

**NATIONAL TRANSPORTATION SAFETY BOARD**

Vehicle Recorder Division  
Washington, D.C. 20594

June 25, 2014

**Track Image Recorder Factual Report**

**Specialist's Factual Report  
By Sean Payne**

**1. EVENT SUMMARY**

Location: Chaffee, Missouri  
Date: May 25, 2013, 02:30 A.M. CDT (Central Daylight Time)  
Company: BNSF Railway Company (BNSF) and Union Pacific Railroad (UP)  
Train: UP Train 2-ASMAR-25 & BNSF Train U-KCKHKMO-05T  
NTSB Number: DCA13MR004

On May 25, 2013 at 2:30 A.M., Central Daylight Time<sup>1</sup>, near Chaffee, Missouri, Union Pacific (UP) southbound freight train, 2-ASMAR-25 collided with BNSF southbound<sup>2</sup> freight train U-KCKHKMO-05T, at Rockview interlocking. The BNSF train was occupying the interlocking when the UP train struck the 12th car behind the locomotives of the BNSF train. As a result of the collision, 13 cars of the BNSF train were derailed. Two locomotives and 11 cars on the UP train were derailed. Spilled diesel fuel from the derailed UP locomotives caught fire. The Missouri State Highway M Bridge was above the Rockview interlocking and collision forces resulted in the collapse of portions of the highway bridge. The engineer and conductor on the UP train were the only crew members that were injured and they were transported to a local hospital. Subsequent to the bridge collapse, two motor vehicles struck damaged highway elements. Five occupants of the motor vehicles were transported to a local hospital. It was clear and 48° F at the time of the accident. Damage was estimated to be in excess of \$11 Million.

**2. GROUP**

A group was not convened.

**3. DETAILS OF INVESTIGATION**

The Safety Board's Vehicle Recorder Division received the following hard drive image recorders:

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<sup>1</sup> The signal data at the control point (CP) Quarry Track Circuit is considered the authoritative time for this accident and refers to timing information from the National Transportation Safety Board's Signal & Train Control Group Factual Report which can be found in the public docket for this accident. Furthermore, all times in this report are represented as Central Daylight Time (CDT) unless otherwise noted.

<sup>2</sup> Railroads use timetable directions to describe train movements. Timetable directions do not always correspond with compass directions.

Train: BNSF U-KCKHKMO-05T  
Locomotive Number: BNSF 7750  
Recorder Manufacturer/Model: GE LocoCAM  
Recorder Hard Drive Serial Number: 1111408  
Locomotive Orientation<sup>3</sup>: Rearward-Facing

Train: UP 2-ASMAR-25  
Locomotive Number: UP 5668  
Recorder Manufacturer/Model: Wabtec VideoTrax  
Recorder Hard Drive Serial Number: KB AAW 9129  
Locomotive Orientation: Forward-Facing

Train: UP 2-ASMAR-25  
Locomotive Number: UP 7421  
Recorder Manufacturer/Model: Wabtec VideoTrax  
Recorder Hard Drive Serial Number: Unknown  
Locomotive Orientation: Rearward-Facing

### 3.1. Device Description – BNSF U-KCKHKMO-05T – Locomotive BNSF 7750

The GE LocoCAM is an outward facing video camera that records to an external hard drive (Figure 1). It records video at a resolution of 720x480 pixels and 15 frames per second (fps). External audio as well as a limited amount of train operating data such as speed, emergency brake, and throttle status is also embedded in the video metadata.

#### 3.1.1. Recorder Condition

The hard drive was recovered undamaged. A photo of a GE LocoCAM hard drive is shown in Figure 1.

Figure 1. GE LocoCAM Hard Drive from BNSF Locomotive 7750.



<sup>3</sup> Locomotive Orientation – Refers to the locomotive’s orientation in relation to its direction of travel. Forward-facing orientation shows a forward-facing image in the direction of travel, rearward-facing shows an image opposite of the direction of travel.

### 3.1.2. Recording Contents

The recorder was downloaded normally. The content of the hard drive was downloaded using a GE readout station appropriate for this model recorder. This process extracts proprietary files from the recorder which are then viewed using a GE supplied viewing program. The system captures data to a series of individual files, each containing approximately 12 seconds of audio, video, and parametric data. The hard drive contained a vast amount of video data, however, only a few hours of images around the time of the accident were extracted. GPS data is embedded in the video measuring time and position once per second. For time correlation between the locomotive event recorders involved in this accident, see Section 6.1 of this report.

The video footage captured forward-facing imagery with external audio. No video or audio was captured from inside the locomotive control compartment.

Table 1: Transcription of Recorded Video – BNSF U-KCKHKMO-05T- Rearward Facing		
Time	Description	Reference
02:28:08	The Missouri State Highway M Bridge becomes visible	Figure 2
02:28:18	The striking locomotive becomes visible	Figure 3
02:28:20	The striking train is visible moments before impact	Figure 4
02:28:21	Moment of impact	Figure 5
02:32:33	The first vehicle is seen on the collapsed bridge span	Figure 6
02:33:29	The second vehicle is seen on the collapsed bridge span	Figure 7
08:56:20	Emergency vehicles are visible after a power interruption	Figure 8

**Figure 2. The Missouri State Highway M Bridge becomes visible as BNSF train U-KCKHKMO-05T passes underneath.**



**Figure 3. The striking locomotive's headlight becomes visible on the right side of the frame.**



**Figure 4. The striking locomotive is visible moments before impact.**



Figure 5. The moment of impact at 02:28:21 CDT.



Figure 6. The first vehicle is seen on the collapsed bridge span.



Figure 7. The second vehicle is seen on the collapsed bridge span.



Headlight – Vehicle #2

Figure 8. Emergency vehicles are visible after a power interruption to the track image recorder. The video picks up here at 08:56:20 when power is applied to the recorder.



Collapsed Bridge Structure

Emergency Vehicles

## 4.1. Device Description – UP 2-ASMAR-25 – Locomotive UP 5668

The Wabtec VideoTrax video recorder is a forward-facing video camera that records to an external hard drive. It records at a resolution of 720x480 pixels and 15 fps. External audio is also recorded.

### 4.1.1. Recorder Condition

The hard drive was recovered undamaged. Figure 9 shows the condition of the Wabtec VideoTrax recorder.

**Figure 9. The undamaged Wabtec VideoTrax recorder from UP locomotive 5668.**



### 4.1.2. Recording Contents

The recorder was downloaded normally using the manufacturer's supplied hardware and software. A proprietary .AVI<sup>4</sup> file was produced that recorded the accident. The manufacturer's software allows playback of the proprietary file that contains functions similar to that of a DVR<sup>5</sup>.

The video footage captured forward-facing imagery with external audio. No video or audio was captured from inside the locomotive control compartment.

Table 2: Transcription of Recorded Video – Train Forward Facing		
Time	Description	Reference
02:21:52	The locomotive passes a green signal at CP ANCELL (Milepost 125.8).	Figure 10
02:22:44	The locomotive passes a private grade crossing without activating the horn.	Figure 11
02:23:08	The locomotive passes a private grade crossing without activating the horn.	Figure 12

<sup>4</sup> .AVI – Audio Video Interleave. A multimedia container format that contains both audio and video data.

<sup>5</sup> DVR – Digital Video Recorder. An application software that allows digital video to be played back with functions similar to a VCR.

Table 2: Transcription of Recorded Video – Train Forward Facing		
Time	Description	Reference
02:24:14	A horn is heard as the locomotive passes a private grade crossing at a flashing yellow Intermediate Signal (Milepost 127.7).	Figure 13
02:25:43	The locomotive passes a solid yellow intermediate signal (Milepost 129.1).	Figure 14
02:26:32	A horn is heard as the locomotive passes a grade crossing.	Figure 15
02:27:58	The struck BNSF locomotive is visible as the locomotive passes a flashing red intermediate signal. Only one short horn blast was detected 22 seconds prior to the locomotive meeting the crossing.	Figure 16
02:28:03	The struck BNSF locomotive is seen ahead of the striking UP locomotive.	Figure 17
02:28:18	The locomotive passes a solid red signal at CP Rockview. The struck BNSF locomotive is visible.	Figure 18
02:28:21	Moment of Impact.	Figure 19
02:28:28	Video feed is lost.	Figure 20

**Figure 10. The locomotive passes a green signal at CP ANCELL (Milepost 125.8).**





**Figure 11. The locomotive passes a private grade crossing without activating the horn.**



**Figure 12. The locomotive passes a private grade crossing without activating the horn.**



**Figure 13. A horn is heard as the locomotive passes a private grade crossing at a flashing yellow Intermediate Signal (Milepost 127.7).**



**Figure 14. The locomotive passes a solid yellow intermediate signal (Milepost 129.1).**



**Figure 15. A horn is heard as the locomotive passes a grade crossing.**



**Figure 16. The struck BNSF locomotive is visible as the locomotive passes a flashing red intermediate signal. Only one short horn blast was detected 22 seconds prior to the locomotive meeting the crossing.**



**Figure 17. The struck BNSF locomotive is seen ahead of the striking UP locomotive.**



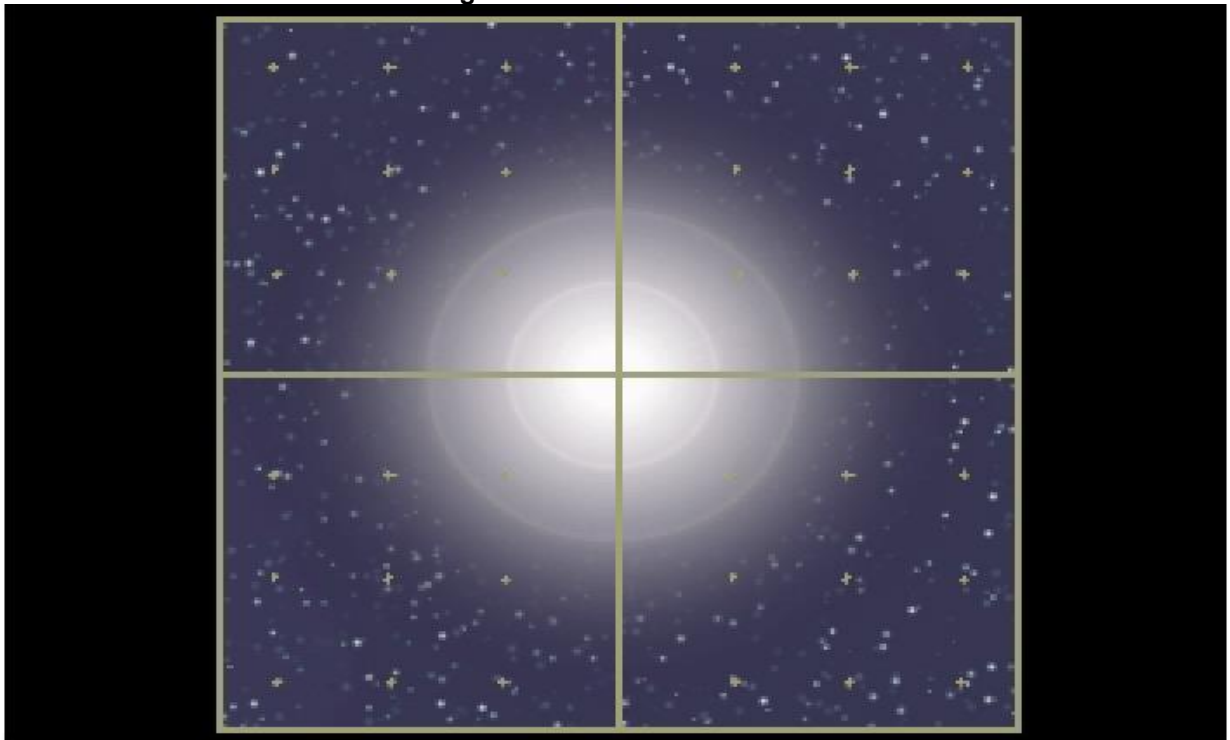
**Figure 18. The locomotive passes a solid red signal at CP Rockview. The struck BNSF locomotive is visible.**



**Figure 19. Moment of Impact.**



**Figure 20. Video feed is lost.**



## 5.1. Device Description – UP 2-ASMAR-25 – Locomotive UP 7421

The recovered device was determined to be a Wabtec VideoTrax track image recorder and its description is covered in section 4.1. of this report.

### 5.1.1. Recorder Condition

The recorder arrived at the laboratory heavily damaged. The recorder's chassis, the recorder's enclosure and the hard drive were severely damaged in the post-accident fire. Due to the damage, recovery was not possible. Figure 21 shows the arrival condition of the recorder to the laboratory.

**Figure 21. The arrival state of UP locomotive 7421's image recorder. The recorder chassis is shown on the left and the hard drive enclosure and hard drive are shown on the right.**



### 5.1.2. Recording Contents

No video or GPS data was recovered from this recorder.

## 6. Time Correlation

The times used in this report are expressed as local time of the accident (CDT). In agreement with the Investigator-in-Charge (IIC), the signal data as recorded at the control point (CP) Quarry Track Circuit is considered the authoritative time for this accident. According to recorded signal data, UP 5668 first occupied the CP Quarry Track Circuit at 02:25:43 CDT. This time was correlated with UP 5668's forward-facing video recorder data, which showed the train first occupying the CP Quarry Track Circuit at 02:25:37 CDT<sup>6</sup>. Using this information, the time of the collision was determined to be 02:28:21 CDT. The forward-facing image recorder from UP 5668 showed the time of impact to be 02:28:14 CDT<sup>7</sup>. An offset of +07 seconds was used to align UP 5668's forward-facing image recorder to the authoritative signal timing. All times given in this report for UP 5668 reflect this offset.

<sup>6</sup> The video recorder recorded two times, the time based on the physical event recorder, and the time based on GPS. The time based on GPS was used for this time correlation.

<sup>7</sup> GPS time.

The rearward-facing image recorder on BNSF 7750 recorded impact at 02:28:15<sup>8</sup>. BNSF 7750's collision time was aligned with the collision time of 02:28:21 CDT (authoritative signal track time). Accordingly, 6 seconds was added to BNSF 7750's GPS time. All times given in this report for BNSF 7750 reflect this offset.

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<sup>8</sup> GPS time.