



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

***Accident Investigation Report
HQ-2014-13***

***Arkansas & Missouri Railroad Company (AM)
West Fork, AR
October 16, 2014***

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

Synopsis

A northbound Arkansas and Missouri Railroad (AM) light locomotive, AM 50, traveling at a recorded speed of 25 mph, collided with a stopped AM Excursion Train on October 16, 2014, at 10:30 a.m., CDT. The collision occurred approximately 2 miles from Brentwood/West Fork, Washington County, Arkansas, at AM Milepost 368.25, on AM's Main Track. There were 39 manifested passengers, 2 show conductors, and a locomotive engineer and conductor on the AM Excursion Train.

The light locomotive crew included a locomotive engineer and a conductor.

All 45 individuals sustained non-life threatening injuries. The collision resulted in the minor damage to Locomotives AM 50 and AM 68, the Excursion Train's coach cars, and the Main Track of approximately \$327,500.

The timetable and geographic direction of the striking locomotive, AM 50, was northbound. Timetable direction is used throughout this report. At the time of the accident, the weather was clear. The temperature was approximately 55 degrees Fahrenheit.

The probable cause of the accident was AM 50 work train crew's excessive speed, (H606) Train outside yard limits in non-block territory, traveling at excessive speed, due to their non-compliance with (H404) track warrant. This excessive speed was due to the failure of the crew to comply with Restrictive Speed per GCOR, Rule 15.4 Protection when Tracks Removed from Service.

There are several contributing factors (H999) (Other train operation/human factors)) that AM's MOW Department was in control of the training, testing, and oversight of its own train crews. Specifically, contributing factors to this accident is:

1. The failure of AM's Operational Testing Program to provide compliant Operating Rules compliance oversight of its Operating employees assigned to the MOW Department.
2. The failure of AM's senior management to provide its supervisors and employees, Operating, Track and Mechanical, with enough assets to perform their duties compliant with the Federal regulations and railroad operating and safety rules.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 Arkansas & Missouri Railroad Company	1a. Alphabetic Code AM	1b. Railroad Accident/Incident No. AM101614
2. Name of Railroad Operating Train #2 Arkansas & Missouri Railroad Company	2a. Alphabetic Code AM	2b. Railroad Accident/Incident No. AM101614

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance Arkansas & Missouri Railroad Company		1a. Alphabetic Code AM	1b. Railroad Accident/Incident No. AM101614	
2. U.S. DOT Grade Crossing Identification Number		3. Date of Accident/Incident 10/16/2014	4. Time of Accident/Incident 10:30 AM	
5. Type of Accident/Incident Head On Collision				
6. Cars Carrying HAZMAT 0	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0	9. People Evacuated 0	10. Subdivision Fayetteville
11. Nearest City/Town West Fork		12. Milepost (to nearest tenth) 368.2	13. State Abbr. AR	14. County WASHINGTON
15. Temperature (F) 55 °F	16. Visibility Day	17. Weather Clear		18. Type of Track Main
19. Track Name/Number Main track		20. FRA Track Class Freight Trains-40, Passenger Trains-60		21. Annual Track Density (gross tons in millions) 2
				22. Time Table Direction North

OPERATING TRAIN #1

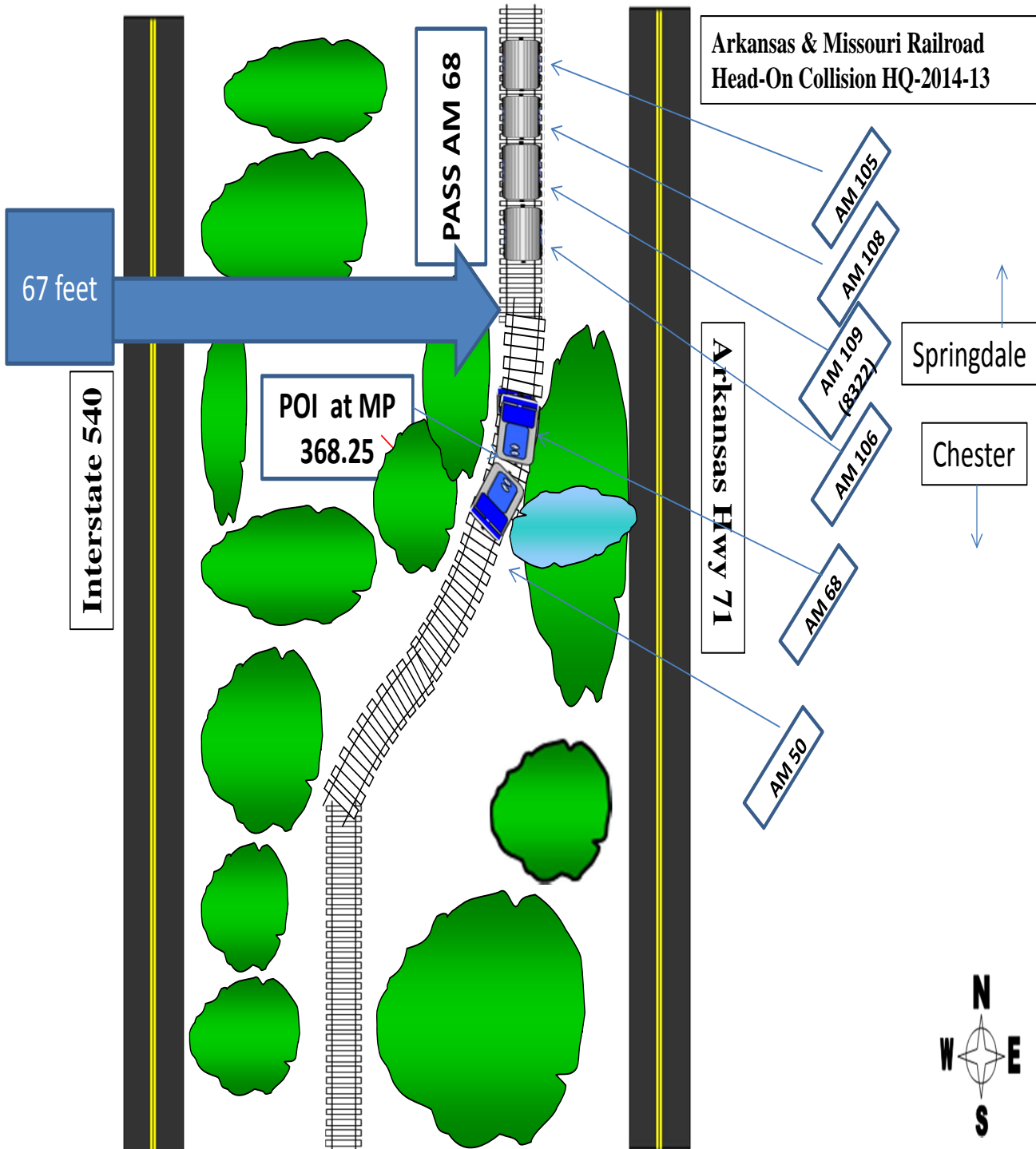
1. Type of Equipment Consist: Light Loco(s)					2. Was Equipment Attended? Yes		3. Train Number/Symbol WORK				
4. Speed (recorded speed, if available) R - Recorded 25 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units)		6a. Remotely Controlled Locomotive? 0 = Not a remotely controlled 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>Not Signaled</u> Method of Operation/Authority for Movement: <u>Direct Train Control</u> Supplemental/Adjunct Codes: <u>P, N/A</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 (derailed, struck, etc.)	AM 50		1		no				0	0	
(2) Causing (if mechanical, cause reported)	N/A		0		no		9. Was this consist transporting passengers?			N/A	
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train		Rear End		11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded		Empty		e. Caboose
		b. Manual	c. Remote	d. Manual	e. Remote		a. Freight	b. Pass.	c. Freight	d. Pass.	
(1) Total in Train	1	0	0	0	0	(1) Total in Equipment Consist	0	0	0	0	0
(2) Total Derailed	1	0	0	0	0	(2) Total Derailed	0	0	0	0	0
12. Equipment Damage This Consist 150000			13. Track, Signal, Way & Structure Damage 2500								
14. Primary Cause Code H606 - Train outside yard limits in non block territory, excessive speed											
15. Contributing Cause Code H404 - Train order, track warrant, track bulletin, or timetable authority, failure to comply											
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: 4 Mins: 30		Hrs: 4 Mins: 30			
Casualties to:	22. Railroad Employees		23. Train Passengers		24. Others	25. EOT Device?		26. Was EOT Device Properly Armed?			
Fatal	0		0		0	N/A		N/A			
Nonfatal	2		0		0	27. Caboose Occupied by Crew?					N/A
28. Latitude 36.000000000			29. Longitude -94.000000000								

OPERATING TRAIN #2

1. Type of Equipment Consist: Passenger Train-Pulling		2. Was Equipment Attended? Yes		3. Train Number/Symbol PASS							
4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code R	5. Trailing Tons (gross excluding power units)	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>Not Signaled</u> Method of Operation/Authority for Movement: <u>Direct Train Control</u> Supplemental/Adjunct Codes: <u>P, N/A</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>)	AM 68	1	no		0	0					
(2) Causing (if mechanical, cause reported)	AM 50	1	no	9. Was this consist transporting passengers?	Yes						
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train		Rear End		11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded		Empty		e. Caboose
		b. Manual	c. Remote	d. Manual	e. Remote		a. Freight	b. Pass.	c. Freight	d. Pass.	
(1) Total in Train	1	0	0	0	0	(1) Total in Equipment Consist	0	2	0	2	0
(2) Total Derailed	1	0	0	0	0	(2) Total Derailed	0	0	0	0	0
12. Equipment Damage This Consist 175000		13. Track, Signal, Way & Structure Damage 0									
14. Primary Cause Code H606 - Train outside yard limits in non block territory, excessive speed											
15. Contributing Cause Code H404 - Train order, track warrant, track bulletin, or timetable authority, failure to comply											
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: 3	Mins: 30	Hrs: 3	Mins: 30				
Casualties to:		22. Railroad Employees	23. Train Passengers	24. Others	25. EOT Device?		26. Was EOT Device Properly Armed?				
Fatal		0	0	0	N/A		N/A				
Nonfatal		2	39	2	27. Caboose Occupied by Crew?		N/A				
28. Latitude 36.000000000			29. Longitude -94.000000000								

SKETCHES

Accident Sketch version 2



NARRATIVE

Circumstances Prior to the Accident:

Work Train

The Arkansas and Missouri Railroad (AM) work train's crew included a locomotive engineer and a conductor. The crew went on duty at 6:00 a.m., CDT, October 16, 2014, in Springdale, Arkansas. This is their home terminal. Both employees failed to receive the statutory off-duty period after performing hours of service (HOS) work on October 15. On October 15, the Engineer performed HOS work from 6:00 a.m. to 11:15 p.m. and was provided only 6 hours and 45 minutes of rest. The Conductor performed HOS work from 6:00 a.m. to 11:45 p.m. and was provided only 6 hours and 15 minutes of rest. This crew reported to and worked for the Maintenance-of-Way (MOW) Department.

The work train, with lite locomotive AM 50, was 60 feet in length and 134 tons, and initially located on a passing siding near Main Line Station Chester, Milepost (MP) 386.1. The work train crew departed Springdale in a highway truck and arrived at Chester approximately 7:49 a.m. The original plan for the crew of AM 50 was to operate a work train, dumping ballast at a wash-out location between Main Line stations Chester and Winslow, MP 386.1 north to MP 374.7.

Passenger Train

AM passenger train's, crew included a locomotive engineer and a conductor. The crew went on duty at 7:00 a.m. CDT, October 16, 2014, at Springdale. This is their home terminal. Each crew member received more than the statutory Off Duty rest period. The passenger train consisted of Locomotive AM 68, Coach Cars 106, 109 (Bar Car), 108 (Dome Car), 105 in order from the locomotive. The passenger train was 375 feet in length and weighed 400 tons.

The southbound passenger train crew received their Track Bulletins, Numbers 255 and 257. They also received Track Warrant Number SS 168, with a Line 2 authority; "Proceed from Yard Limit MP (YLMP) 346.4 to Chester on Main Track." Also included was Line 17 Other Specific Instructions; "Remote Control Locomotive (RCL) in Remote Control Zone (rczone) at 8:30 a.m. Radio blocking authorized to be followed by AM 44 south. 5 mph at MP 380 plus 15 to MP 380 plus 25. Mainline Out of Service at MP 374 to MP 387 per Track Supervisor." (The Track Supervisor was in charge of the track repair work that was ongoing from MP 374 south to MP 387). Time OK on the track warrant was 7:56 a.m.

The locomotive of passenger train received its daily inspection at 5:10 a.m. on October 16, 2014, by the Mechanical Department. The Federal Railroad Administration's (FRA) Class 1 air brake test was completed by the Conductor the same day at 7:30 a.m. The air brake test records obtained did not include identifying information about the train such as train ID, or locomotive number. The Conductor provided the paperwork and stated this was the record of test.

The first move of the morning for Locomotive AM 68 was to place one coach car, 107, at the Springdale Passenger Depot for a static display. This move was completed without incident. Next, Locomotive AM 68 coupled up to the four coach cars of the passenger train, performed the air brake test and proceeded to the passenger boarding area. After all passengers boarded, the passenger train departed Springdale at 8:00 a.m. with a final destination of Van Buren, Arkansas. The crew had an uneventful trip until they encountered slippery rail conditions at approximately MP 366 and reduced their speed. The passenger train temporarily stalled. The Locomotive Engineer was able to start the train moving. However, at approximately MP 368 the train again stalled. This time the Locomotive Engineer decided not to attempt to move the passenger train further. The passenger train crew determined that the assigned single locomotive would not be able to pull the train south up the rest of the grade of the track without assistance.

The northbound AM 50 work train crew received their Track Bulletins, Numbers 255 and 257 and Track Warrant 170 from the Dispatcher, departed Springdale in a highway truck and arrived at Main Line Station Chester, MP 386.1, at approximately 7:49 a.m. Although the Engineer stated that he did a Daily Locomotive Inspection on AM 50 upon arrival at Chester, there were no actual records of this inspection. The most recent recorded daily inspection was recorded on October 14.

The Engineer of southbound passenger train started to experience wheel slip issues at approximately MP 366. He

used his personal cell phone to call the (MOW) Foreman in order to give him a warning that the passenger train might need the assistance of the work train to ascend the track grade at approximately MP 368. MOW Foreman informed AM 50's Locomotive Engineer of the need to assist Locomotive AM 68's movement south. The passenger train Engineer also spoke with the Mechanical Foreman and the Transportation Department Superintendent to inform them of the Wheel slip. The Engineer briefly exited the locomotive to inspect the area for the possible cause of the wheel slip. He boarded the locomotive and the passenger train continued south. Wheel slip issues continued at MP 368 with the passenger train stalled at MP 368 + 8 poles, approximately MP 368.25.

The Locomotive Engineer contacted AM's Dispatcher to inform that the passenger train was stopped between MP 367–MP 369. He next called the work train Engineer and preliminarily coordinated the link up of the two trains. The plan was to have locomotive AM 50 assist Locomotive AM 68 with the movement south to Van Buren.

At approximately 10:00 a.m., the Dispatcher contacted the Conductor of the work train and explained that the passenger train had stalled and the train would need the assistance of the work train locomotive to get up the grade south. The Dispatcher made arrangements to allow the work train, Locomotive AM 50, to proceed north to assist the stalled passenger train. The Dispatcher issued Track Bulletin Form D, Number 258, with Main Line Out Of Service MP 374 to MP 366 contact the Conductor of the work train. The work train, Locomotive AM 50, departed Chester heading north towards the passenger train. The Engineer of the work train stated that he had two phone conversations with the passenger train Engineer. First, when he was ready to leave Chester, and second was at MP 375 +20 poles. The Engineer of the work train understood that the passenger train should be located at approximately MP 366.

The Accident

The passenger train is stopped at MP 368.25. The crew, having made contact with the Dispatcher and the work train Engineer, are in the cab of Locomotive AM 68. The locomotive is long hood forward, facing south, with the cab, front, of the locomotive north and coupled to the coach car. The Engineer is seated at the controls of the locomotive on the west side of the crew compartment. The Conductor is seated in her chair, east side of the crew compartment.

The work train is proceeding north from Main Track Station Chester, MP 386.1. The cab of Locomotive 50 is forward in the movement north. The Engineer is seated at the controls of the locomotive on the east side of the crew compartment. The Conductor is seated at his seat on the west side of the crew compartment.

The work train Engineer expected the passenger train to be at MP 366 and started feathering the independent brake at MP 369. He placed the independent brake in full as soon as he saw the passenger train.

Moments before the collision event recorder data shows the independent air brakes of the locomotive AM 50 were fully applied approximately 230 feet prior to striking the excursion train. Due to the speed of AM 50 (Recorded 25 mph), the collision derailed the lead trucks of both locomotives. Also as a result of the collision, the 4 passenger cars, uncoupled, separated from Locomotive AM 68, and rolled approximately 67 feet south, until the passenger car air brake system stopped the movement.

Method of Operations

At the accident site, trains are governed and authorized by track warrants, issued by AM's Train Dispatcher located in Springdale. The collision occurred at MP 368.25. The railroad at this location is single main track with sidings, rail car set-outs and pick-ups in route. Trains operate in both directions on the single main track. The authorized Timetable speed for trains operating on this part of the main track is 35 mph. Operating Rules governing employees on AM are the General Code of Operating Rules (GCOR), Sixth Edition, effective April 7, 2010. Also, governing train movements on AM is Timetable Number 7, effective April 5, 2009. Track Bulletins initially in effect the morning of October 16 were Numbers 255 and 257.

Both train crews involved in the collision were governed by track warrants, track bulletins, GCOR, and AM's Timetable.

AM's Timetable indicates the main track runs north and south. Unique to AM is the following terminology, "Milepost 380 plus 15." The "plus 15" location indicates the number of telegraph poles past a certain milepost. Previous history on AM indicates there would be 40 telegraph poles between each milepost. This terminology is used in the track warrants and in some radio communications between AM employees.

The railroad timetable direction for the striking train is north. The geographic direction was north. Timetable

The railroad timetable direction for the striking train is north. The geographic direction was north. Timetable direction is used throughout this report.

Central Daylight Time (CDT) is used throughout this report as well.

Analysis and Conclusions

Analysis - Post accident Toxicological Tests:

This head-on collision qualified as a passenger train accident, meeting FRA's monetary reporting threshold for damages with a 45 injuries to passengers and crews. The members of both train crews were post-accident toxicologically tested under Federal authority.

Conclusion:

FRA's Post-Accident Forensic Toxicology Result Reports indicate that the four employees tested had negative test results. Impairment was not a factor.

Analysis - Fatigue:

FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to blood alcohol content (BAC) 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 both locomotive engineers and conductors involved in this derailment.

Conclusions:

FRA concluded fatigue was neither probable for the Locomotive Engineer nor the Conductor.

Analysis – Cell Phone Use:

Cell phone data

The cell phones that were used for operational purposes during the accident trip were obtained, and their call histories during their on-duty times were recorded. Below are some noteworthy cellphone communications that occurred prior to the accident:

Time	Communication	Duration
9:18 a.m.	Passenger Train Engineer to Track Supervisor for	51 seconds
9:27 a.m.	Passenger Train Engineer to Locomotive Mechanic for	26 seconds
9:35 a.m.	Passenger Train Engineer to Track Supervisor for	45 seconds
9:39 a.m.	Passenger Train Engineer to Train Dispatcher for	60 seconds
9:43 a.m.	Passenger Train Engineer to work train Engineer for	60 seconds
9:49 a.m.	Work Train Conductor to Train Dispatcher for	84 seconds
9:56 a.m.	Work Train Conductor to Train Dispatcher for	150 seconds
10:01 a.m.	Passenger Train Engineer to Mark Marching for	25 seconds
10:03 a.m.	Passenger Train Engineer to work train Engineer for	50 seconds
10:09 a.m.	Passenger Train Engineer to Train Dispatcher for	54 seconds
10:09 a.m. and 10:15 a.m.	Passenger Train Engineer tries to reach work train Engineer	Both 2 seconds calls (likely unanswered)

Conclusion:

Although personal and railroad provided cell phones were used on the day of the collision, there is no evidence that personal or railroad provided cell phones were used on a moving train or any other circumstances where prohibited by FRA regulations. Use of cell phones was not a factor to the accident.

Analysis - Post Accident Train Air Brake, Locomotive and Rail Car Inspections:

Railroad Equipment Involved in the Collision

The locomotive on the northbound movement was AM 50. This is an ALCO four-axle, 2,000 horsepower (1,491 kW) diesel-electric locomotive of the road switcher type, built in 1963.

The lead locomotive on the southbound Passenger Train was the Locomotive AM 68. This is an ALCO four-axle, 2,000 horsepower (1,491 kW), diesel-electric locomotive of the road switcher type, built in 1964. The Passenger Train coach cars consisted of Car Numbers 106, 109, 108, and 105. Passenger Coach Cars 105 and 106 were manufactured by Harlan and Hollingsworth (Bethlehem Steel) in 1927 and Coach Cars 108 and 109 were manufactured by the Budd Company in 1948 and 1950 respectively. Both 105 and 106 have seating for 72 passengers and Cars 108 and 109 have a capacity for 56 passengers.

Pre-Departure Inspections

On the morning of October 16, 2014, the lead locomotive of the Passenger Train received its daily inspection at 5:10 a.m. FRA's Class 1 air brake test was completed the same day at 7:30 a.m. The records obtained did not include identifying information about the train such as train ID, or locomotive number. The Conductor provided the paperwork and stated this was the record of test.

Pre-departure brake test and daily inspection records were requested for locomotive AM 50. AM railroad was not able to provide a record of test for either FRA's Class 1 air brake test or the daily inspection. The last daily record of inspection located was dated October 14, 2014.

Equipment Post-Accident Inspections

Passenger Cars

On October 18, 2014, investigators requested and observed an FRA Class 1 air brake test and a mechanical inspection of the four passenger cars from southbound excursion train. The brakes on all cars applied and released as designed except for Car 105. The brake rigging on the number three axle was damaged and the brakes on that axle did not apply. See figure 1.

The coupler assembly on car 106 was observed to have been longitudinally loaded and pushed into its draft pocket about 3 feet. The coupler was bent in the downward direction about 18 inches. Fresh marks were observed on the upper portion of the knuckle assembly that was consistent with the coupler hook of Locomotive AM 68 overriding the top of the coupler of Car 106. See figures 2 and 3.

Locomotive AM 68

The R-end of the locomotive from the Passenger Train, AM 68, was struck head-on and damage was primarily constrained to the rear plate, end sill and the rear truck assembly. See figures 4 and 5. On October 18, 2014, Locomotive AM 68 was examined at AM's railroad maintenance facility in Springdale. The brake system was damaged and was not evaluated. Investigators tested the radio on Locomotive AM 68, no exceptions were noted.

This locomotive is equipped with an automatic sanding system to assist with traction during periods of reduced adhesion. The sanders are located on the front axle (axle Number 1) and the rear axle (axle Number 4) of the locomotive. When a wheel slip occurs, the sanders will drop sand in front of the leading wheels, depending on which end of the locomotive is leading. See figure 6.

Forward or reverse sanding is controlled by electrical connections from the forward or reverse position of the reverser which controls the operation of the desired magnet valve. Actuating air from these magnet valves control the flow of main reservoir air through the sander control valves to the forward or reverse sand traps. The emergency sanding switch, if used with electro-pneumatic sanding, actuates all magnet valves regardless of reverser position.

Investigators tested the sanding system of Locomotive AM 68. The system on number one axle operated as designed. The system on axle number four, which was the lead axle during the Passenger Train trip on the day of the accident, did not function. Investigators troubleshooted the system isolating the problem to a magnet valve for axle number four. Voltage was checked using a voltage meter and 67 VDC was measured (the system is designed for 72 VDC). The valve portion was determined to be defective (possibly due to collision damage). See figure 7.

The valve was replaced and the system was retested, the system worked as designed. The sand flow was qualitatively assessed for all four wheels. Investigators found the amount of distributed sand varied for each wheel from moderate to very light.

Investigators selected three locomotives from AM's railroad fleet in an effort to understand and assess the reliability of their locomotive sanding systems on the ALCO units. The following AM locomotives were evaluated in Springdale Yard: AM 34, 52, and 54. Investigators found that each locomotive sanding system was only partially operational. All had some exception that prevented proper operation. AM stated that these 3 units had not been serviced and released for operation.

On October 20, 2014, representatives from the mechanical group (the NTSB, FRA, and AM) contacted the operating Engineer from the excursion train by phone. The Engineer was asked about the operation of his system on the day of the accident. He stated that during his trip he began to experience reduced adhesion as he was entering the West Fork area of the Main Track. He reported the sanders came on (automatically) and he backed the throttle off. He again experienced reduced adhesion, the sanders came on and he backed off the throttle. He reported this occurred once again between MP 367–MP 368. At MP 368, he noticed the rail was black, covered with the crushed leafy organic material often present during the autumn. This condition, described as black rail, created a severe reduction in adhesion. When he came to a stop, he stepped off the locomotive to inspect the sanding system on axle number four, the leading axle during his trip. He reported that he heard air, but sand was not flowing from the nozzles.

Locomotive AM 50

The F-end of the northbound locomotive, AM 50, struck head on and damage was primarily constrained to the end sill and front plate. See figure 8. On October 18, 2014, locomotive AM 50 was examined at AM's maintenance facility in Springdale Yard. The brake system was leaking air at the manifold area under the brake control valve in the engineer's cab. Investigators determined the damage was a result of the collision. See figure 9.

The system was examined by qualified mechanics and efforts to correct the leaks were made on October 20, 2014. After the corrections the locomotive was given an FRA Class 1 air break test. The brakes set and released with no exceptions but, the locomotive failed the leakage test.

The wheels from AM 50 were examined and investigators observed fresh marks on all wheels consistent with wheel recent lock up. See figure 10.

This locomotive was also equipped with an automatic sanding system to assist with traction. Investigators inspected the system and found that axle number one, the leading axle during the northbound rescue move, was cut out. In this condition the system will not function. Once the system was restored, the sanders worked as designed. Investigators found the amount of distributed sand varied for each wheel from moderate to very light. Investigators tested the radio on AM 50, no exceptions were noted.

Accident Car Interiors

Passengers from the passenger train were located in the rear two cars. AM 108, the third car in the train consist was originally a Western Pacific rail coach dome car. The seating in the dome area has a capacity for 24 passengers. The seating area consisted of fore and aft oriented bench style back to back wooden padded booth seats and tables. See figures 11 and 12.

The seating remained intact but several benches were detached from their anchors at the point of attachment. The attachment system consisted of small angled steel brackets and small diameter wood screws. Several tables separated from their mounting brackets during the collision.

Other passengers were seated in the lower level of the car. The seating in this area consisted of various types of lounge chairs that were not affixed to the floor and tables that were cantilevered off of the side wall of the car. Several table tops separated from the side wall of the car as a result of the collision. See figure 13.

According to the show conductors, there were 23 passengers and one show conductor on this car at the time of derailment.

AM 106, the last car in the excursion train was carrying 13 passengers according to the show conductors. AM 106 was manufactured by Harlan and Hollingsworth (Bethlehem Steel) in 1927 and has seating for 72 passengers. The

was manufactured by Harlan and Hollingsworth (Bethlehem Steel) in 1927 and has seating for 72 passengers. The seats are fore and aft oriented steel framed plush velvet bench style seats anchored to the floor with steel fixtures. The seat backs are designed to be repositioned in a way that permits reorientation of the seating direction. The seat backs on several seats were moved as a result of the impact forces. Some seat bottoms were partially separated from the seat frame. See figures 14 and 15.

Conclusion:

The post-accident inspection of the locomotives allowed us to observe the locomotive's sanding equipment on both locomotives to be either inoperable or not fully functioning as intended. There are three recommendations for violations submitted to FRA's Office of Chief Counsel due to supporting evidence that AM Railroad currently has a problem with the operation of their locomotives sanding equipment. There were no noted defects on the passenger equipment. Investigators randomly selected three locomotives from AM's railroad fleet in an effort to understand and assess the reliability of their locomotive sanding systems on the ALCO units. The following AM locomotives were evaluated: 34, 52 and 54. Investigators found that each locomotive sanding system was only partially operational. All had some exception that prevented proper operation.

At the time of this report, investigators were able to track down the Class 1 air brake certificate for the passenger train, which was non-compliant for not being completely filled out as it was missing the train ID. There is still no record of any air brake test performed on Locomotive AM 50 the morning of October 16.

Also, On October 20, 2014, investigators contacted the operating Engineer from the passenger train by phone. The Engineer was asked about the operation of his system on the day of the accident. He stated that during his trip he began to experience reduced adhesion as he was entering the West Fork subdivision. He reported the sanders came on (automatically) and he backed the throttle off. He again experienced reduced adhesion, the sanders came on and he backed off the throttle. He reported this occurred once again between MP 367–MP 368. At MP 368, he noticed the rail was black, covered with the crushed leafy organic material often present during the autumn. This condition, described as black rail, creates a severe reduction in adhesion. When he came to a stop, he stepped off the locomotive to inspect the sanding system on axle number four, the leading axle during his trip. He reported that he heard air, but sand was not flowing from the nozzles.

AM Railroad officials will ensure that the sanders on all locomotives function as intended. Also, AM officials have agreed to increase the number of audits they perform concerning sander operations at all locations.

Analysis - Engineer and Conductor Certificate and Training:

Locomotive Engineer and Conductor certificates, hearing and vision testing, driver license checks, knowledge testing, and other required training events were neither current nor in compliance with 49 CFR Part 240 and Part 242. In regards to the current certificates, the Engineer of the passenger train was missing his knowledge testing requirements, Section 240.125; the Conductor of the passenger train was missing her Motor Vehicle Operations Safety check, § 242.111 and the previous experience requirements of § 242.113; the Engineer of the work train was missing his knowledge testing requirements, § 240.125; and the Conductor of the work train was missing the requirements of an unannounced efficiency test compliant with § 242.123.

Conclusion:

Engineer and Conductor training, records checks and unannounced efficiency test were not current. The lack of managerial oversight, current rules and knowledge training were factors that contributed to the collision.

Analysis - Locomotive Engineer and Conductor Operating Performance:

The event recorder from AM 50 was downloaded by the National Transportation Safety Board (NTSB). The NTSB has neither released any data nor made any determination about the event recorder. FRA and AM's railroad management performed a cursory review of the data and determined that AM 50 was traveling at 25 mph just prior to impact. The crew of AM 50 operated at 30 mph from Chester to the collision location, from the time they departed the wash out location to impact.

The Engineer of AM 50 appeared to be "Feathering of independent brake" 10 to 40 pounds coming down the hill prior to the collision location. There was an Engineer Induced Emergency application of automatic brake after impact.

Conclusion:

Conclusion:

Per GCOR Rule 15.4, the crew of AM 50 should have been operating at Restricted Speed during their travel on Out of Service Track Limits. This inaction was a primary contributor to the collision.

Analysis – AM Operating Rules and Efficiency Testing Data for the Train Crews and dispatcher involved in the Collision January 2014 – October 2014:

AM Operational Rules and Efficiency Testing data for the passenger train and work train crews indicated that AM's supervisors performed numerous relevant tests on the train crews. Specifically Efficiency Test observations for compliance with Main Track Authority, Speed Restrictions, Air Brake Tests and Radio Communications were performed on the train crews numerous times in the previous ten months.

Efficiency Test performance on the Train Dispatcher was non-existent. There were no Efficiency Tests performed in the previous twelve months.

Conclusion:

Although numerous rules compliance Observations were made it is apparent that the Engineer and Conductor from AM 50 were unclear of the speed restrictions associated with the track warrant Authority, per Rule 15.4. FRA recommends refresher training to all operating train crews as to the compliance with Rule 15.4 and Restricted Speed. FRA recommends that AM require a specific number of Efficiency Rules test performed on the Train Dispatcher.

Analysis – Track condition, Inspection and Programs:

Track Description

This portion of AM was previously owned by Frisco Railroad and consists of single main track. AM inspects and maintains this track to FRA Track Safety Standards (TSS) for Class 3 track, which allows for a maximum operating speed of 40 mph for freight trains and 60 mph for passenger trains. AM does operate seasonal (April –December) Excursion Passenger Trains between Fort Smith, Arkansas, and Springdale.

The derailment occurred at MP 368.25, in a right hand curve with a curvature of 4 degrees 6 minutes, having an elevation 1.6 inches. The length of spiral was approximately 589'.179"; the body of the curve had a length of 185 feet and 225 inches. The track in the area is short segments of left- and right-hand curves with short segments of tangent track between them. The track mileposts numbering increases in the northward direction, and the track is geographically aligned in a north and south direction.

A total of two trains operate daily over MP 368.25. According to AM documentation, the 2013 total annual gross tonnage was estimated at 2 million gross tons for the calendar year.

The grade at MP 368.25 is 1.00 percent and gradually rolls to 0.25 percent extending north to MP 366.00. Extending south from 368.25, the grade gradually rolls 1.14 percent to MP 372.

The track is constructed with 115-pound continuous welded rails (CWR). The manufacture labeling on the rail was Tennessee, February 1949, RE, CC, and was installed 1984. The spiking pattern was 4 rail holding spikes. The tie plates measured 13 inches by 8 inches. The CWR was box anchored at every other tie location with "channel" type rail anchors. The tie spacing was 19 1/2-inches on center. The ballast was predominately mixed granite at a depth of greater than 16-inches. The hardwood crossties were found to be in good shape extending north and south beyond the point of derailment (POD). According to information provided by AM, the ties were installed during 2012.

FRA inspections revealed that the track inspection records were not current in the months previous to the collision. AM's Track Inspector remarked of the lack of time given to AM's Track Inspectors to perform their required track inspections.

Conclusion:

FRA suggested AM dedicate more time and assets to perform the required track inspections and maintenance on the main track.

Analysis - Recent FRA Inspection Activity:

FRA conducted numerous inspections prior to this collision and one multi-discipline audits after this accident. The inspections results were due to the records presented by AM's management. Inspection activity did not include the operating crews working for the MOW Department of AM.

Conclusion:

It is incumbent on AM's management to present all records pertaining to an inspection to FRA for review. In this way, FRA can be assured that all operating train crew members and AM are compliant with Federal regulations.

After this collision FRA conducted one Multi-Discipline audit in December 2014. A total of 100 violations were noted during these audits. Particularly noted during the audit for the: Operating Practices Discipline; 104 units inspected with 46 defects and 7 violations noted, for a defect ration of 50.96 percent, a very high defect ratio. Violations included one § 219.502, Conditions for pre-employment alcohol testing not consistent; one for § 225.25, Record keeping; one for § 228.11, Failure to include required information in HOS record; one for § 240.207, Implementation of the certification process; one for HSL 21105B1, Dispatching Employee on Duty More Than Allowed; two for HSL 21103A2 Train Service Employee on Duty More Than Allowed.

Track discipline results were 17 defects and 12 violations in 60 units inspected, for a defect ratio of 48.33 percent, a very high defect ratio. There were 12 violations for § 213.241 Failure to conduct required track inspections July – October 2014. FRA recommends that AM dedicate more time and assets to perform the required track inspections and maintenance on the main track.

Mechanical Discipline results were 179 units inspected with 20 defects noted, for a defect ration of 11.175 percent.

Hazardous Materials Discipline results were 2 defects in 15 units inspected, for a defect ratio of 13.33 percent.

Damages Estimate

AM engineering personnel conveyed that the initial damage estimates for engineering damages were \$2,500.00. This figure included costs for the replacement of a 39-foot section of rail. Equipment damage has been estimated at \$325,000.

Overall Conclusion:

Based on the observation of the two AM locomotives, northbound AM 50 and southbound Locomotive AM 68, the position of the four passenger coaches, and the injuries suffered by the passengers and crew, FRA can ascertain the following chain of events occurred immediately prior to the collision.

On October 16, 2014, passenger train with Locomotive AM 68 was issued TWC Warrant SS 168 at 7:56 a.m. from Yard Limit MP 346.4 to Chester MP 386. It included a TWC Warrant Box 17 marked to include "Other Specific Instructions – mainline out of service (OOS) MP 374 to MP 387 per Track Supervisor." Initially the MOW employees were scheduled to work in the OOS track noted in Block 17 of Track Warrant SS 168.

At MP 368, the passenger train stalls. At this location, the rail was black, covered with the crushed leafy organic material often present during the autumn. This condition, described as black rail, creates a severe reduction in adhesion. In addition the sanders for Locomotive AM 68 failed to function as intended. The passenger train Engineer tells Dispatcher the location of the passenger train is approximately between MP 366 to MP 368.

The passenger train Engineer communicated first, with the MOW supervisor, locomotive maintenance employees, and then the work train Engineer, and discussed the stall and assist prior to the Dispatcher successfully contacting the passenger train. The Train Dispatcher learns of the plan to use the work train Locomotive at Chester from the work train Conductor, a MOW Employee, who is a certified Engineer and Conductor, working on MOW work gang at Chester. The Train Dispatcher encounters various degrees of radio interference and utilizes Dispatching Office Land Line to communicate with the work train Conductor.

The Train Dispatcher, after communicating with the work train Conductor, decided to issue a 2nd Form-D authorizing a move for the work train from MP 374 to north end reported limits of passenger train, MP 366. Although there is no prohibition to leaving an active track warrant and taking the track out of service, there is no GCOR rule to authorize this move through a Track Bulleting Form-D.

GCOR rule to authorize this move through a Track Bulleting Form-D.

There is no reference of a Form-D in GCOR and there is a misunderstanding of the requirements of Main Track moves between the Train Dispatcher and the work train crew. In accordance with GCOR Rule 6.3, Main Track Authorization, trains cannot occupy main tracks unless authorized by one of the following, to include Rule 6.14 (Restricted Limits), Rule 14.1 (Authority to Enter TWC Limits) and Rule 15.4 (Protection When Tracks Removed from Service).

The Train Dispatcher understood that she was issuing authority in accordance with GCOR Rule 14.1, Authority to Enter TWC Limits, where designated by the timetable, a track warrant will authorize main track use under the direction of the train dispatcher or as prescribed by Rule 6.13 (Yard Limits) or Rule 6.14 (Restricted Limits). The track warrant instructions must be followed where yard limits or restricted limits are in effect.

The work train crew understood that it had protection and authorization per GCOR Rule 15.4 Protection When Tracks Removed from Service; before a track is removed from service it must be protected. A track bulletin may protect tracks removed from service by designating the track and naming the points at each end of the track. Trains must not use this track, unless the track bulletin states the name or title of an employee who may authorize use and this person directs all movement. Movements must be made at restricted speed.

At issue as stated above is AM Operates using GCOR, TWC, and track warrants – per the current AM Timetable. No employee is certain where AM's abbreviated version of Form-D originated. The Form-D System is a product of the NORAC Operating Rules. (This Form-D and Engineer of AM 50's understanding of his movement authority is related to the Form-D of the Northeast Operating Rules Advisory Committee (NORAC) Operating Rules – Not GCOR. This is an unauthorized movement authority for a railroad that operates per the GCOR Operating Rules).

The work train crew decided running at restrictive speed from MP 374 to MP 368 would be less “expedient” and therefore elected to use the misunderstood Form-D authority for movement at which they thought they could move at Track speed. Further evidence the exact meaning and application of Form-D's was not universally understood.

There is no mention or explanation of Form-D issuance or use in any Transportation, Dispatching, or MOW Operational Rules. When questioning various employees on their understanding of what speed is required under a Form-D, the answer varies from Restricted to Track Speed. The Work Train's Engineer's summary of interview reflects his understanding he could operate at Track Speed, 35 mph.

Another issue is the Dispatcher on duty has always associated the use of the Form-D Bulletin with GCOR Rule 15.4, Protection When Tracks is Removed From Service. The current version of AM's Dispatcher's Rules (Page 13, Rule 22.12 B Item 3 – gives examples of wording to be used when removing track from service.) The wording clearly shows when removing tracks from service – the words, “BE GOVERNED BY GCOR Rule 15.4”) AM's Dispatching Office creates such forms from a separate computer using Excel. Over Time – the required wording, (BE GOVERNED BY GCOR RULE 15.4) as prescribed in the Dispatcher's Rules, has been dropped from the Form-D. In the job briefing required, the Dispatcher did not use the words restricted speed at any time – per her discussion with me. The Dispatcher assumed the work train crew had the same understanding of the Form-D Bulletin as she did.

The work train crew operated the lite power at track speed and impacted the passenger train at MP 368.2. There is no training or instruction or testing on Form-D issuance or application.

Form-D use (in any form) has been revoked form AM's Dispatchers'. Track Warrants will be used exclusively.

Probable Cause and Contributing Factors

The probable cause of the accident was AM 50 work train crew's excessive speed, (H606) Train outside yard limits in non-block territory, traveling at excessive speed, due to their non-compliance with (H404) track warrant. This excessive speed was due to the failure of the crew to comply with Restrictive Speed per GCOR, Rule 15.4 Protection when Tracks Removed from Service.

There are several contributing factors (H999) Other train operation/human factors)) that AM's MOW Department was in control of the training, testing, and oversight of its own train crews. Specifically, contributing factors to this accident is:

1. The failure of AM's Operational Testing Program to provide compliant Operating Rules compliance oversight of its Operating employees assigned to the MOW Department.

its Operating employees assigned to the MOW Department.

2. The failure of AM's senior management to provide its supervisors and employees, Operating, Track and Mechanical, with enough assets to perform their duties compliant with the Federal regulations and railroad operating and safety rules.