

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, DC 20594

June 15, 2018

Onboard Image Recorder

Specialist's Factual Report By Sean Payne

1. EVENT

Location: Cayce, South Carolina
Date: February 4, 2018
Train/Locomotive: Amtrak PO91, Locomotive AMTK47
Train/Locomotive: CSXT Train F777 03, Locomotive CSXT 130
Train/Locomotive: CSXT Train F777 03, Locomotive CSXT 36
Operator: Amtrak/CSX Transportation
NTSB Number: RRD18MR003
Summary: Refer to the Accident Summary Report, within this docket.

2. GROUP

A group was convened on May 8, 2018, at the NTSB's Vehicle Recorder Laboratory. The group consisted of the following members:

Group Chairman: Sean Payne
Mechanical Engineer
National Transportation Safety Board (NTSB)

Member: Dick Hipskind
Investigator-In-Charge
NTSB

Member: Gregory Drakulic
Investigator-In-Charge
Federal Railroad Administration (FRA)

Member: Matt Campbell
State Legislative Director
Sheet Metal Air Rail Transportation (SMART)

Member: Steve Ammons
Director – Train Handling Rules and Practices
CSX Transportation

Member: Carl Fields
Coordinator, Safety Task Force
Brotherhood of Locomotive Engineers and
Trainmen (BLET)

Member: Jonathan Hines
Senior Director Compliance and Certification
Amtrak

3. DETAILS OF INVESTIGATION

On February 9, 2018, the National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following image recording devices:

Recorder Manufacturer/Model: **Wabtec VideoTrax**
Recorder Serial Number: **KB0916A117**
Locomotive **AMTK47**

Recorder Manufacturer/Model: **GE Lococam**
Recorder Serial Number: **11436100**
Locomotive **CSXT130 (Lead Locomotive¹)**

Recorder Manufacturer/Model: **GE Lococam**
Recorder Serial Number: **11434066**
Locomotive **CSXT36 (Trailing Locomotive¹)**

¹ Lead locomotive refers to the camera that was mounted in the operator's cab and faced in the direction of forward travel of the locomotive or trainset. The trailing locomotive refers to a forward facing camera that looked rearward due to the orientation of locomotive consist.

3.1. Recorder Description

Wabtec VideoTrax

The Wabtec Track Image Recorder (TIR) system contains a forward facing video camera and microphone that record to an external hard drive. It records color video at a resolution of 704x480 pixels and 15 frames per second (fps). External audio is also recorded. Some versions will also record GPS position and speed.

GE Lococam

The GE Lococam On-Board Image recorder is a forward facing video camera that records to external storage. It records video at a resolution of 720x480 pixels and 15 frames per second (fps) in color with external audio. The system also captures limited parametric data, such as speed.

3.2. Recorder Damage

Wabtec VideoTrax – AMTK47

The image recorder from AMTK 47 was ejected from the locomotive. The orange outer chasis was dented and covered in mud. Figure 1 shows the outer casing with the side panel removed. The silver external hard disk enclosure is shown installed inside and undamaged. The external hard disk enclosure was removed and the device was read out normally via a PC using the manufacturer’s software and suggested procedures. The system did not record the impact but recorded many hours leading up to the accident.



Figure 1. The Wabtec VideoTrax recovered from AMTK47.

GE Lococam – CSX 130

Figure 2 shows the condition of the GE Lococam. The silver solid state hard drive was extracted from the unit and the device was read out via a PC using the manufacturer's software and suggested procedures. The device contained a number of short video files (.VAM) that the manufacturer's software uses to create a full length video of the accident. The system did not record the impact but recorded many hours leading up to the accident.



Figure 2. The Wabtec VideoTrax recovered from AMTK47.

GE Lococam – CSX 36

The silver solid state hard drive was extracted from the unit and the device was read out via a PC using the manufacturer's software and suggested procedures. The device contained a number of short video files (.VAM) that the manufacturer's software uses to create a full length video of the accident. The system recorded the accident. The unit is not pictured.

3.3. Timing and Correlation

The times used in this report are expressed as Local Time of the accident (EST). Timing information was correlated to the locomotive event recorder for each respective locomotive. Correlation of the locomotive event recording timing to an authoritative accident time is discussed in the time correlation section of the Locomotive Event Recorder – Specialist's Factual Report which can be accessed in the public docket for this accident.

Time correlation data for AMTK47 was adjusted to Amtrak TCD data from the time the train left Columbia Station, Columbia, South Carolina. Amtrak TCD data showed Amtrak 47 leaving Columbia station at 2:03:42 A.M. Eastern Standard Time (EST). The time correlation for AMTK47 is as follows:

AMTK47 VideoTrax Time – 28,788 seconds = EST

Time correlation data for CSXT130 was adjusted to match the final reversing move of the locomotive into Silica Storage track. The time correlation for CSXT130 is as follows:

CSXT130 Lococam Time – 17,996 seconds = EST

Time correlation data for CSXT36 was adjusted to match the final reversing move of the locomotive into Silica Storage track. The time correlation for CSXT36 is as follows:

CSXT36 Lococam Time – 17,991 seconds = EST

3.4. Summary of Recorded Contents

For references to specific speeds and other parametric data, refer to the Event Recorders – Specialist’s Factual Report which can be found in the public docket for this accident.

All times are presented in eastern standard time (EST).

3.4.1. Train PO91 - AMTK47 (Forward Facing)

Review of recorded material began at 01:57:44 on the day of the accident as the locomotive came to a stop at Columbia Station in Columbia, South Carolina. External audio from the station announcement at Columbia Station was recorded but not transcribed.

At 2:03:27 the train’s horn and bell were activated. By 02:03:42, the train began moving. The train’s auxiliary lights were pulsating and alternating.

The train continued forward (southbound direction), activating its horn at crossings.

At 02:07:15, the train’s headlights were dimmed while approaching a train stopped in the other direction (northbound) located in the Cayce Yard to the east of the main track.

At 02:07:44 the train passed the stopped northbound train.

At 02:07:45 the train’s headlights were restored to a bright setting.

At 02:09:18, the train stopped at Holdout (Milepost S362.5). The train’s headlights remained on a bright setting. The train stopped about three cars short of the signal.

There were no remarkable aspects of the video recording as the train was stopped at Holdout (Milepost S362.5).

At 02:20:52, the train's horn and bell were activated. At 02:21:12, the train began moving. The train's auxiliary lights were pulsating and alternating.

At 02:21:39, the train passed the signal at Holdout. The train continued moving southbound and by 02:22:27, the train passed the end of the stopped northbound train located in the Cayce Yard to the east of the main track (same train as noted at 02:07:15). Later, at 02:22:37, the train's headlight was dimmed.

At 02:22:53, the train continued southbound and passed the south end of Cayce Yard.

At 02:23:02, the locomotive's headlight was restored to a bright setting.

At 02:23:12, a sound similar to dynamic braking was heard. The train continued southbound and the train's horn was activated as it passed grade crossings.

At 02:24:09, sound ceased being recorded by the recorder. The recorder showed GPS coordinates of 33.9500 deg N, 81.0508 deg W. The GPS position is plotted as "SOUND" on figure 2 which is a Google Earth overview of the accident region.

At 02:26:06, the train continued southbound passed North End Dixiana (Milepost 365.9). The video recorder displayed a speed of 55.8 mph.

Video ceased being recorded at 2:26:30. The train was approaching the south end of Dixiana as it rounded a right hand curve. The speed was recorded as 55.0 mph and the GPS coordinates showed 33.9202 deg N, 81.0587 deg W. The GPS position is plotted as "VIDEO" on figure 3 which is a Google Earth overview of the accident region.

Only GPS position and derived GPS speed continued to display on the recorder. Timing information ceased as described above at 02:26:30. The last displayed GPS coordinates were given as 33.9150 deg N, 81.0623 deg W. A derived speed was shown as 56.5 mph. The GPS position is plotted as "GPS DATA" on figure 3 which is a Google Earth overview of the accident region.

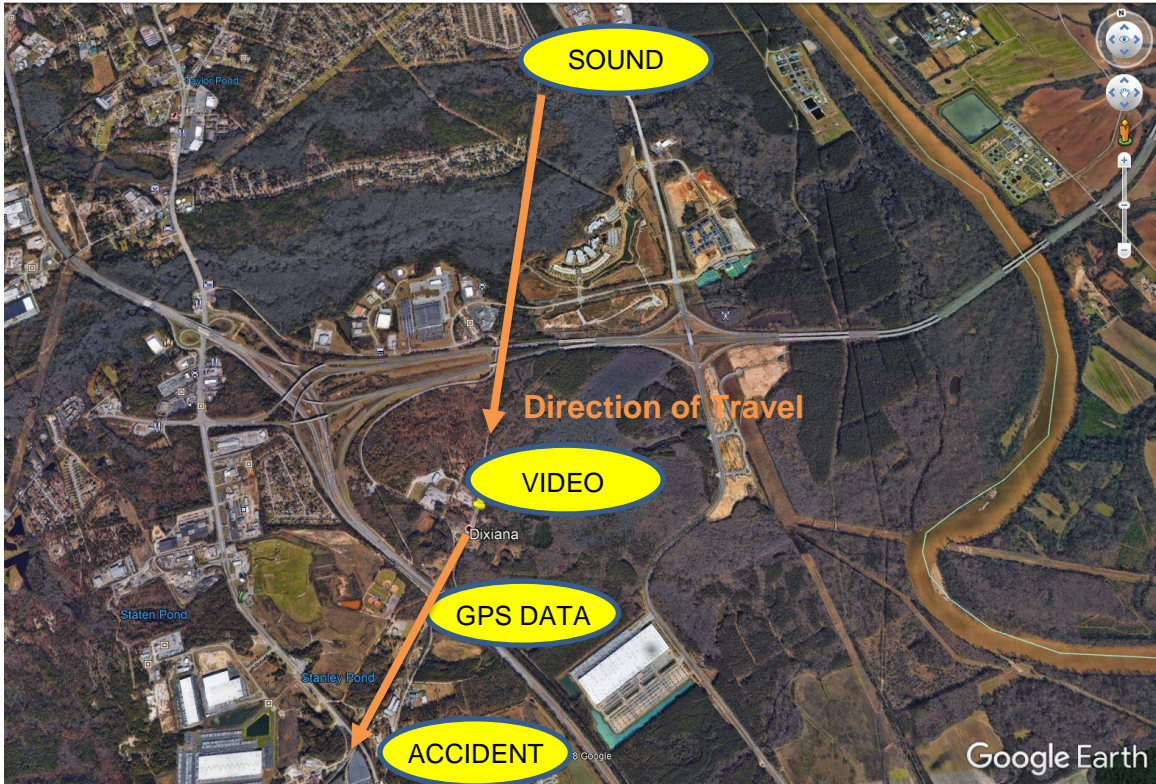


Figure 3. A Google Earth overview of coordinates in which data streams ceased recording.

3.4.2. CSX Local Train F777 03 - CSXT130 (Forward Facing)

Review of recorded material began as the CSX F777 03 completed movements within the auto ramp facility. Around 01:40:04 the train moved forward out of the auto ramp facility onto the runaround track, headed toward the main line. The area appeared to be lit by flood lights in the vicinity of the auto ramp facility and the mainline track. The area was lit much better in some areas as opposed to other areas.

For the majority of the reviewed recording, the conductor was not visible in the view of the forward facing camera of CSXT130.

At 01:42:04 the locomotive entered the main line and stopped on the main line switch.

At 01:42:44, the train began moving forward on the main line. The train passed the north end Silica Storage track. At 01:43:21, the train stopped. At 01:43:37, the train began reversing into the Silica Storage track.

At 01:44:06, the train reversed across the north end of the Silica Storage track switch. The conductor was not seen at the switch after CSX F777 03 passed the switch. CSX F777 03 did not stop as it passed the switch. Figure 4 shows a view of Silica switch at this time.



Figure 4. Silica switch at 06:44:02.

At 01:44:24, the locomotive came to a stop. At almost the same time, the conductor in a safety vest was visible in front of the locomotive. The conductor was bending at the waist, then became upright and walked across the Silica Storage track and the main line (figure 5).



Figure 5. The conductor seen bending at the waist next to the Silica Storage track switch. The conductor's body has been redacted.

The conductor disappeared from view of the forward facing camera by 01:44:32. The main line switch into the north end of the auto ramp facility can be seen lined for the main line at 01:44:44 (figure 6).



Figure 6. The derail and the position of the track switch.

At 01:45:28, some voice or radio chatter was detected. The word “clear” was detected.

At 01:45:35, the locomotive began reversing. The derail became visible on the Silica Storage track. The derail was in the derailing position. The locomotive continued reversing until 01:46:31 when it came to a stop.

Around 01:49:24, some electronic tones were heard consistent with adjustment of a radio. At 01:50:00, a sound similar to a door operating was recorded. At 01:51:34, the locomotive’s headlight became extinguished.

Audio and video were reviewed while the locomotive sat idle on the Silica Storage track. Nothing remarkable was noted during the time the locomotive sat idle.

At 02:25:50, the locomotive’s headlight was turned to a bright setting. A view forward of the locomotive was captured by the image recorder, the position of the Silica Storage track switch could not be ascertained. By 02:25:55, the locomotive’s headlight was extinguished.

At 02:26:29, a locomotive headlight approaching in the opposite direction became visible. A reflection on the CSX locomotive’s front grab iron on the short hood and window was also visible around the same moment. A moment later, a reflection flashed again. At 02:26:32, a light similar to that of a hand held light was visible illuminating a small spot on the west rail of the main line track. The

headlight from the oncoming train was visible growing larger and brighter in intensity.

At 02:26:42, a hand held light beam was visible reflecting off concrete pillars to the front left of the locomotive.

At 02:26:54, the recording ended. The approaching train's headlight was bright and directly facing toward the Silica Storage track. Figure 7 is a screenshot of the last image recorded by the camera.



Figure 7. The last image recorded by the camera.

3.4.3. CSX Local Train F777 03 - CSXT36 (Rear Facing)

Review of recorded material began as the train completed movements within the auto ramp facility. The train was moving forward to the runaround track. At 01:38:36, the train came to a stop. The conductor was visible behind the locomotive closing a yellow gate to the auto ramp facility. The conductor was visible holding a lantern. By 01:39:21, the conductor was finished securing the gate. At 01:39:37, the conductor was visible on the platform of the front end of the locomotive. The locomotive began moving out of the auto ramp facility while the conductor was on the locomotive.

At 01:40:44, the locomotive came to a stop. At 01:41:27, the locomotive began moving forward again.

At 01:41:02, the conductor was visible walking behind the locomotive as the locomotive was still moving forward. Seconds later, at 01:41:06, the locomotive came to a stop. The conductor was using a lantern and walked toward the derail which was seen on the runaround track outside of the auto ramp facility. The conductor restored the derail. By 01:42:29, the conductor was walking toward the

locomotive which was still stationary. At 01:42:47, the locomotive began moving forward.

The locomotive continued to move forward. The derail was visible in the non-derailing position on the Silica Storage track as it came into view of the rear facing camera. The locomotive continued to move forward and stopped at 01:43:26 ahead of the Silica Storage track.

At 01:43:44, the locomotive began backing into the Silica Storage track. The conductor's lantern was visible shining south of the stopped locomotive, in the direction the train was reversing into the Silica Storage track.

As the locomotive was reversing down the Silica Storage track, light beams from the conductor's lantern were visible illuminating the ground near the derail on the Silica Storage track. The locomotive came to a stop at 01:44:31.

The locomotive began reversing again at 01:45:36. The conductor boarded the front end of the locomotive on the east side and crossed the front end of the locomotive and descended on the west side of the locomotive. As the train reversed down the Silica Storage track, the conductor's lantern was visible in a manner consistent with the conductor riding the locomotive's steps while it was reversing. The locomotive continued reversing toward a coupling.

At 01:46:33, the locomotive coupled with an auto ramp on the Silica Storage track. The locomotive then stretched the train.

The locomotive sat idle coupled to the auto rack train for the next 40 minutes and 54 seconds. Nothing remarkable on the video or audio was noted during this time.

At 02:27:27, impact was recorded. As the train was struck, it moved in the reverse direction (south). By 02:27:32, the train came to a stop after being impacted.

Around 02:40:28, emergency lights from first responders were visible near the edge of the video recording.

3.4.4. Exemplar Recording – Amtrak Train Southbound

An exemplar recording was reviewed of an Amtrak train that was traveling southbound from Columbia Station toward the accident site. Data showed the exemplar train traveling around 60 mph when the train passed the accident location.

The time that the train operated around the curve just north of the accident site was 08:46:30. The exemplar train passed Silica switch southbound at 08:47:14.

Seven seconds later, at 08:47:21, the exemplar train passed the accident location under the roadway overpass.

3.4.5. Security Camera Footage

The group reviewed security camera footage from two locations, one from a contractor adjacent to the accident site, and another from the auto ramp facility. Both locations had cameras that captured portions of the train collision. The orientation of both cameras were from the east and looked west, providing a side view of the collision.

The camera view from the contractor adjacent to the accident showed an individual adjacent to the struck train holding a flashlight under the roadway overpass. Just prior to impact, the flashlight's source moved uphill under the roadway overpass. Moments after the accident, the flashlight's source continued moving under the roadway overpass.

The footage from the adjacent contractor is attached to this report as attachment 1. The footage from the auto ramp facility is attached to this report as attachment 2. Both recordings can be found in the public docket for this accident.