

**NATIONAL TRANSPORTATION SAFETY BOARD  
OFFICE OF HIGHWAY SAFETY  
WASHINGTON, D.C.**

**VEHICLE FACTORS GROUP CHAIRMAN'S  
FACTUAL REPORT**

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**A. CRASH INFORMATION**

Location: 14000 block US 441, Delray Beach, Palm Beach County, Florida  
Vehicle 1: 2019 International truck-tractor in combination with a 2008 Vanguard semi-trailer  
Operator 1: FirstFleet Inc., Murfreesboro, Tennessee  
Vehicle 2: 2018 Tesla Model 3  
Operator 2: Private Operator  
Date: March 1, 2019  
Time: Approximately 6:17 a.m. (local time)  
NTSB #: **HWY19FH008**

**B. VEHICLE FACTORS GROUP**

David Pereira, Vehicle Factors, Group Chairman  
NTSB Office of Highway Safety  
490 L'Enfant Plaza East, S.W., Washington, DC 20594

**C. CRASH SUMMARY**

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

**D. DETAILS OF THE VEHICLE FACTORS INVESTIGATION**

The Vehicle Factors Factual report is a collection of factual information obtained during the inspection of the 2019 International truck tractor in combination with a 2008 Vanguard enclosed semitrailer, and the 2018 Tesla Model 3 passenger vehicle. See *Technical Reconstruction Report* for structural components of the advance driver assist system.

Inspection of the 2018 Tesla, Model 3 was conducted at the Palm Beach County Sheriff's Office, Holding Lot, located at 3228 Gun Club Road, West Palm Beach, Florida on March 4 and March 6, 2019.

Inspection of the 2019 International truck-tractor in combination with a 2008 Vanguard semi-trailer was conducted on March 5, 2019 at Efficiency Enterprises locate at 8509 East Martin Luther King Jr. Boulevard, Tampa, Florida.

These inspections were limited in scope to the overall collision damage and photographic documentation of the vehicles. No detailed mechanical inspection was performed.

Supporting photographs, vehicle specifications, maintenance records, and prior annual inspection reports were collected and reviewed.

**1. Vehicle 1: 2019 International truck tractor in combination with a 2008 Vanguard semitrailer**

**1.1. General Information**

**Truck Tractor**

VIN:	3HCDZAPR1KL241561
Model:	LT625 6x4
Model Year:	2019
Build Date:	11/9/2018
Unit #:	19707
Mileage:	29,673
GVWR: <sup>1</sup>	52,350 lbs.
GAWR: (Front Axle) <sup>2</sup>	12,350 lbs.
GAWR: (Middle Axle)	20,000 lbs.
GAWR: (Rear Axle)	20,000 lbs.
Engine:	Cummins X15 450SA
Transmission:	Eaton Endurant EEO-17F112C 12 speed
Brake Type:	Bendix 4S/4M ABS Air operated antilock drum brakes

Additional equipment and specifications are included in the International Line Set Ticket (Build Sheet)<sup>3</sup>

**Semitrailer**

VIN:	5YJ3E1EB2JF079950
Model	VIP 4000
Model Year	2008
Length:	53-feet
Unit #:	53179

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<sup>1</sup> 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

<sup>2</sup> Gross Axle Weight Rating (GAWR) is the maximum distributed weight that a given axle is designed to support

<sup>3</sup> Additional information is contained in Vehicle Factors Attachment - 2019 International Truck Tractor Line Set Ticket

## 1.2. Damage Description

For uniform description, “left” will refer to the driver’s side, and “right” will refer to the passenger side of the vehicle. There was no damage sustained to any of the major vehicle operation systems.

Post collision damage was limited to the semitrailer. There were two main areas of contact damage to the semitrailer as shown in **Figure 1 A-B** depicting the initial area of impact on the left side of the semitrailer. This consisted of impact damage to the lower edge of the sidewall rails on both sides of the semitrailer and the undercarriage between the opposing damaged rails. The height of the lower edge of the trailer was measured at 3’ 6” as shown in **Figure 2-A** and correlated to the damage to the passenger vehicle as shown in **Figure 2-B**.

Damage to the left side exhibited inward intrusion, while damage to the right side exhibited outward deformation.<sup>4</sup> The damage on both sides exhibited two distinct area of contact, that can be correlated to the left and right A-pillars of the Tesla. The undercarriage damage consisted of scrapes and gouges to the transverse floor support rails between the damaged area of the two sides.<sup>5</sup>



**Figure 1 A-B** - Photographs depicting the initial impact on the left side of the 2008 Vanguard semitrailer, area of impact circled in red, photo B is a focused view of the area of impact

<sup>4</sup> Refer to Vehicle Factors Photograph 1 - Depicting the impact damage on the right side of the 2008 Vanguard semitrailer

<sup>5</sup> Refer to Vehicle Factors Photograph 2 - Depicting damage to frame rails on the underside of the 2008 Vanguard semitrailer



**Figure 2 A-B** - Photographs depicting the height of the lower edge of the trailer, measured at 3' 6" as shown in photo A and correlated to the damage to the passenger vehicle as shown by the yellow line in photo B.

### 1.3. Lighting and Electrical

The combination unit's lighting system was illuminated during the inspection, headlights and side center amber marker lights were clearly visible. The trailer was equipped with red and white conspicuity reflective tape also known as *DOT C2 retro reflective tape*, as required along the lower edge on both sides as shown in **Figure 3**.<sup>6</sup>



**Figure 3** - Photograph depicting a view of the 2008 Vanguard semitrailer left side center amber marker light and red and white DOT C2 reflective retro reflective tape

<sup>6</sup> According to the Federal Motor Carrier Safety Regulations (FMCSRs), Title 49 *Code of Federal Regulations* 393.11(b)

## 1.4. Maintenance and Inspection Records

Maintenance and inspection records were obtained by NTSB investigators from the motor carrier, FirstFleet, Inc. According to the Federal Motor Carrier Safety Regulations (FMCSRs), commercial vehicles must be inspected at a minimum of every 12 months to ensure compliance with the requirements set forth in the regulations.<sup>7</sup>

The truck tractor involved in this collision was recently acquired by the carrier and inspected on November 28, 2018.<sup>8</sup> At the time of the crash, it had not received its first scheduled maintenance. The semitrailer was last inspected July 30, 2018.<sup>9</sup>

A post-crash Level 1 - North American Standard Inspection was conducted on the International truck tractor and the Vanguard semitrailer by the Florida Highway Patrol (FHP) on March 1, 2019. The truck tractor and trailer were released to the motor carrier the same day. The following violations were documented:<sup>10</sup> The violations were corrected prior to NTSB inspecting the vehicle.

- Relay Valve axle 3 contains an air leak at proper connection (leaks when service brake applied).<sup>11</sup>
- Axle 4 right side brake out of adjustment<sup>12</sup> (Type 30 clamp-type brake chamber measured at 2<sup>1/4</sup> brake readjustment limit is 2 in).
- CMV manufactured after 10/19/94 has an automatic airbrake adjustment system that fails to compensate for wear.<sup>13</sup>

None of the above are out of service violations.<sup>14</sup>

## 1.5. Documented Recall and Warranty Claims

A search of the safety recall database maintained by the National Highway Traffic Safety Administration (NHTSA) found no recalls associated to this vehicle make and model.<sup>15</sup>

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<sup>7</sup> According to the Federal Motor Carrier Safety Regulations (FMCSRs), Title 49 Code of Federal Regulations, Part 396.17(c)

<sup>8</sup> Additional information is contained in Vehicle Factors Attachment - 2019 International Truck Tractor Annual Vehicle Inspection Report

<sup>9</sup> Additional information is contained in Vehicle Factors Attachment - 2008 Vanguard Semitrailer Annual Vehicle Inspection Report

<sup>10</sup> Additional information is contained in Vehicle Factors Attachment - FHP Driver/Vehicle Examination Report

<sup>11</sup> According to the Federal Motor Carrier Safety Regulations (FMCSRs), Title 49 Code of Federal Regulations, Part 393.45(d)

<sup>12</sup> According to the Federal Motor Carrier Safety Regulations (FMCSRs), Title 49 Code of Federal Regulations, Part 393.47(e)

<sup>13</sup> According to the Federal Motor Carrier Safety Regulations (FMCSRs), Title 49 Code of Federal Regulations, Part 393.53(b)

<sup>14</sup> North American Standard Inspection Out of Service Criteria - <https://www.cvsa.org/inspections/inspections/out-of-service-criteria/>

<sup>15</sup> <https://www.nhtsa.gov/recalls> accessed on 7/16/2019

Additionally, records kept by Navistar Incorporated,<sup>16</sup> did not indicate there were any active or pending safety related recalls pertaining to the tractor truck.

## 2. Vehicle 2: 2018 Tesla Model 3

### 2.1. General Information

Make/Model:	Tesla Model 3 Performance
VIN:	5YJ3E1EB2JF079950
Date of Manufacture	11/2018
Date Registered in FL	1/8/2019
Mileage	2143 <sup>17</sup>
GVWR	4993 lbs.
GAWR (Front)	2447 lbs.
GAWR (Rear)	2771 lbs.
Overall Length	184.4 in
Overall Width (including mirrors)	82.2 in
Overall Width (including folded mirrors)	76.1 in
Overall Width (excluding mirrors)	72.8 in
Overall Height - coil suspension	56.8 in
Wheelbase	113.2 in
Overhang Front	33 in
Overhang rear	39 in
Track Width (Front)	62.2 in
Track Width (Rear)	62.2 in
Transmission:	Single speed fixed gear
Gearbox Ratio:	9:1

Vehicle was configured with the dual electric motor, long range, all-wheel drive performance package and enhanced autopilot.<sup>18</sup>

### 2.2. Damage Description

For uniform description, “left” will refer to the driver’s side, and “right” will refer to the passenger’s side of the passenger vehicle. Damage sustained to the major vehicle operation systems will be documented in their respective sections in this report.

Damage to the Tesla, as shown in **Figure 4**, included separation of the glass roof panel and separation and deformation of the forward-facing surfaces of the vehicles A and B-Pillars just below where the roof met the pillars.<sup>19</sup> The rear trunk lid was displaced aft of its original position,<sup>20</sup>

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<sup>16</sup> Navistar International Corporation is an American holding company, that owns the manufacturer of International brand commercial trucks

<sup>17</sup> Last mileage recorded on vehicle electronic data log

<sup>18</sup> Autopilot is a proprietary name used by Tesla for a combination of vehicle driver assist system that provide driver assistance through the Traffic-Aware Cruise Control, Autosteer, and Auto Lane Change systems

<sup>19</sup> Refer to Vehicle Factors Photograph 3 - Depicting A and B-Pillars separated and deformed just below where the roof met the pillars

<sup>20</sup> Refer to Vehicle Factors Photograph 4 - Depicting the trunk lid being displaced aft of its original position

and there was induced damage to the right rear quarter panel and displacement of the front passenger seat headrest.<sup>21</sup>



**Figure 4** - Photograph depicting the left side view of the 2018 Tesla Model 3, showing collision damage and separation of the glass roof panel

### **2.3. Lighting and Electrical**

The vehicle's 400-volt lithium-ion battery was not breached during the collision sequence. The vehicle still had electrical power. A security video that captured the vehicle coasting to its final point of rest indicated that its headlights and warning hazard lights were still illuminated after the collision with the truck. *See Recorders Group Factual Report.*

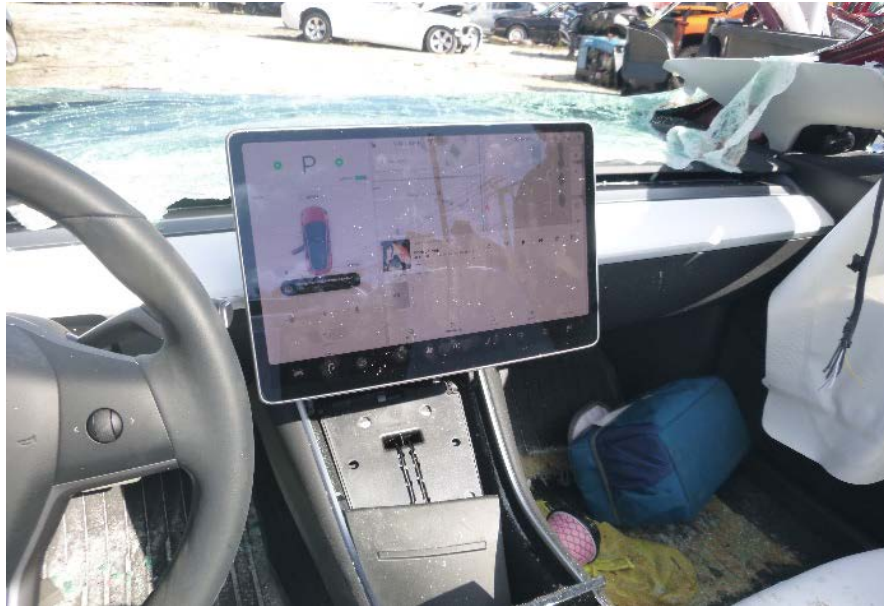
### **2.4. Driver Controls**

The Tesla Model 3 cabin was mostly free of buttons, switches and knobs. The main interface for most of the vehicle's systems was a 15-inch touchscreen, mounted on the center console as shown in **Figure 5**. The touchscreen was still functional and powered up during examination.

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<sup>21</sup> Refer to Vehicle Factors Photograph 5 - Depicting a right-side view of the 2018 Tesla Model 3, showing collision damage



**Figure 5** - Photograph depicting the central 15-inch touchscreen mounted on the center console.

## **2.5. Event Data Recorder**

The event data recorder (EDR) was part of the vehicle's Restraints Control Module (RCM).<sup>22</sup> The RCM was removed from the vehicle for further evaluation.

The Tesla stored additional data in nonvolatile memory using a removable secure digital (SD) card installed within the vehicle's electronic control unit (ECU). The SD card was removed from the vehicle, and with the RCM, were sent to the National Transportation Safety Board, Research and Engineering Laboratory in Washington DC for further evaluation.

Tesla was able to communicate with the vehicle via data link to Tesla's virtual private network connection established via Wi-Fi. Tesla provided investigators a 26-page EDR report, a Vehicle Data Log, and forward-facing video leading up to the crash. No further evaluation of the RCM and the SD card was required, and both were returned to Delray Beach, Palm County Sheriffs Department. This data will be further discussed in the *Technical Reconstructionist Report*.

## **2.6. Steering**

The vehicle was equipped with a three spoke, multifunction steering wheel with two scroll buttons controls, mounted to a power-operated tilt and telescoping steering column. The steering wheel was connected via steering shafts to an electronic-powered steering rack.

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<sup>22</sup> According to Title 49 Code of Federal Regulations, Part 563 Event data recorder means a device or function in a vehicle that records the vehicle's dynamic time-series data during the time period just prior to a crash event (e.g., vehicle speed vs. time) or during a crash event (e.g., delta-V vs. time), intended for retrieval after the crash event. For the purposes of this definition, the event data do not include audio and video data.



## 2.7. Suspension

The front axle is an independent, double wishbone, coil spring/telescopic damper, sway bar. The rear axle is an independent, multi-link, coil spring/telescopic damper. No damage was observed during the inspection.

## 2.8. Brake System

The vehicle was equipped with a hydraulically operated 4-wheel anti-lock disc braking system (ABS) with electronic brake force distribution, integrated advanced stability control and electronic accelerator pedal actuated regenerative braking system. The brake calipers were a fixed type with four pistons each.

## 2.9. Tires and Wheels

General information about each of the Tesla's tires as they were at the time of inspection is included in **Table 1**. Tire tread depth measurements were taken in the major tread grooves of each tire. The smallest depth measured is displayed in the table and represents a minimum tread depth value for that tire.<sup>23</sup> All the rims were inspected for cracks, welds, and elongated lug nut holes. No non-collision related defects were found on any of the rims.

**Table 1-** 2018 Tesla Model 3 Tire Information

Front Axle	Left	Right
Make/Model	Michelin/ Pilot Sport 4 S	Michelin/ Pilot Sport 4 S
Tire Size	235/35 ZR20	235/35 ZR20
Pressure	41 psi	41 psi
Tread Depth <sup>24</sup>	10/32 <sup>nd</sup>	10/32 <sup>nd</sup>
DOT #	4M7X 00DX 3418	4M7X 00DX 1018
Rear	Left	Right
Tire Make	Michelin/ Pilot Sport 4 S	Michelin/ Pilot Sport 4 S
Tire Size	235/35 ZR20	235/35 ZR20
Pressure	41 psi	41 psi
Tread Depth	10/32 <sup>nd</sup>	10/32 <sup>nd</sup>
DOT #	4M7X 00DX 3518	4M7X 00DX 3818

## 2.10. Maintenance History

Maintenance records received from Tesla indicate that on January 23, 2019 the vehicle was serviced at Riviera Beach, Florida Tesla. The vehicle received a courtesy inspection, brake

<sup>23</sup> Measured in two adjacent tread grooves at any location on the tire (49 CFR 570.9(a)).

<sup>24</sup> Under Florida law, the minimum tread depth in Florida is 2/32 of an inch

discs/caliper general diagnosis and the application of a missing badge on the exterior of the vehicle, no additional issues were found during the inspection.<sup>25</sup>

## **2.11. Documented Recall and Warranty Claims**

A search of the safety recall database maintained by the National Highway Traffic Safety Administration (NHTSA) found no recalls associated to this vehicles' VIN.<sup>26</sup> Additionally, warranty claim records kept by Tesla, found no warranty claims.

### **E. DOCKET MATERIAL**

The following attachments and photographs are included in the docket for this investigation:

#### LIST OF ATTACHMENTS

- Vehicle Factors Attachment - 2019 International Truck Tractor Line Set Ticket
- Vehicle Factors Attachment - 2019 International Truck Tractor Annual Vehicle Inspection Report
- Vehicle Factors Attachment - 2008 Vanguard Semitrailer Annual Vehicle Inspection Report
- Vehicle Factors Attachment - FHP Driver/Vehicle Examination Report
- Vehicle Factors Attachment - Service Invoice for 2018 Tesla dated Jan. 23. 2019

#### LIST OF PHOTOGRAPHS

- Vehicle Factors Photograph 1 - Depicting the impact damage on the right side of the 2008 Vanguard semitrailer
- Vehicle Factors Photograph 2 - Depicting damage frame rails on the underside of the 2008 Vanguard semitrailer
- Vehicle Factors Photograph 3 - Depicting A and B-Pillars separated and deformed just below where the roof met the pillars
- Vehicle Factors Photograph 4 - Depicting the trunk lid being displaced aft of its original position
- Vehicle Factors Photograph 5 - Depicting a right-side view of the 2018 Tesla Model 3, showing collision damage

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<sup>25</sup> Additional information is contained in Vehicle Factors Attachment – Service Invoice for 2018 Tesla dated Jan. 23. 2019

<sup>26</sup> <https://www.nhtsa.gov/recalls> accessed on 7/16/2019

END OF INFORMATION

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David Pereira

Senior Highway Crash Investigator (Vehicle Factors)