Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2016-1143

Amtrak (ATK)
West Palm Beach, FL
July 6, 2016

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

An Amtrak passenger train, P098-06, traveling on South Florida Regional Transit Authority/Tri-Rail (SFRV) Main Track No. 2, in traffic control system territory, collided with a motor vehicle at a highway-rail grade crossing on July 6, 2016, at 10:00 a.m., EDT. The accident occurred in West Palm Beach, Florida, at Milepost SX 968.2 on the South Florida Rail Corridor Subdivision. The motor vehicle driver was seriously injured. The motor vehicle was completely destroyed. There were no injuries to the train crew or passengers.

The U.S. DOT Crossing Number is 628116P. It was equipped with four quadrant gates, flashing lights, and bells, as well as two cantilever structures for over-lane lighting, as this is a designated Quiet Zone. The track and crossing warning systems are maintained by VTMI, a signal contractor for SFRV. VTMI is a railroad infrastructure and maintenance company and a subsidiary of Transdev North America.

The leading locomotive sustained damages totaling $16,305, and there was no derailment. At the time of the accident, it was daylight and clear, with a southeast wind of approximately 9 mph. The temperature was 90 °F.

FRA determines that the probable cause of the accident was the malfunction, improper operation of the train-activated warning devices (FRA cause code M307). The contributing cause code is the failure of the VTMI signal inspector to provide for the safety of train movement and highway users prior to disabling the highway-rail grade crossing warning system at the 25th Street crossing (FRA cause code H994).

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2016-1143

TRAIN SUMMARY

1. Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Amtrak (National Railroad Passenger Corporation)	ATK	143215

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
South Florida Regional Transit Authority	SFRV	070616_

2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
628116P	7/6/2016	10:00 AM

5. Type of Accident/Incident
Hwy-Rail Crossing

6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated	10. Subdivision
0	0	0	0	South Florida Rail Corridor

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
West Palm Beach	SX968.2	FL	PALM BEACH

15. Temperature (F)	16. Visibility	17. Weather	18. Type of Track
90 ˚F	Day	Clear	Main

19. Track Name/Number	20. FRA Track Class	21. Annual Track Density *(gross tons in millions)*	22. Time Table Direction
Main Track 2	Freight Trains-40, Passenger Trains-60	12	North

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OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Passenger Train-Pulling	Yes	P09806

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross exluding 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
50 MPH	R			0

6. Type of Territory

Signalization:
Signaled

Method of Operation/Authority for Movement:
Signal Indication

Supplemental/Adjunct Codes:
Q

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.)*	ATK 146	1	no		0	0
(2) Causing *(if mechanical, cause reported)*	0	0	no	9. Was this consist transporting passengers?		Yes

10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End e. Remote	11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	2	0	0	0	0	(1) Total in Equipment Consist	0	11	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	0	0	0	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
16305	0

14. Primary Cause Code
M307 - Malfunction, improper operation of train activated warning devices

15. Contributing Cause Code
H994 - Human Factor - Signal installation or maintenance error (field)

Number of Crew Members				Length of Time on Duty	
16. Engineers/Operators	17. Firemen	18. Conductors	19. Brakemen	20. Engineer/Operator	21. Conductor
2	0	2	0	Hrs: 2 Mins: 50	Hrs: 2 Mins: 50

Casualties to:	22. Railroad Employees	23. Train Passengers	24. Others	25. EOT Device?	26. Was EOT Device Properly Armed?
				No	N/A
Fatal	0	0	0	27. Caboose Occupied by Crew?	
Nonfatal	0	0	1		N/A

28. Latitude	29. Longitude
26.736631000	-80.064581000

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CROSSING INFORMATION

Highway User Involved		Rail Equipment Involved
1. Type: Auto		5. Equipment: Train (Units Pulling)
2. Vehicle Speed *(est. mph at impact)*: 30	3. Direction *(geographical)*: West	6. Position of Car Unit in Train: 1
4. Position of Involved Highway User: Moved over Crossing		7. Circumstance: Rail Equipment Struck Highway User
8a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials?: N/A		8b. Was there a hazardous materials release by: N/A

8c. State here the name and quantity of the hazardous material released, if any.
No hazardous materials involved. Passenger train collided with motor vehicle.

9. Type of Crossing	10. Signaled Crossing Warning	11. Roadway Conditions
1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other *(spec. in narr.)* 3. Standard FLS 6. Audible 9. Watchman 12. None 7, 6, 1, 2, 3		Dry

12. Location of Warning	13. Crossing Warning Interconnected with Highway Signals	14. Crossing Illuminated by Street Lights or Special Lights
Both Sides	No	No

15. Highway User's Age	16. Highway User's Gender	17. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train	18. Highway User
24	Female	N/A	N/A

19. Driver Passed Standing Highway Vehicle	20. View of Track Obscured by *(primary obstruction)*
Yes	Highway Vehicle

Casualties to:	Killed	Injured	21. Driver was	22. Was Driver in the Vehicle?
			Injured	Yes
23. Highway-Rail Crossing Users	0	1	24. Highway Vehicle Property Damage *(est. dollar damage)*: 10000	25. Total Number of Vehicle Occupants *(including driver)*: 1

26. Locomotive Auxiliary Lights?	27. Locomotive Auxiliary Lights Operational?
Yes	Yes
28. Locomotive Headlight Illuminated?	29. Locomotive Audible Warning Sounded?
Yes	Yes

10. Signaled Crossing Warning

1 - Provided minimum 20-second warning
2 - Alleged warning time greater than 60 seconds
3 - Alleged warning time less than 20 seconds
4 - Alleged no warning
5 - Confirmed warning time greater than 60 seconds
6 - Confirmed warning time less than 20 seconds
7 - Confirmed no warning
N/A - N/A

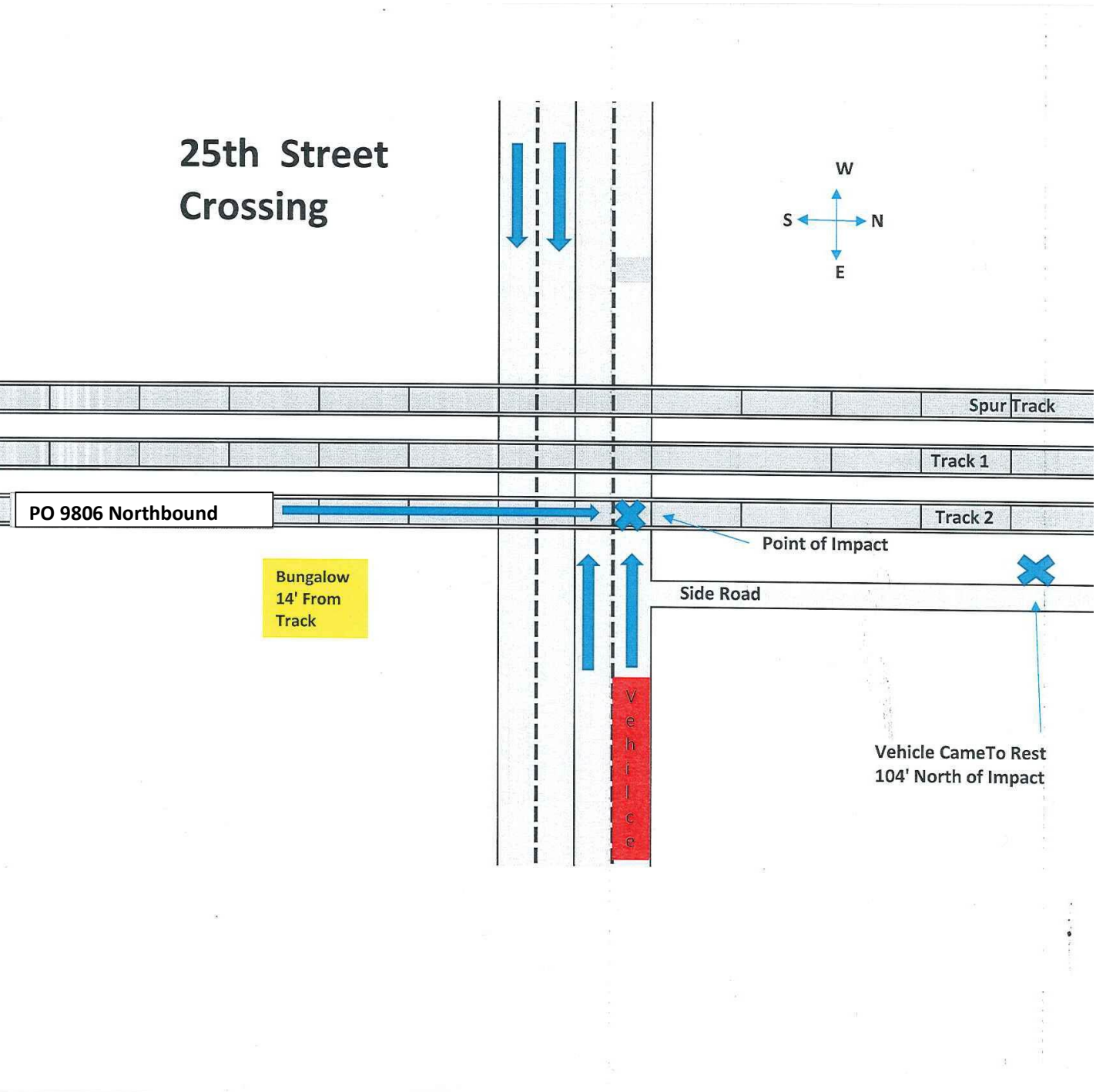
Explanation Code

A - Insulated rail vehicle
B - Storm/lightning damage
C - Vandalism
D - No power/batteries dead
E - Devices down for repair
F - Devices out of service
G - Warning time greater than 60 seconds attributed to accident-involved train stopping short of the crossing, but within track circuit limits, while warning devices remain continuously active with no other in-motion train present
H - Warning time greater than 60 seconds attributed to track circuit failure (e.g., insulated rail joint or rail bonding failure, track or ballast fouled)
J - Warning time greater than 60 seconds attributed to other train/equipment within track circuit limits
K - Warning time less than 20 seconds attributed to signals timing out before train's arrival at the crossing/island circuit
L - Warning time less than 20 seconds attributed to train operating counter to track circuit design direction
M - Warning time less than 20 seconds attributed to train speed in excess of track circuit's design speed
N - Warning time less than 20 seconds attributed to signal system's failure to detect train approach
O - Warning time less than 20 seconds attributed to violation of special train operating instructions
P - No warning attributed to signal systems failure to detect the train
R - Other cause(s). Explain in Narrative Description

SKETCHES

Site sketch

HQ-2016-1143



NARRATIVE

Circumstances Prior to the Accident

The Amtrak (ATK) crew of Train P098-06 included a locomotive engineer, an assistant locomotive engineer, a conductor and an assistant conductor. They first went on duty at 7:10 a.m., EDT, July 6, 2016, at the Amtrak Miami Station in Miami, Florida. This was the away-from-home terminal for all crew members, and all received more than the statutory off-duty period prior to reporting for duty.

Their assigned passenger train consisted of 2 locomotives and 11 passenger cars of several varieties. The train originates in Miami with a final destination of Penn Station, New York, New York. Amtrak mechanical employees performed all required pre-departure inspections and air brake tests prior to departure. The train crew boarded the train at Amtrak Miami Station and departed on schedule at 8:10 a.m.

Train P098-06's last scheduled station stop prior to the accident was West Palm Beach, Florida. Train P098- 06 made four station stops before stopping at West Palm Beach station at approximately 9:45 a.m. The train proceeded northbound at authorized track speed from West Palm Beach to the accident location.

As the train approached the accident area, the Locomotive Engineer was seated at the controls on the east side of the lead locomotive and the Assistant Engineer was seated on the west side. The conductor, assistant conductor and train service employees were located throughout the train.

Approaching the accident site, there is a 1-degree, right-hand curve and a 0.12-percent descending grade. Movements on Main Track No. 1 and Main Track No. 2 through this area are governed by a traffic control system, controlled by the South Florida Regional Transit Authority (SFRV) Dispatcher located in Pompano, Florida, with a maximum authorized speed of 55 mph for all trains. The railroad timetable direction of the train was north and geographic direction was north. Timetable directions are used throughout this report.

The 25th Street, U.S. DOT Crossing Number 628116P, is part of an approved quiet zone, located in West Palm Beach, Milepost SX 968.2 on SFRV. Traffic moves across this four-lane undivided road in an east and west direction with a posted speed limit of 30 mph. There are three tracks that traverse 25th Street; Main Track No. 1, Main Track No. 2, and an industry track. The road is constructed of asphalt, with a concrete panel where it crosses over Main Track No. 2 and asphalt and rubber panels where it crosses over Main Track No. 1 and the industrial track.

A VTMI Signal Inspector was testing relays at 25th Street, that affect the proper function of the warning system, just prior to the accident.

The Accident

Train P098-06 was operating on Main Track No. 2 in a northbound direction. The maximum authorized track speed on Main Track No. 2 at this location is 55 mph. The 25th Street highway-rail grade crossing is an established quiet zone eliminating the requirement to use the locomotive horn except in an emergency situation. As Amtrak P098-06 approached the 25th Street highway-rail grade crossing the Locomotive Engineer noticed several highway vehicles passing over the crossing. He realized that the east crossing gate was still in the upright position and no crossing lights were activated. The Locomotive

Engineer immediately applied the brakes on the train. As the train began to slow, the Locomotive Engineer observed a westbound vehicle in the right lane of the two westbound traffic lanes pull onto the 25th Street crossing and partially foul Main Track No. 2. He immediately made a train emergency air brake application and sounded the horn on the lead locomotive.

The lead locomotive of Train P098-06 struck the highway vehicle on the driver's side at about 10:00 a.m., at a recorded speed of 50 mph. The train shoved the vehicle approximately 100 feet north of the crossing on Main Track No. 2 until it was pushed off the track to the east. The occupant was seriously injured and transported to the local hospital. The train came to a stop approximately 710 feet beyond the crossing. The Locomotive Engineer transmitted an emergency radio call to trains in the area, and gave immediate notification of the crash to SFRV's Train Dispatcher.

The Investigation

25th St. Highway grade crossing warning system

The highway-rail grade crossing at 25th Street utilizes four quadrant gates, 12-inch LED lights and a cantilever signal mast for each direction of travel. The cantilevers are equipped with one set of lights facing the traffic on the mast and two sets (one for each lane) on the cantilever. The crossing is also equipped with crossbucks, Emergency Notification System, and "3-tracks" signs. Stop bars are painted on the road along with posted "do not stop on track" signs.

The 8-by-8 steel control house is located at the southeast quadrant. The warning devices at this location; gates, lights and bells, are controlled by a Safetran model GCP-3000 D2 grade crossing predictor, which provides constant warning times. The location is also equipped with a North American Signal event recorder, which logs vital information about the warning systems operation. The northbound approach on Main Track No. 2, which utilizes a Down Stream Adjacent Crossing circuit is approximately 3,990 feet in length.

Post-Accident signal system examination and testing

The initial post-accident investigation discovered that a VTMI signal inspector was performing relay tests at 25th Street at the time of the accident.

Just prior to the accident, the VTMI signal inspector connected a relay tester onto the coils of the XR relay. As he continued testing the relay, northbound Amtrak P098-06 occupied the approach circuit for 25th Street. The GCP-3000 unit detected the presence of the train and removed relay voltage from the GCP output. The removal of relay voltage should have caused the XR relay to de-energize and the highway-rail grade crossing warning devices to activate. The highway-rail grade crossing warning devices, however, failed to activate since the relay tester being utilized by the VTMI signal inspector placed an external voltage on to the coil wires of the XR relay keeping it energized.

All information contained within the GCP-3000 was recorded, including the EZ/EX values, and the warning times from the last 10 trains including Amtrak P098-06. The Safetran model GCP-3000 D2 unit was found operating on the normal side and the standby side was fully functional. Shunt tests were performed on the Main Track No. 2 at 100-foot intervals and the termination shunts were removed in order to determine the detection circuit was working properly. Battery capacity and ground tests were performed on the highway rail-grade crossing. Trains were observed in both directions and on both tracks at track speed to verify warning times.

Absolute and intermediate signals were examined and all locations equipped with data logs were

downloaded. Signal aspects were verified and ground tests were performed. Post-Accident signal lamp voltage measurements were recorded. There were no defects noted during the inspection of the signal system or the associated signal appurtenances.

On July 9, 2016, an accident simulation was conducted using an Amtrak train dispatched to simulate the accident and to measure sight distances and warning times. Two simulations were performed. The first simulation measured sight distance from the locomotive to the crossing, warning system detection, and island detection. Sight distance from the locomotive to the crossing was a 1,082-foot point of visibility. The second simulation was performed at accident speed to obtain warning time, gate descent, light verification, and bell activation. No exceptions were taken with either simulation.

Analysis and Conclusions

Analysis-Highway-Rail Grade Crossing (Active Warning Devices): All tests, downloads, photographs, and documentation determined that the Grade Crossing Predictor worked as intended. At the time of the accident, the warning devices; gates, lights, and bells, were not operational due to the XR relay being falsely energized during testing. A download of the GCP3000 showed the unit detected Amtrak Train P09806 and would have provided 34 seconds of warning time.

Conclusion: All pertinent tests were performed and the results documented by a Federal Railroad Administration (FRA) Signal and Train Control (S&TC) Inspector. No exceptions were taken to the operation of the warning devices.

Analysis-Locomotive Safety Devices: The locomotive was equipped with a headlight, auxiliary lights, and the audible warning device required by Federal regulations. The Locomotive Engineer tested these devices at the accident site in the presence of police department and they functioned as intended. The locomotive was also equipped with a speed indicator and an event recorder, as required. The event recorder data from Amtrak 146 was reviewed by both Amtrak managers, National Transportation Safety Board and FRA. The event recorder showed the bell and horn were activated at the time of the accident.

Conclusion: The locomotive safety devices were in full compliance with Federal requirements and were not a factor in this accident.

Analysis-Train Inspection and Operation: Amtrak Train P098-06 received all required equipment inspections and tests by qualified maintenance personal at Hialeah Yard. The train crew performed all required operating inspections and tests after taking charge of the train at Miami Station prior to departure. Event recorder data from ATK 146 locomotive showed the Engineer operated the train from Miami to the accident site within authorized speed limits. Interviews of the locomotives engineers noted there were no mechanical issues with train handling or braking.

Conclusion: There were no conditions on the equipment or in the operation of Train P098-06 that would have contributed to or could have caused this accident.

Analysis-Toxicology Testing: FRA does not require such testing for this type of accident.

Conclusion: No tests were conducted on the train crew members or signal inspector. No toxicology tests were conducted on the driver of the highway vehicle.

Overall Conclusion

SFRV and Amtrak were in compliance with their own and all applicable Federal regulations. All train and locomotive inspections were completed as required. All locomotive safety devices functioned as intended. Based on crew interviews and the locomotive event recorder downloads, there were no

exceptions to the train's operation. The VTMI Signal Inspector interfered with the normal function of the highway-rail grade crossing system. VTMI failed to ensure proper procedures were followed when temporarily disabling or testing of in-service highway-rail grade crossing warning devices.

Probable Cause and Contributing Factors

FRA determined that the probable cause of the accident was the malfunction, improper operation of the train activated warning devices (FRA cause code M307). A contributing cause code is the failure of the VTMI signal inspector to provide for the safety of train movement and highway users prior to disabling the highway-rail grade crossing warning system at the 25th Street crossing (FRA cause code H994).