

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, DC 20594

November 14, 2016

Onboard Image Recorder

Specialist's Factual Report
By Bill Tuccio, Ph.D.

1. EVENT

Location:	Panhandle, Texas
Date:	June 28, 2016
Locomotives:	Locomotive, Eastbound Train, BNSF 5162 ¹ Locomotive, Siding Train, BNSF 5451 Locomotive, Westbound Train, BNSF 7553 Locomotive, Westbound Train, BNSF 7907 Locomotive, Westbound Train, BNSF 8191 Locomotive, Siding Train, BNSF 7911
Operator:	BNSF Railway
NTSB Number:	DCA16FR008

2. GROUP

An onboard image recorder group was not convened.

3. SUMMARY

For a summary of the accident, refer to the *Accident Summary* report, within this docket. Two BNSF trains were involved in the collision: An Eastbound train and a Westbound train. There were also two trains not involved in the collision, positioned in sidings, which were potential witnesses to the collision.

4. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following forward facing video-related devices:²

Devices with no pertinent information recovered:

Train/Locomotive:	Eastbound/BNSF 5162
Type/Manufacturer:	Recorder/Unknown
Serial Number:	Unknown

¹ The references Eastbound, Westbound, and Siding are defined in the Summary section of this report.

² The recorder from the lead locomotive of the westbound train was not recovered and was presumed destroyed in the collision and ensuing fire.

Train/Locomotive: Siding/BNSF 5451
Type/Manufacturer: Solid State Drive (SSD)/Wabtec VideoTrax
Recorder Serial Number: MS1142B654

Devices with pertinent information recovered:

Train/Locomotive: Westbound/BNSF 7553
Type/Manufacturer: SSD/GE Lococam
Recorder Serial Number: 11114090

Train/Locomotive: Westbound/BNSF 7907
Type/Manufacturer: SSD/GE Lococam
Recorder Serial Number: 11140100

Train/Locomotive: Westbound/BNSF 8191
Type/Manufacturer: SSD/GE Lococam
Recorder Serial Number: 11426027

Train/Locomotive: Siding/BNSF 7911
Type/Manufacturer: SSD/ GE Lococam
Recorder Serial Number: 11229125

4.1. Devices With No Pertinent Information Recovered

The recorder from the lead locomotive of the Eastbound train, BNSF 5162, suffered extreme heat damage, as shown in figure 1. Damage to non-volatile memory³ destroyed all recorded information.

The SSD from the lead locomotive of a train positioned in a siding near the accident, BNSF 5451, was undamaged and downloaded. However, it was determined the recorder was not operating at the time of the collision.

Figure 1. Onboard image recorder from BNSF 5162.



³ Non-volatile memory is semiconductor memory that does not require external power for data retention.

4.2. Devices With Pertinent Information Recovered

Devices described in this section yielded pertinent information.

4.2.1. Recorder Description

The GE Lococam On-Board Image recorder is a forward facing video camera that records to external SSD storage. It records color video at a resolution of 720x480 pixels at 15 frames per second with external audio.

4.2.2. Recorder Damage

All SSD modules were undamaged and information was downloaded normally.

Downloaded video content from the 2nd locomotive of the Westbound train, BNSF 7553, stopped prior to the collision. The SSD was brought to the manufacturer to attempt to recover the missing content. It was determined that at least 12 seconds of content was corrupted during the collision sequence and power interruption, consistent with the recording logic design. Using information provided by the manufacturer, the corrupted video was repaired; however, there was no additional content from the accident video. Usable content from BNSF 7553 prior to the collision was used for time correlation as described in the following section.

4.3. Timing and Correlation

In agreement with the Investigator-in-Charge, time recorded by the track signal system was considered authoritative for this accident.⁴ Table 1 summarizes events and times used to convert recorded time to CST. The method used for timing was to first align authoritative signal system time to BNSF 7553 through a review of video events and signal data. Thereafter, BNSF 7553's corrected, authoritative time was used to align with BNSF 7907 through video and audio review; followed by BNSF 7907 compared to BNSF 8191; and finally, BNSF 7907's recording of the collision compared to BNSF 7911's recording of the collision.

Table 1. Summary of timing and correlation.

Source	Alignment Event	Recorded Time	Authoritative Source	Authoritative Time (CST)	Offset
Signal System	MP 523.1 Signal Occupied	0817:34	<i>Not Applicable</i>	0817:34	<i>Not Applicable</i>
BNSF 7553	MP 523.1 Signal Occupied	1317:26 UTC	Signal System	0817:34	-0459:52
BNSF 7907	Multiple Events	Same as BNSF 7553	BNSF 7553	Same as BNSF 7553	-0459:52

⁴ See the Track Signal System Group Chairman's Report in the public docket for this accident.

Source	Alignment Event	Recorded Time	Authoritative Source	Authoritative Time (CST)	Offset
BNSF 8191	Multiple Events	Same as BNSF 7907	BNSF 7553	Same as BNSF 7907	-0459:52
BNSF 7911	Collision	1320:00 UTC	BNSF 7907	0820:55	-0459:05

4.4. Summary of Recording Contents

4.4.1. BNSF 7553

BNSF 7553 stopped recording before the collision. Recorded content was only used for time alignment.

4.4.2. BNSF 7907

At 0819:58 CDT, BNSF 7907 began to record horn activations in advance of the last grade crossing before the collision.

At 0820:25 CDT, BNSF 7907 crossed the last grade crossing observed before the collision.

At 0820:34 CDT, BNSF 7907 background sound decreased and the parametric data on the video file showed a reduction in throttle.

At 0820:38 CDT, a loud pneumatic sound was recorded by BNSF 7907 and parametric data showed the Pneumatic Cutoff Switch (PCS) transition to open.

At 0820:51 CDT, a person, image redacted, was visible to the right of BNSF 7907, as shown in figure 2.

Figure 2. BNSF 7907 at 0820:51 CDT.



At 0820:55 CDT, BNSF 7907 first recorded sounds and visual indicators of the collision. Loud sounds, fire, and moving debris were recorded for about the next 20 seconds.

By 0821:15 CDT, BNSF 7907 had come to a stop and fire was visible in the recorded imagery, as shown in figure 3.

Figure 3. BNSF 7907 at 0821:15 CDT.



4.4.3. BNSF 8191

At 0820:26 CDT, BNSF 8191 crossed the last grade crossing before the collision.

At 0820:53 CDT, a person, image redacted, was visible to the right of BNSF 8191, as shown in figure 4.

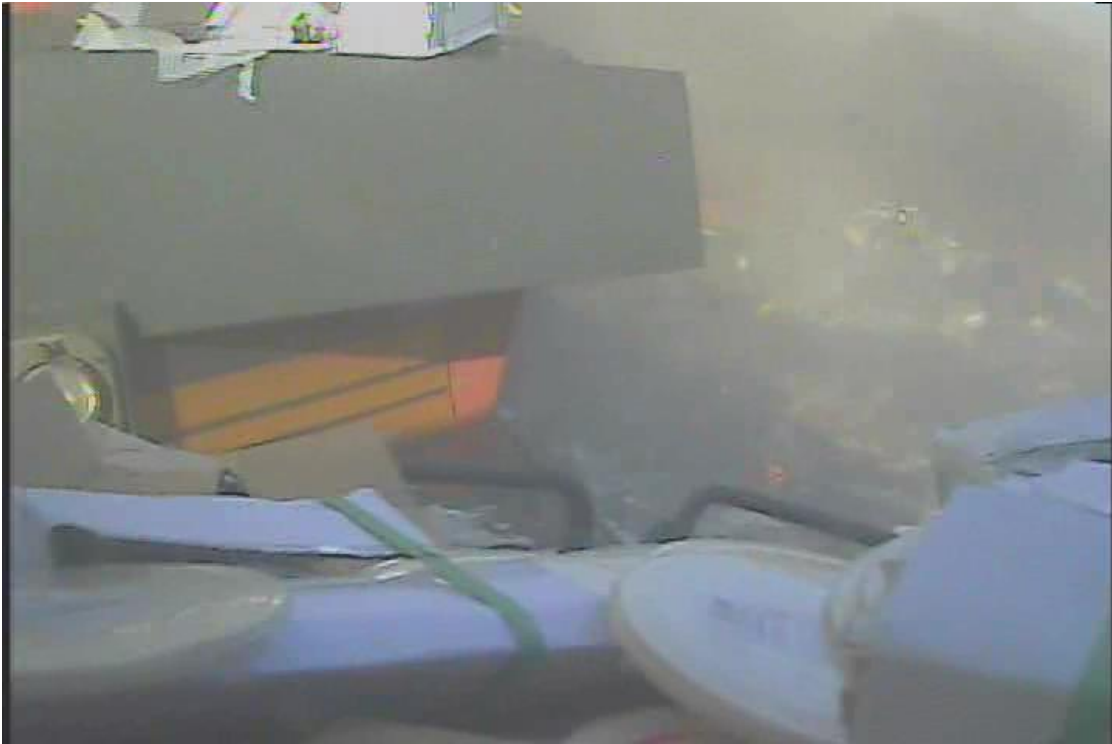
Figure 4. BNSF 8191 at 0820:53 CDT.



At 0820:55 CDT, BNSF 8191 first recorded sounds and visual indicators of the collision. Louds sounds, fire, and moving debris were recorded for about the next 20 seconds.

By 0821:15 CDT, BNSF 8191 had come to a stop and fire and smoke were visible in the recorded imagery, as shown in figure 5.

Figure 5. BNSF 8191 at 0821:15 CDT.

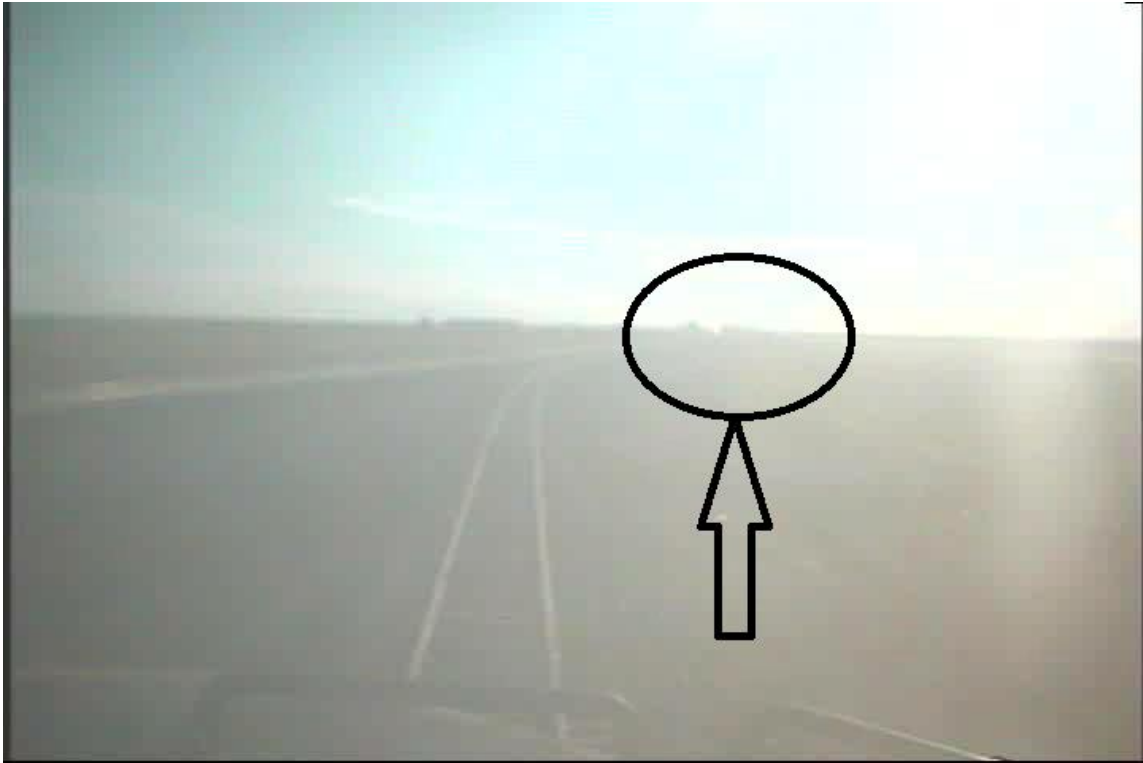


4.4.4. BNSF 7911

BNSF 7911 was located in the siding and its image recorder captured the collision.

By 0820:10 CDT, the westbound train was visible to BNSF 7911, as shown in figure 6. The westbound train was coming in the direction of BNSF 7911 on a different track; the annotated arrow and circle highlight the position of the train.

Figure 6. BNSF 7911 at 0820:10 CDT.



At 0820:55 CDT, the westbound train collided with the eastbound train. Figure 7 shows the westbound train at the moment of collision. The eastbound train was not within the field of view of BNSF 7911 at the time of the collision, but subsequent to 0820:55 CDT, parts of the eastbound train entered the field of view, along with fire and debris.

Figure 7. BNSF 7911 at 0820:55 CDT.



By 0821:43 CDT, sounds of the collision had subsided and smoke filled most of the field of view on BNSF 7911.

By 0822:49 CDT, unintelligible voices were recorded on BNSF 7911's external microphone and the smoke had cleared, as shown in figure 8.

Figure 8. BNSF 7911 at 0822:49 CDT.



By 0824:17 CDT, a person walked towards the wreckage. Shortly after a voice said, “is somebody in there.”

By 0826:23 CDT, sirens were recorded by BNSF 7911’s external microphone.

By 0834:33 CDT, a firefighter was first visible pulling a hose towards the smoke and fire.