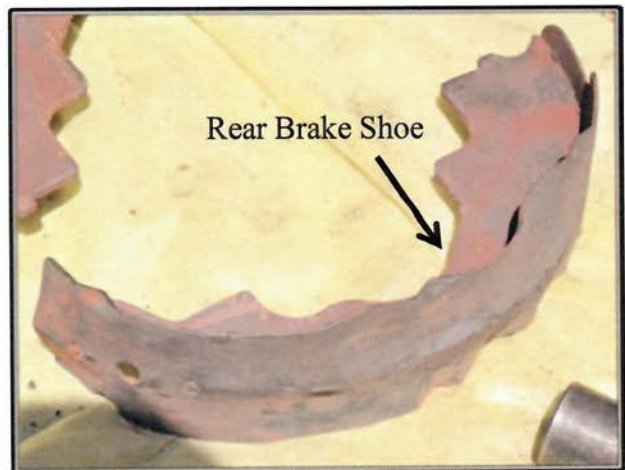
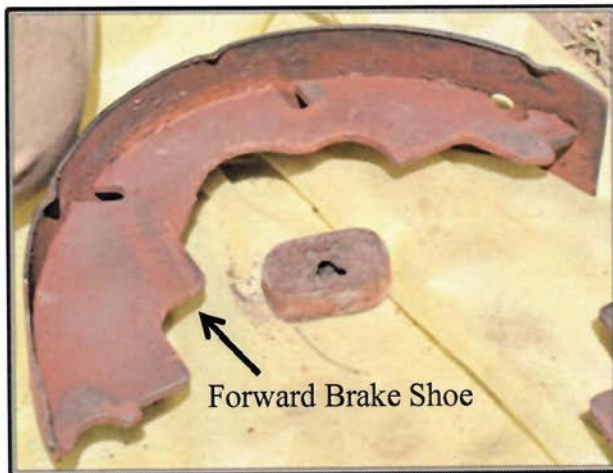
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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Braking System (continued)

The right-front and right-rear brake components were detached from the backing plates and were found loose in the brake hubs. The brake shoes were designed to be secured to the backing plates with hold down springs, pins, and retainers. None of the aforementioned parts were found during the inspection. The right-front and right-rear brake assemblies were also missing the brake adjusting screw springs. The right-front and right-rear brake assemblies did have the brake return spring and the brake adjusting screw. All brake shoes on the right side were void of any friction material; they were discolored and deformed. The electric magnets attached to the actuating arms for each of the right side brake assemblies were melted, and the windings were displaced from the housing.



Right-Rear Brake Components

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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Tires and Wheels

The manufacturer's label, located on the left front of the vehicle, specified a tire size of 205/75D14 with a tire inflation pressure of 50 psi on the front and rear axles.

The tires were mounted on steel wheels. The wheels were held in place with five lug nuts each. A clock face reference (1:00 – 12:00) was used to describe locations on each tire and wheel. The valve stem was used as the 12:00 position. All locations were approximations.

LEFT FRONT	
MANUFACTURER/MODEL	TOWMAX STR POWER KING
SIZE	ST 205/75R14
MAXIMUM LOAD RATING	1,760 pounds at 50 psi
TREAD PLIES	2 plies polyester, 2 plies steel
SIDEWALL PLIES	2 plies polyester
SERIAL NUMBER	DOT ADB2 GPB 2214
TREAD DEPTH	7/32, 7/32, 8/32, 8/32 inch
INFLATION PRESSURE	51.0 psi

This tire was manufactured in the 22nd week of 2014. The tire and wheel were unremarkable.

LEFT REAR	
MANUFACTURER/MODEL	TOWMAX STR POWER KING
SIZE	ST 205/75R14
MAXIMUM LOAD RATING	1,760 pounds at 50 psi
TREAD PLIES	2 plies polyester, 2 plies steel
SIDEWALL PLIES	2 plies polyester
SERIAL NUMBER	DOT 83B2 GPB 1413
TREAD DEPTH	6/32, 7/32, 8/32, 7/32 inch
INFLATION PRESSURE	50.0 psi

This tire was manufactured in the 14th week of 2013. The tire and wheel were unremarkable.

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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Tires and Wheels (continued)

RIGHT FRONT	
MANUFACTURER/MODEL	TOWMAX STR POWER KING
SIZE	ST 205/75R14
MAXIMUM LOAD RATING	1,760 pounds at 50 psi
TREAD PLYS	2 plies polyester, 2 plies steel
SE sidewall PLYS	2 plies polyester
SERIAL NUMBER	DOT ADB2 GPB 2314
TREAD DEPTH	7/32, 8/32, 8/32, 7/32 inch
INFLATION PRESSURE	51.0 psi

This tire was manufactured in the 23rd week of 2014. The tire was unremarkable. The wheel-mounting surface, around the bolt holes, was discolored.



Right-Front Tire and Wheel

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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Tires and Wheels (continued)

RIGHT REAR	
MANUFACTURER/MODEL	TOWMAX STR POWER KING
SIZE	ST 205/75R14
MAXIMUM LOAD RATING	1,760 pounds at 50 psi
TREAD PLIES	2 plies polyester, 2 plies steel
SIDEWALL PLIES	2 plies polyester
SERIAL NUMBER	DOT 83B2 GPB
TREAD DEPTH	6/32, 7/32, 7/32, 6/32 inch
INFLATION PRESSURE	0.0 psi

The portion of the tire with the DOT number showing the week and year the tire was manufactured was missing. The outboard sidewall was unremarkable. The inboard sidewall bead seat was de-beaded around the circumference. The inboard sidewall had multiple tears and pieces missing from the 6:30 to the 10:30 positions, approximately 19 inches in chord length. The wheel-mounting surface, around the bolt holes, was discolored. There was no indication the tire had a prior flat repair.



Right-Rear Inboard Tire and Wheel

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Facts – Mechanical Inspection

Forest River (Vehicle #1)

Vehicle Research

On Tuesday, August 14, 2018, Investigator Patton searched the National Highway Transportation Safety Administration (NHTSA) Office of Defects Investigation internet website² for consumer complaints, defect investigations, recalls, and technical service bulletins for this year, make and model of vehicle.

- There was one consumer complaint
- There were no investigations
- There were three recalls
- There were no varying manufacturer communications

While recalls applied to this year and model trailer, two of the recalls were unassociated with this investigation. One was for a fire extinguisher and the other was for an awning.

NHTSA campaign 17 V56000 and Forest River 17A-10082015-0094 pertained to an incorrect tire and wheel placard. This campaign was for vehicles manufactured between February 2013 and August 2013. The placard on the trailer in this investigation indicated a manufactured date of October 2, 2012.

2. <http://www.nhtsa.dot.gov>

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Facts**Photograph Log and Inventory**

Photographs taken by MAIT personal during the course of this inspection were transferred from the memory card of the camera directly to DVD. The DVD was identified by the date the memory card was downloaded and Investigator Patton's initials. Upon completion of the investigation, the evidence was transferred to the National Park Service, Whiskeytown National Recreation area office.

Requests for copies of the photographs listed below should be made directly to:

National Park Service
P.O. Box 188
Whiskeytown, California 96095
(530) 242-3468

Photographer and Equipment

PHOTOGRAPHER	CAMERA
Sergeant C. Dalin (CD) Investigator J. Patton (JP)	Nikon digital, model D90, equipped with an 18-105 millimeter Nikkor lens

Inventory

DATE DOWNLOADED	TAKEN BY	DESCRIPTION
08-16-2018	CD/JP	308 digital color photographs of the trailer, taken on Wednesday, August 15, 2018

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Conclusions

The left-front and left-rear-inner bearings were discolored from overheating due to an insufficient amount of grease and/or from having no end play. The missing roller from the left-rear-inner bearing was not found.

The right-front and right-rear wheels, brake assemblies, brake hubs, bearing assemblies, spindles, and castle nuts all had thermal damage. The right-front and right-rear bearing assemblies overheated and failed, most likely due to an insufficient amount of grease and/or no end play, as observed on the left-front and left-rear bearing assemblies.

The failure of the bearings caused the right-front and right-rear brake hubs to contact the castle nuts that held the brake hubs on the spindles. The brake hubs were no longer centered on the spindles, which caused the brake components to detach from the backing plates. The right-front and right-rear spindle dust caps were missing. It was undetermined as to the length of time the spindle dust caps were missing. If the dust caps had been place, they most likely detached at the time of the bearing failures and/or when the brake hubs were no longer centered on the spindles.

The right-front and right-rear wheels were bolted to the brake hubs. With the brake hubs no longer centered on the spindles, the tires on the right-front and right-rear may have been tilted causing the top and bottom of the tire to be displaced inward or outward. Normally, the weight of vehicle and the heat generated from tires in contact with road would be spread over the entire tread surface. If the tires were tilted, the weight of the vehicle on the right side and the heat generated by the tires in contact with the road could be concentrated into a narrow section of the tread. The friction between the detached brake components, brake hubs, and the spindles caused these components to produce heat. The heat then spread to the wheels, which most likely caused the inflation pressure in the tires to increase. However, it was undetermined if the right-rear tire "blowout" was due to an inflation pressure increase and/or from the tires being tilted. The right-rear wheel did not show any signs of having had contact with the roadway, and the tire did not have any exposed metal cords from the tread.

(b)(6), (b)(7)(c)

(b)(6), (b)(7)(c)

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Conclusions

The failed and detached components from the right side of the vehicle generated a substantial amount of heat. A spindle dust cover, or a piece(s) from a failed bearing assembly, brake components, and/or sparks from the contact between a brake hub and spindle castle nuts could have started a fire if separated from the vehicle and exposed to dry vegetation.

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Recommendations

This supplemental report shall be forwarded to the National Park Service for inclusion in their investigation and findings.