



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

**TECHNICAL RECONSTRUCTION GROUP CHAIRMAN'S
FACTUAL REPORT**

ANDREWS, TEXAS – HWYM22H006

A. CRASH INFORMATION & CRASH SUMMARY

Refer to the *Crash Information and Crash Summary Report* in the docket for this investigation.

B. TECHNICAL RECONSTRUCTION GROUP

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C. DETAILS OF THE TECHNICAL RECONSTRUCTION INVESTIGATION

The Technical Reconstruction Group for this investigation was convened for the purpose of providing the on-scene documentation of the crash location and involved vehicles, and to assist in the analysis of the collision events and causation factors. In support of these tasks the group reviewed documentation provided by the Texas Department of Public Safety (TXDPS).

Factual reports prepared by other NTSB investigative groups should be consulted for information related to other aspects of the investigation, including information used within this report.

1. Basic Collision Scenario, Site Location and Documentation

The crash involved an offset frontal collision between a 2007 Dodge Ram 2500 ¾ ton pickup truck (Dodge Ram) and a 2017 Ford E-350 chassis 12-passenger transit van (Ford). The Ford was towing a 2019 Salvation trailer (Trailer). The events began when the Dodge Ram, traveling southbound on Farm-to-Market (FM) Road 1788 in the opposing travel lane and collided with the

Ford that was traveling northbound. The collision occurred at mile-point 10.547 which was approximately 40 miles north of Odessa.

The NTSB Technical Reconstruction Group examined and documented the collision site and other roadway and environmental features on March 22nd, 2022, seven days after the collision using ground photography, video, and geographic coordinate (GPS) acquisition. TXDPS investigators, as part of their on-scene investigation, marked the location of certain roadway evidence and documented approximately 400 feet of highway around the crash site using a FARO Focus Scanner¹ and a sUAS.

FM 1788 through the area of collision, is a two-lane undivided highway which travels north and south. The travel lanes were delineated by single yellow line pavement striping for the northbound travel lane and spaced yellow lines that measured approximately 10 feet and were spaced about 30 feet apart for the southbound travel lane. The collision occurred on a tangent section of FM 1788. **Figure 1** depicts the area of the collision on FM 1788.



Figure 1. Google Earth image of FM 1788 depicting the collision site.

¹ The FARO Focus is a high-speed terrestrial laser scanner used for 3D documentation. The scanner creates point cloud scans that are combined or linked from multiple positions to create a cohesive three-dimensional point cloud rendering of the subject area.

The roadway speed limit was posted at 75 mph. There was no available highway lighting on FM 1788 where the collision occurred. Additional information regarding the highway is available in the NTSB Highway Factors Group Factual report.

The onset of roadway evidence began north of the Fords position of final rest. There was an area of burnt asphalt that encompassed the northbound travel lane and shoulder. Excluding vehicle debris, such as in this case vehicle components including the Ford's engine, scene evidence consisted of roadway metal scars, and fluid stains that extended over approximately 43 feet. There were a series of 4 short metal scars/gouge marks approximately 19.6 feet southwest of the area of impact along the northbound side of the yellow lane line. The marks exhibited about a 43° angle relative to the direction to the roadway, with a southwestward orientation. There were two additional sets of two short gouge marks approximately 43 feet and 50 feet, respectively, southwest of the area of impact. There were furrows in the dirt/grass adjacent the southbound travel lane. The furrows were in line with the described gouge marks and led to the final rest of the Dodge Ram. All the described evidence was related to the post-impact movement of the vehicles.

There was a single tire friction mark observed in the northbound lane. The outside and inside edges of the tire imprinted on the roadway surface which terminated at the area of impact. The friction mark extended southwestward in the northbound travel lane for approximately 73 feet. The distance between the two edges of the friction mark measured approximately 7.5 inches apart consistently throughout the length of the mark. The tire friction mark measured approximately 1.8 feet from the white edge line in the northbound lane at the onset and about 6.6 feet from the white edge line at its termination (area of impact). The tire friction mark displayed a shallow rightward arc throughout its length.

As shown in TXDPS scene photographs, the Ford remained partially in the northbound travel lane and on the northbound shoulder. The Dodge Ram traveled off the southbound side of the roadway and became entangled in a barbed wire fence. At final rest, the Ford and the Dodge Ram had a heading toward the southeast. The trailer came to rest east of the Ford on its left side with a southeasterly heading. At final rest the Ford was at an angle of about 226° relative to its initial direction of travel (northbound). The Dodge Ram, at final rest, was at an angle of about 127° relative to its initial direction of travel (southbound), and approximately 89 feet southwest of the Ford. The trailer separated from the Ford and overturned onto its left side. At rest, the trailer was located about 32 feet east of the Ford, off the roadway, at an angle of 180° relative to its initial direction of travel.

Figure 2 is a two-dimensional scaled diagram showing the positions of final rest for the vehicles and roadway evidence. Vehicle placement was based on vehicle dimensions, 3D scan data, and sUAS data.

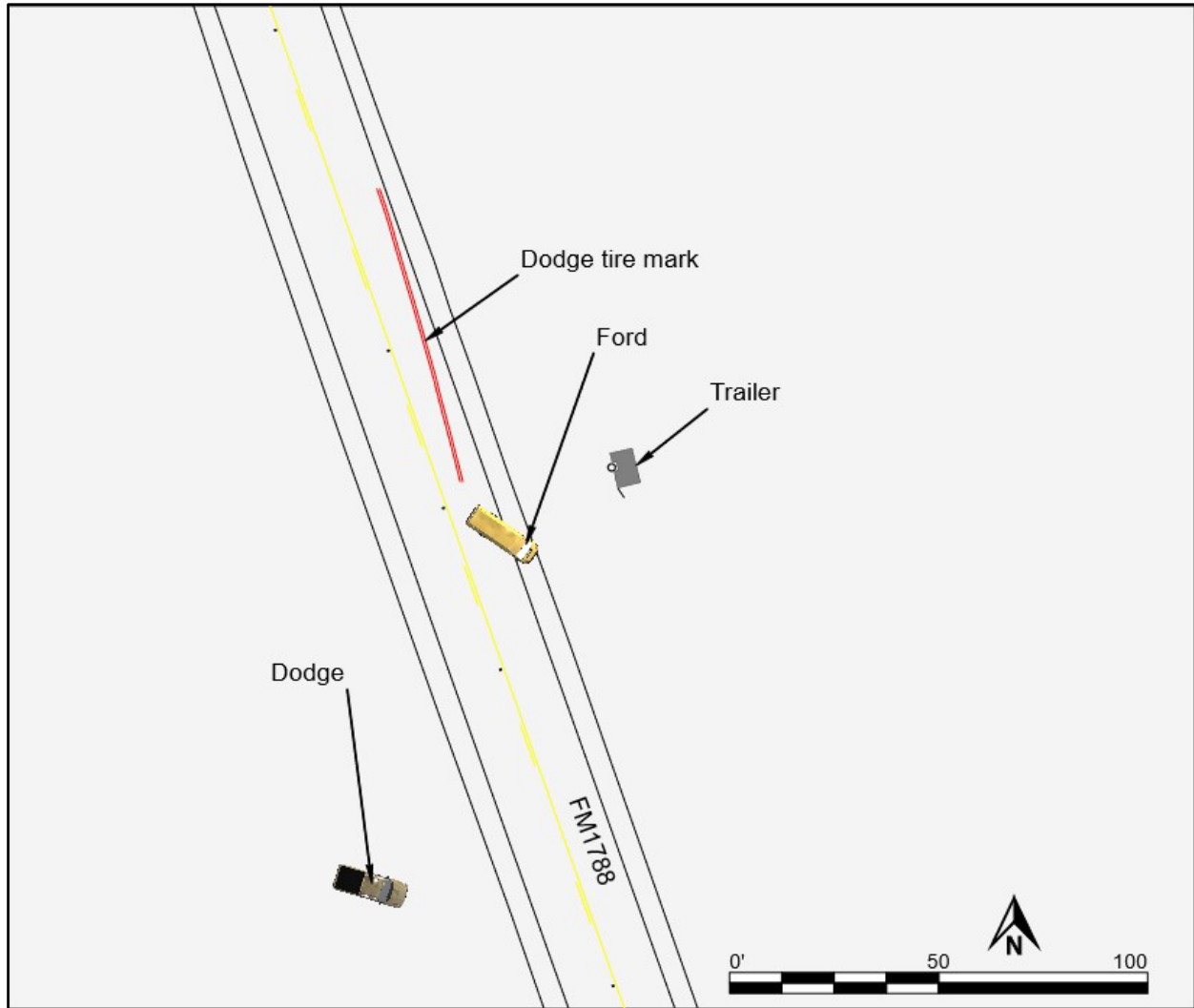


Figure 2. Collision site diagram showing post-crash final rest positions of the vehicles with tire mark evidence. Diagram based on sUAS mapping data provided by the TXDPS.

2. Vehicle Documentation

2.1. Ford

The vehicle was configured as a transit van, having a 12-passenger seat configuration, on a 2017 Ford E-350 chassis. The Ford had two forward seating positions for the driver and right front passenger. The vehicle was examined and photographed on May 13th, 2022. The Ford had been three-dimensionally scanned by TXDPS at the collision scene. The Ford had been secured at a local tow yard by TXDPS investigators. A more detailed examination and documentation of the vehicle was undertaken by the NTSB Vehicle Factors Group.

Figure 3 is a 3D image of the collision damage exhibited by the Ford. Overall, the Ford exhibited catastrophic damage. The vehicle had sustained an offset frontal collision on the driver’s side with contact damage overlapping about 47.3 inches of the lateral width of the vehicle, as

measured from the sidewall at the left front axle position. The motor had been torn from the mounts and was dislodged from the vehicle. The left fender was pushed rearward and down. The firewall was separated from both “A” pillars and displaced rearward and down. The leading edge of the roofline had also exhibited contact damage and was crumpled rearward. The driver’s door and first passenger side window area were pushed rearward to the “B” pillar and had been torn from the roofline. The front axle had been pushed rearward and down and the bumper was torn in half along the centerline. The left half of the bumper and left front wheel were displaced rearward and laterally to the left. The left side of the left bumper half was pushed rearward toward the centerline of the vehicle causing the right edge of the bumper outward, ultimately facing to the front of the Ford. Another area of contact damage was identified on the left rear of the Ford. The damage



Figure 3. The image shows a 3D view of the Ford looking at the left front of the vehicle where the damage was concentrated.

resulted from the collision induced rotation between the Ford and trailer. A post-crash fire caused extensive fire damage. **Figure 4** shows the damage profile of the Ford atop an undamaged outline of an exemplar Ford.

Table 1 provides certain dimensional data for the vehicle.²

Table 1. Dimensional data for an exemplar 2017 Ford Transit Van

	Inches	Feet	
Overall length	237.96	19.83	
Wheelbase	147.96	12.33	
Front overhang	41.04	3.42	
Rear overhang	48.96	4.08	
Overall width	81.00	6.75	
Overall height	100.7	8.39	
Curb weight			6,092 lbs.

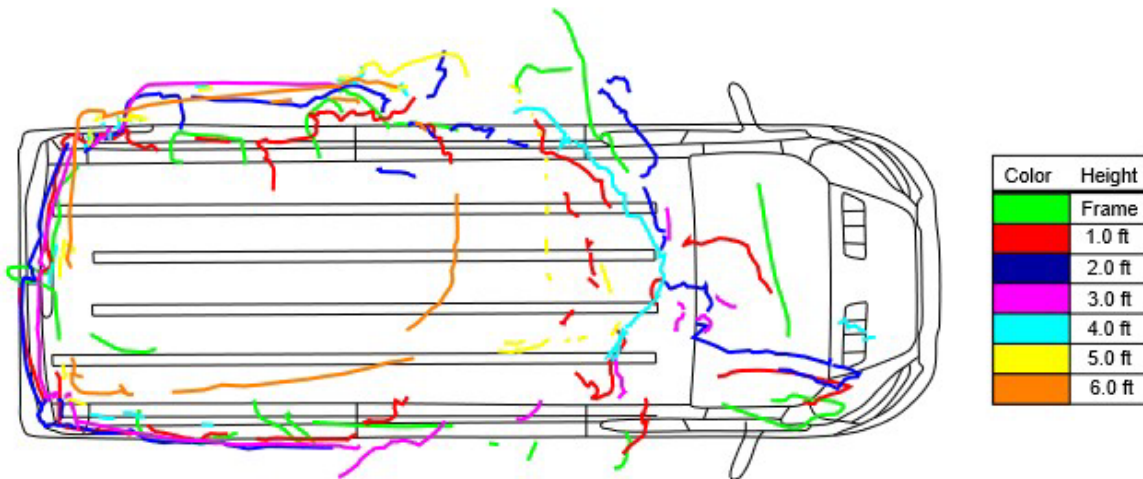


Figure 4. Image depicts a two-dimensional, top-down illustration of damage to the Ford atop an undamaged outline. Damage outlines were drawn from the 3D scan data at one-foot vertical intervals beginning at the axle height.

2.2. Salvation Trailer

The trailer was identified as a 2019 Salvation trailer with a single axle. The trailer was examined on May 13th, 2022.

The tongue of the trailer had been bent upwards to approximately a 30° angle. There was direct contact damage identified on the front left that extended the full vertical height of the trailer. The sheet metal had been pushed rearward into the storage area of the trailer. About 2 feet upward from the bottom of the trailer the sheet metal had been torn exposing the interior wood frame. The left

² Reference 4N6XPRT Systems Expert AutoStats v6.1.1.

side of the trailer received fire damage. The trailer was weighed during the examination. The weight, which included all equipment, was determined to be 1,350 pounds. **Figure 5** depicts the damage to the Salvation trailer.



Figure5. Photograph depicting the damage sustained by the Salvation trailer.

2.3. Dodge Ram

The vehicle was identified as a 2007 Dodge Ram 2500 quad cab pickup truck. The vehicle was examined and photographed on May 13th, 2022.

The Dodge Ram exhibited severe front-end damage from an offset frontal collision. The direct contact damage extended laterally across the full front of the vehicle. The front end of the vehicle had been pushed through the engine compartment into the firewall. The left side had been displaced further rearward than the right side. The right side had shifted leftward, toward the driver's side. As a result of the collision the Dodge Ram exhibited extensive fire damage that had consumed the entire vehicle. The Dodge was weighed during the examination, and it was determined that the post-crash weight was approximately 7,140 pounds. **Figures 6 and 7** depict 3D and damage patterns exhibited by the Dodge.



Figure 6. 3D rendering of the Dodge. View of the damage sustained by the Dodge looking at the front left side.

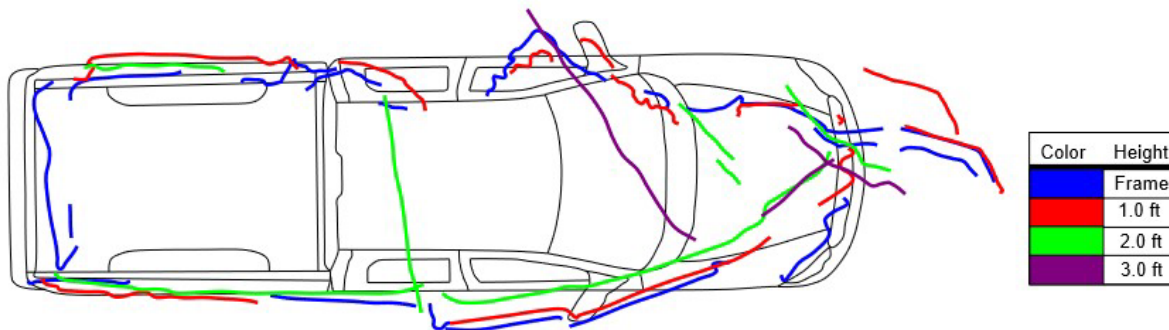


Figure 7. Image depicts a two-dimensional, top-down illustration of damage to the Dodge atop an undamaged outline. Damage outlines were drawn from the 3D scan data at one-foot vertical intervals beginning at the axle height.

Table 2 provides certain dimensional data for the vehicle.³

Table 2: Dimensional Data for an exemplar 2007 Dodge Ram 2500

	Inches	Feet	
Overall length	185	19.00	
Wheelbase	113	11.75	
Front overhang	33	3.08	
Rear overhang	39	4.17	
Overall width	73	6.67	
Maximum height			
Curb weight			6,083 lbs.

3. Electronic Data Recorders

Both vehicles were equipped with airbag control modules (ACM). The main function of an ACM is to command the deployment of the vehicles supplemental restraint system (SRS). Located within the ACM is an Event Data Recorder (EDR). The EDR records certain parameters in relation to an SRS activation.

3.1. Ford

NTSB investigators were able to locate and recover the ACM from the vehicle. Due to the extensive thermal damage the ACM was photographed and shipped to NTSB Office of Research and Engineering for the imaging. Upon further examination, investigators determined that the damage to the internal components including the EDR was beyond repair and no information was obtained from the EDR. Information regarding the inspection is addressed in the *NTSB Recorders Report* prepared by the Office of Research and Engineering.

3.2. Dodge Ram

NTSB investigators located the mounting bracket for the ACM. Pieces of the ACM were found around the mounting bracket. Based on the minimal number of pieces located it was determined that the ACM had been destroyed during the collision events and post collision fire.

4. Roadway Friction Testing

On March 22nd, 2022, testing was conducted near the collision site to identify a potential sliding friction value (also referred to as coefficient of friction) between a passenger vehicle tire and the road surface. Testing was conducted by equipping a Chevrolet Tahoe with a Vericom 4000. The testing was conducted with the anti-lock braking system enabled. A total of 6 tests were conducted. **Table 3** summarizes the average friction values acquired from each test.

³ Reference 4N6XPRT Systems Expert AutoStats v6.1.1

Table 3. Summary of the friction values from on scene testing.

Test	Initial Test Speed	Average Deceleration from test	Average Deceleration Value
1	31.5 mph	.830g	.866g
2	31.3 mph	.875g	
3	31.4 mph	.878g	
4	30.2 mph	.899g	
5	30.8 mph	.851g	
6	31.6 mph	.863g	

D. DOCKET MATERIAL

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

LIST OF ATTACHMENTS

Reconstruction Group Attachment – Vehicle Specification 2007 Dodge Ram 2500

Reconstruction Group Attachment – Vehicle Specification 2017 Ford Transit Van

END OF REPORT

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