



***Federal Railroad Administration  
Office of Railroad Safety  
Accident and Analysis Branch***

***Accident Investigation Report  
HQ-2017-1196***

***Union Pacific Railroad Company (UP)  
Malakoff, TX  
March 29, 2017***

***Note that 49 U.S.C. §20903 provides that no part of an accident or incident report, including this one, made by the Secretary of Transportation/Federal Railroad Administration under 49 U.S.C. §20902 may be used in a civil action for damages resulting from a matter mentioned in the report.***

**SYNOPSIS**

On March 29, 2017, at 5:40 p.m., CST, westbound Union Pacific Railroad (UP) freight Train MPBMX-28, traveling at a recorded speed of 46 mph, derailed 38 freight cars. The accident occurred at Milepost 593.8 on the Fort Worth Service Unit Division, Corsicana Subdivision, in the town of Malakoff, Texas.

There were no injuries to the train crew or public. Train MPBMX-28 consisted of 132 cars including 15 hazardous material cars. Ten of the hazardous material cars derailed, and 5 of these cars were compromised, leaking approximately 25,000 gallons of diesel fuel. No evacuation had to be issued within the Malakoff, Texas, area.

A total of 38 freight cars derailed in the accident, and 37 of these received extensive damage. The estimated monetary damage to mechanical equipment, signal system, and track structure was \$1,994,581.

At the time of the accident, it was daylight and cloudy, with a temperature of 81 °F.

The Federal Railroad Administration (FRA) determined the probable cause of this derailment to be Improper train makeup at initial terminal (H501).

**TRAIN SUMMARY**

1. Name of Railroad Operating Train #1 Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0317FW037
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**GENERAL INFORMATION**

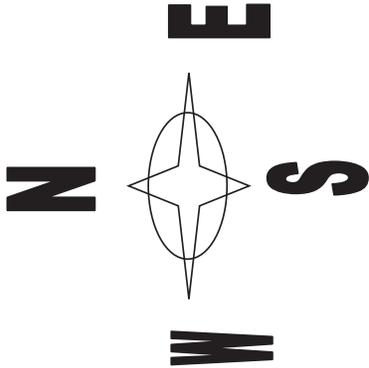
1. Name of Railroad or Other Entity Responsible for Track Maintenance Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0317FW037
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 3/29/2017	4. Time of Accident/Incident 5:40 PM
5. Type of Accident/Incident Derailment		
6. Cars Carrying HAZMAT 15	7. HAZMAT Cars Damaged/Derailed 10	8. Cars Releasing HAZMAT 5
	9. People Evacuated 0	10. Subdivision Corsicana
11. Nearest City/Town Malakoff	12. Milepost (to nearest tenth) 593.8	13. State Abbr. TX
		14. County HENDERSON
15. Temperature (F) 81 °F	16. Visibility Day	17. Weather Cloudy
		18. Type of Track Main
19. Track Name/Number Single Main Track	20. FRA Track Class Freight Trains-60, Passenger Trains-80	21. Annual Track Density (gross tons in millions) 22.6
		22. Time Table Direction West

**OPERATING TRAIN #1**

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes		3. Train Number/Symbol MPBMX-28				
4. Speed (recorded speed, if available) R - Recorded 46.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 15603		6a. Remotely Controlled Locomotive? 0 = Not a remotely controlled operation 1 = Remote control portable transmitter 2 = Remote control tower operation 3 = Remote control portable transmitter - more than one remote control transmitter					Code 0	
6. Type of Territory Signalization: <u>Signaled</u> Method of Operation/Authority for Movement: <u>Signal Indication</u> Supplemental/Adjunct Codes: <u>Q</u>											
7. Principal Car/Unit		a. Initial and Number		b. Position in Train		c. Loaded (yes/no)		8. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box		Alcohol	Drugs
(1) First Involved <i>(derailed, struck, etc.)</i>		GAMX 896		75		yes				0	0
(2) Causing <i>(if mechanical, cause reported)</i>								9. Was this consist transporting passengers?		No	
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)											
11. Cars (Include EMU, DMU, and Cab Car Locomotives.)											
12. Equipment Damage This Consist											
13. Track, Signal, Way & Structure Damage											
14. Primary Cause Code											
15. Contributing Cause Code											
Number of Crew Members						Length of Time on Duty					
16. Engineers/Operators		17. Firemen		18. Conductors		19. Brakemen		20. Engineer/Operator		21. Conductor	
1		0		1		0		Hrs: 6 Mins: 40		Hrs: 6 Mins: 40	
Casualties to:		22. Railroad Employees		23. Train Passengers		24. Others		25. EOT Device?		26. Was EOT Device Properly Armed?	
Fatal		0		0		0		Yes		Yes	
Nonfatal		0		0		0		27. Caboose Occupied by Crew?		N/A	
28. Latitude 32.168728000				29. Longitude -96.012366000							

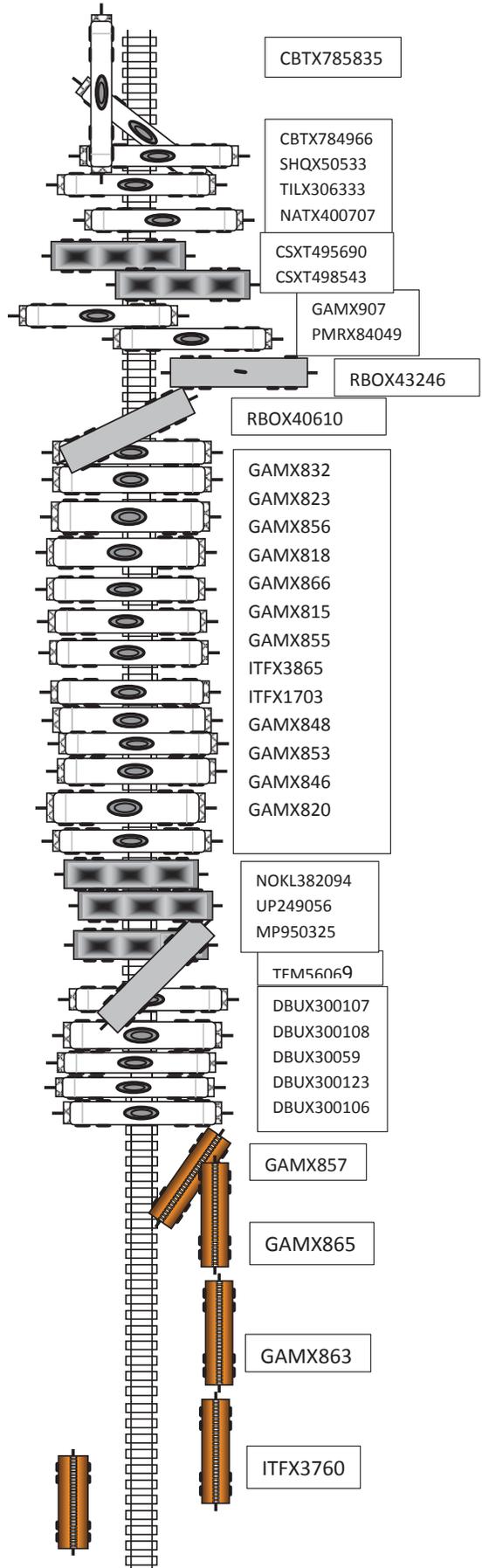
SKETCHES

Accident Sketch



MPBMX-28  
126 LOADS  
6 EMPTY  
15603 TONS  
7479 FEET LONG  
  
38 CARS DERAILED  
37 LOADS  
1 EMPTY  
LINE 75 - 112

Drawing Not to scale  
HQ-2017-1196



## NARRATIVE

**Circumstances Prior to the Accident**

The train crew of MPBMX-28 (the train) consisted of one locomotive engineer and one conductor, reporting for duty on March 29, 2017, at 11 a.m., CST, in Longview, Texas, which is the home terminal for both crew members. Prior to reporting for duty, each crew member received more than the statutory off-duty rest period. The train crew was taxied from Longview to Big Sandy, Texas (approximately 23 miles), to board their train.

The consist of their freight train included 2 lead locomotives, 132 freight cars (126 loads and 6 empties) and 2 distributed power units (DPUs) on the rear, and was 7,479 feet in length with 15,603 trailing tons. The train crew was scheduled to take the train to Hearne, Texas, which is approximately 168 miles from Big Sandy.

The train originated in Pine Bluff, Arkansas, and was destined for Mexico. It received the required Class I air brake test and inspection by Union Pacific Railroad (UP) mechanical personnel on March 28, 2017, at 11 p.m. When the train arrived at Big Sandy on March 29, 2017, the crew involved in the accident took charge of their train. This crew was the third for this train.

The crew of the train performed no switching operations between Big Sandy and the accident site. The crew was informed by the previous crew's Engineer (second crew) of some communication issues they had experienced with the rear DPUs, and that UP had received reports of track disturbances near Milepost (MP) 506 and MP 513 prior to Big Sandy on the Pine Bluff Subdivision.

Due to the reports of communication problems and track disturbances, UP's Manager of Operating Practices (MOP) responded by performing a roll-by inspection of the train and then stopped the train at approximately MP 576 in Brownsboro, Texas. The MOP then downloaded the event recorders on the DPUs and observed the crew perform a Class 3 air brake test. The MOP took no exception to the data or the operation of the brakes and instructed the crew to continue its operation.

As the train approached the accident site westbound at a recorded speed of 46 mph, it was being operated with the lead controlling locomotive coming out of dynamic braking and into throttle position Run 1 and 2, with the rear DPU locomotive power on a descending grade, in throttle position 7. The maximum authorized speed for this train was 50 mph, as designated by UP's System Timetable No. 5. The railroad timetable direction is west and it was operating in centralized traffic control signaled territory. Timetable directions are used throughout this report.

The Locomotive Engineer was seated at the controls of the lead locomotive on the north side of the cab compartment and the Conductor was seated on the south side of the lead locomotive cab compartment.

**The Accident**

As the head-end of the train approached approximately MP 595, the train experienced an undesired emergency brake application. The seventy-fifth through one hundred and twelfth cars from the head-end derailed at MP 593.8. The derailed cars came to rest in more or less an accordion-style, some upright and others on their side, with the one hundred and twelfth car having one set of trucks derailed. The accident site was within the limits of the town of Malakoff, Texas. There were no injuries as a result of the accident. Once the train was secured, the Conductor began a walking inspection of the train.

The crew of the train stated there was nothing unusual about the operation of their train and that it was running normal at the time of the accident. Both crew members stated that they couldn't see any cars derailling from their positions in the lead locomotive.

Several emergency responders and public entities were involved at the accident site including UP's Emergency Response Team, Malakoff City Officials, Henderson County Precinct 1 Commissioner, and Atmos Energy.

At the time of the accident, it was daylight and cloudy, with a temperature of 81 °F.

### **Analysis and Conclusions**

Analysis - Toxicological Testing: This accident met the criteria for Title 49 Code of Federal Regulations Part 219, Subpart C, Post Accident Toxicological Testing. The Conductor and Engineer for the train were tested under the Federal Railroad Administration's (FRA) guidelines for the use of alcohol and drugs. The train crew member's results were negative.

Conclusion: Alcohol and drug use were not factors in this accident.

Analysis - Fatigue Analysis: FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to blood alcohol content of 0.05. At or above this baseline, we do not consider fatigue as probable for any employee. Software sleep settings vary according to information obtained from each employee. If an employee does not provide sleep information, FRA uses the default software settings.

FRA obtained fatigue-related information, including a 10-day work history, for the train crew employees involved in this accident. Based on the results of the analysis, fatigue was not probable for either employee.

Conclusion: Fatigue was not probable as a contributing factor in this accident.

Analysis - Track Structure: On the approach to the accident site, there are four curves between MP 590.5 and the point of derailment (POD) at MP 593.8. At the time of the derailment the train would have been traversing three curves simultaneously. The grade approaching the POD is a series of ascending and descending grades. At the time of the derailment, the head-end of the train was on a .58 percent descending grade (approximately MP 594.60). The rear of the train at this time would be just entering a .44 percent ascending grade (approximately MP 593.10). There were no other switches, turnouts, bridges, or culverts within the area of the accident. The main track at this location is constructed of continuously-welded 115-pound rail with wooden ties.

Track inspections behind the train, the day of the accident, revealed three locations to be severely out of alignment. The track at MP 506.85 was found to be 9 inches out of alignment, 8 inches at MP 513.85 and 13 inches at MP 591.5.

The train make-up (consist) out of both Pine Bluff and Big Sandy was noted to contain several isolated "heavy" blocks interspersed with "light" short blocks. For instance, cars 1-47 ranged in tonnage between 100 tons to 140 tons, while a single car (48) showed 35-40 tons. Cars 49-64 were heavy – with cars 65-73 light. There were several instances of "blocking" issues noted, which would aggravate train handling in undulating territory and could certainly create excessive "in-train" forces.

Conclusion: There was no evidence of continuously-welded rail problems at any of the locations. FRA inspectors believe these alignment issues to be caused by excessive in-train forces due to terrain and train consist make-up.

Analysis – Mechanical: On March 28, 2017, at 4:15 a.m., the prior train crew encountered a wheel impact detector warning on loaded freight Car TILX 639805 (forty-first car from head-end), at Stuttgart, Arkansas. The wheel impact detected was in the R1 wheel, with a wheel impact reading of 106.47 kips. The alert action generated from this reading was, “Inspect and replace when in shop or repair track.” The subject loaded freight car was below the threshold limits to be immediately set out and was not part of the cars derailed. The impact limit for unloaded freight cars is 110 kips and for loaded freight cars is 120 kips. Freight Car TILX 639805 was to be set out in San Antonio, Texas, on March 29, 2017. Locomotive UP 7357 was inspected by UP mechanical personnel after the accident and found no defective conditions with the trucks that could potentially cause track misalignments, as previously described in this report.

Conclusion: Inspections did not reveal any indication of a mechanical defect or failure that would have caused this accident. Freight Car TILX 639805 that received a wheel detector warning, was within kip limits to leave it in the train until it reached the next mechanical facility (San Antonio). Rear DPU Locomotive UP 7357 was inspected with no defects found that would cause track disturbances or experience communication problems.

Train rides were conducted by FRA on May 3, 9 and 10, 2017, on similar DPU trains from Big Sandy, to Corsicana, Texas. It was observed on these train rides that there was intermittent communication loss, mostly due to the heavy vegetation from Big Sandy, west to the Trinity River, which is about 8 miles west of Malakoff (accident site). Although there are safety measure practices in place when losing DPU communications, UP is looking for opportunities to enhance DPU communication on this Subdivision, which would, in turn, improve train handling. The train was not experiencing a communication loss at the time of the accident.

Analysis - Train Crew Performance: Examination of the event recorder downloads of the locomotives indicated the train was being operated at a recorded speed of 46 mph approaching the accident site. The event recorder downloads revealed at the time of the derailment, the head-end locomotive consist, UP 5433 and UP 7352, were in dynamic braking (DB) and began to come out of DB into throttle positions Run 1 and 2 with the rear DPUs, UP 7671, and UP 7357, operating in throttle position Run 7.

The train was 7,479 feet in length with 15,603 trailing tons. The undulating grades and multiple curves in the track segment occupied by the train at the time of the derailment, made it difficult to control a train with these dimensions. Examination of the event recorder downloads revealed the Engineer making an excessive demand for power on the rear of the train with near full power pushing and simultaneous heavy braking (approximately 50 percent) at the head-end of train. At the time of the derailment, a little over half of the train was on a descending grade (head-end), with a little less than half of the train on an ascending grade and was simultaneously traversing three curves.

As previously stated, the blocking arrangement on the train was questionable – with extremely heavy blocks of cars interspersed with light single cars or blocks.

The “fencing” behavior (separating controls between the headend and rear-end locomotives), to allow better control of “in-train” forces is allowed and encouraged by UP. Parameters for “fencing” are general in nature and cannot exactly fit every possible train make-up scenario. UP did not take exception to the crew’s train handling, given the train make-up.

To determine whether crew train handling, or train physical characteristics played the decisive critical role in this derailment, UP modeled the train with their TOES Package to check in-train forces by computer simulation. The results, according to UP, clearly showed “train make-up” as the primary failure.

Conclusion: FRA agrees with the final outcome following the UP’s computer modeling analysis, with the primary cause of this derailment being “H501-Train Make Up Initial Terminal.”

**Overall Conclusion**

FRA investigation found that many trains originating in UP’s Pine Bluff Terminal are excessive in length and weight. This factor was confirmed during multiple train rides and conversations with UP train crews that regularly move these trains, both conventional and with DPU.

FRA found historical issues with trains on UP’s Corsicana Subdivision experiencing “coupler knuckle failure.” This type of failure is often associated with long, heavy trains and undulating terrain.

**Probable Cause and Contributing Factors**

FRA determined the probable cause of this derailment to be Improper train makeup at initial terminal (H501).