National Transportation Safety Board
Office of Highway Safety
Washington, DC 20594

HWY22MH009

VEHICLE FACTORS

Group Chair's Factual Report

3/7/2023

A. CRASH INFORMATION AND SUMMARY

Location: Clarendon Hills, IL
Date: May 11, 2022
Time: 8:16 a.m. CDT

B. VEHICLE FACTORS GROUP

Group Chair — Jerome Cantrell
NTSB
Washington, DC

C. CRASH SUMMARY

For a summary of the crash refer to the Crash Summary Report, which can be found in the NTSB docket for this investigation.

D. DETAILS OF THE VEHICLE FACTORS INVESTIGATION

The Vehicle Factors Group Chairman's Factual Report is a collection of factual information obtained during the detailed inspection of the 2004 International truck (truck). The truck was examined at Airline Towing, Inc. located in Calumet Park, IL on May 13, 2022.

All major vehicle operation systems were examined, which included the steering, braking, suspension, and electrical systems. Overall crash damage, along with any damage or anomalies within major vehicle systems were documented. Supporting photographs, vehicle specifications, and any maintenance records were collected and reviewed.

1.0 Vehicle Inspection:

1.1. General Information:

Make:	International
Model:	4400 SBA 4x2, 26' Box Truck
VIN:[1]	1HTMKAANX4H661279
Model Year:	2004
Date of Manufacture:	October 20, 2003
Placed into Service:	March 5, 2004
Mileage:	Unknown

[1] Vehicle Identification Number.

GVWR:[2]:	33,000 lbs.
GAWR[3] (Axle 1):	12,000 lbs.
GAWR (Axle 2):	21,000 lbs.
Engine:	DT466, 7.6L, 250 HP, inline 6-cylinder
Transmission:	Eaton-Fuller 6-speed manual, Model: FS-6406N
Rear Axle Ratio:	3.36
Steering Gear:	TRW Ross TAS65
Brake Type:	Air-operated drum brakes with Antilock Braking System (ABS)

1.1 Damage Description:[4]

For uniform description, "left" will refer to the driver's side, and "right" will refer to the passenger side of the truck, see **Figure 1**.

The complete truck sustained crash damage: the engine and passenger compartments sustained post-crash fire and thermal damage. All combustible materials, from the front bumper to the rear of the cab, were consumed by the post-crash fire. The hood had separated from the truck and was located a short distance away. The cab of the truck was crushed and displaced to the right, and both diesel fuel tanks were ruptured and empty, see **Figure 2**. Both frame rails were bowed towards the right.

Figure 1: Photograph of the truck taken at the crash scene.

[2] Gross Vehicle Weight Rating (GVWR) is the total maximum weight that a vehicle is designed to carry when loaded, including the weight of the vehicle itself, plus fuel, passengers, and cargo.

[3] Gross Axle Weight Rating (GAWR) is the maximum distributed weight that a given axle is designed to support.

[4] See Attachment – Vehicle Factors Photographs for additional damage photographs.

Figure 2: Photograph of truck at crash scene after turned upright.

1.2 Powertrain:

The truck was powered by an International, model DT466 diesel engine. An Eaton 6-speed manual transmission was bolted to the rear of the engine and was connected to the drive axle (axle 2) via a propeller shaft.[5]

As previously stated, due to the post-crash fire, all combustibles attached to the engine and transmission were consumed or melted. The engine remained inside the engine compartment, but the transmission had separated from the rear of the engine but remained attached to the vehicle via the propeller shaft. The transmission was broken around the bell housing, and the top of the transmission was melted around the shifting tower. Axle 2 appeared undamaged from either the crash or post-crash fire.

1.3 Driver Controls:

All combustible driver controls were consumed by the post-crash fire. The remaining controls were damaged from the crash forces. The driver's foot pedals were missing along with any electrical wiring and switches the foot pedals contacted.

Since this truck was equipped with a manual transmission, there was a requirement for the clutch pedal to be depressed to activate a switch before the truck

[5] Often referred to as a driveline.

could start.[6] Because of crash damage, a test could not be conducted for this system to verify operational status.

1.4 Transmission and Clutch Operation

As mentioned above, this truck was equipped with a 6-speed manual transmission and a clutch pedal. The clutch pedal is used to engage or disengage the clutch assembly, which is part of the transmission, and is mounted between the engine and transmission. When the clutch pedal is depressed, the clutch assembly is disengaged allowing the transmission to be shifted between gears. When the clutch pedal is released, the clutch assembly re-engages with the engine to allow power to be provided to the drive axle.

To operate a vehicle with a manual transmission, the vehicle needs to be placed in the correct gear when beginning from a stop. Once the vehicle has gained enough speed to change to the next gear, the driver depresses the clutch pedal and selects the next gear via the gear shifter located in the cab and slowly releases the clutch pedal. To begin from a stop on and incline requires the driver to not only depress the clutch pedal, but to also have one foot on the brake pedal at the same time. If the clutch pedal is released too quickly the engine may stall.

1.5 Electrical System:

The truck's electrical system had been compromised due to the crash and post-crash fire damage. The battery containers had melted which allowed the battery plates to spill onto the ground. The electrical system was unable to be checked for electrical shorts, blown fuses, or tripped circuit breakers and the starter case was melted. The battery cables, mounted to the rear of the starter, were securely attached and there were no signs of corrosion at the connection locations.

1.6 Steering System:

The steering system consisted of a hydraulic assist power steering gear and a tie rod connected to the steering knuckles mounted on each axle end via ball joint connections.

Sometime during the crash sequence, the steering gear and lower steering arm had separated from the truck and were located a short distance away. The drag link ball joint stud, which had been mounted to the left side upper steering knuckle arm, was broken. The pitman arm was loose on the sector shaft, and the pinch bolt securing the pitman arm to the sector shaft was missing. There was rust around the splined connection between the pitman arm and sector shaft, which is indicative of a pre-existing condition, see **Figure 3**.

[6] See Vehicle Attachment – Operator's Manual Excerpt

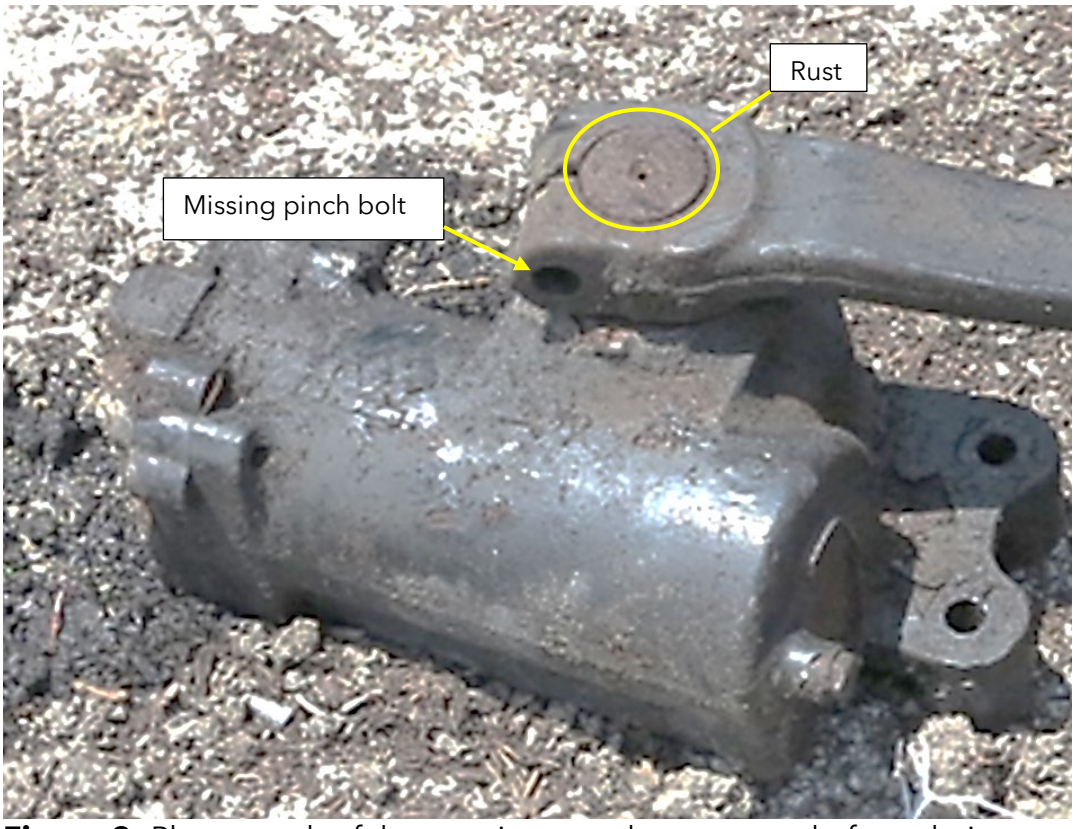

Figure 3: Photograph of the steering gear box, sector shaft, and pitman arm

1.7 Suspension:

Axle 1 (steering) suspension consisted of a solid axle with leaf-spring packs and shock absorbers mounted to each axle end. The shock absorbers mounted to each end of the axle were crushed. The rear of the springs mounted to the right side of the axle were bowed, and the U-bolt mounting plate was missing. The right side of the axle had separated from the spring pack attachment.

Axle 2 suspension consisted of a solid axle with a tapered leaf spring, air springs, and a shock absorber mounted to each axle end. No pre-existing or crash damage was noted to the suspension.

1.8 Tires and Wheels:

The manufacturer's specification plate was missing from the vehicle. Vehicle specifications were obtained from the manufacturer which identified some of the information used in this section.[7]

[7] See Vehicle Attachment – 2004 International Specifications.

The truck was specified to be equipped with 295/75R22.5G tires, mounted on 22.5 x 8.25 rims (wheels). The tires were specified to be inflated to 105 psi for axle 1 (steer axle), 105 psi for axle 2 (drive axle).

General information about each of the tires on the truck at the time of the inspection is documented in **Table 1.** All the wheels were inspected for cracks, welds, and elongated lug nut holes. No non-crash related defects were discovered on any of the wheels. Tire pressure measurements were taken using a commercial grade tire pressure gauge.

Table 1: Truck Tire Information

Axle 1	**Left**		**Right**	
Make/Model	TOYO M177		Unknown	
Tire Size	11R22.5		Unknown	
Pressure	0 psi		0 psi	
Tread Depth[8]	17,17,17,17		Not Available	
DOT #	N33T3D2120		Unknown	
Maximum Load Rating[9]	6,175 lbs @ 105 psi (single)[10]		Unknown	
Tire Plies	Unknown		Unknown	
Rolling Radius	Unknown		Unknown	
Axle 2	**Left**		**Right**	
	Outside	Inside	Inside	Outside
Make/Model	GOODYEAR G362	GOODYEAR G362	GOODYEAR G362	GOODYEAR G362
Tire Size	11R22.5	11R22.5	11R22.5	11R22.5
Pressure	98 psi	102 psi	104 psi	104 psi
Tread Depth	13,11,12	13,9,11	11,7,7	11,9,10
DOT #	MC3TR7BW2803	MC3TR7BW2803	MC3TR7BW2803	MC3TR7BW2803
Maximum Load Rating[11]	5,840lbs @ 105 psi (dual)	5,840lbs @ 105 psi (dual)	5,840lbs @ 105 psi (dual)	5,840lbs @ 105 psi (dual)
Tire Plies	Tread 5-Steel Sidewall 1-Steel	Tread 5-Steel Sidewall 1-Steel	Tread 5-Steel Sidewall 1-Steel	Tread 5-Steel Sidewall 1-Steel

[8] Measurements were taken from the outboard to inboard. Measurements are in 32nds.
[9] This is the maximum weight this size tire can carry in a single tire configuration.
[10] Information obtained from www.toyotires.com/M177 - Long Haul Commercial Steer Tire | Toyo Tires
[11] This is the maximum weight each tire can carry when mounted in a dual tire configuration.

Rolling Radius	20	20

The tire and wheel damage observed during the tire and wheel examination:

- The tire mounted to the left side of axle 1 sustained crash, fire, and thermal damage, see **Figure 4**.
- The outboard sidewall of the left-front tire was punctured.
- The wheel mounted to the left side of axle 1 sustained substantial crash damage.
- The tire mounted to the right side of axle 1 sustained crash, fire, and thermal damage, see **Figure 5**.
- Both inboard and outboard sidewalls of the right-front tire were missing.
- Both inside and outside tires mounted on the right side of axle 2 sustained abrasions in their respective tread areas along with rubber having been torn from their outboard shoulders.

Figure 4: Left-side axle 1 tire and wheel

Figure 5: Right-side axle 1 tire and wheel

1.9 Brake System:

Truck Brake Information:[12]

Brake Location	Axle 1		Axle 2	
	Left	Right	Left	Right
Brake Type	Drum 20/Clamp	Drum 20/Clamp	Drum 20/Clamp	Drum 20/Clamp

[12] All measurements are in inches.

Measured Lining Thickness	Upper 23/32	Upper 23/32	Upper 24/32	Upper 24/32
	Lower 23/32	Lower 23/32	Lower 24/32	Lower 24/32
Pushrod Stroke[13]	NA	NA	1 1/8-inch	1 ¼-inch

The air hoses and brake chambers for the axle 1 brakes had been destroyed either by the crash or post-crash fire. Air from a service vehicle was utilized to operate the brakes on axle 2 to check brake adjustment and to verify the foundation brake components were operating normally. The brakes were not cammed over, were in adjustment, and operated as intended.

The left-front brake drum was cracked through one wheel stud hole, and along the diameter of the drum face, see **Figure 6.** It was undetermined if all or part of the drum crack was pre-existing or because of the crash.

Figure 6: Photograph of the cracked left-side brake drum

1.9.1 Anti-lock Braking Systems (ABS):

Axle 1 ABS sensors and wiring were consumed by the post-crash fire. Axle 2 ABS sensors and wiring remained intact and securely mounted.

[13] Due to crash and fire damage no pushrod stroke measurements were obtained from axle 1.

1.10 Vehicle Recorded Event Data:

The Engine Control Module (ECM), which had been mounted on the left side of the engine, had been consumed by the post-crash fire, see **Figure 7**.

Figure 7: Photograph of fire damaged ECM circuit board.

1.11 Maintenance Records:

The motor carrier for this truck did not maintain maintenance records. For further information regarding this carrier and what records were or were not maintained, refer to the *Motor Carrier Group Chairman's Report*.

E. ATTACHMENTS:

Vehicle Attachment - Vehicle Factors Photographs

Vehicle Attachment – Operator's Manual Excerpt

Vehicle Attachment - 2004 International Specifications

Submitted by:

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