



OPERATIONAL SERVICES BRANCH  
**ENGINEERING LABORATORY REPORT**

LP141/2013

Lac-Mégantic Video Analysis

Montreal, Maine & Atlantic Railway, Train MMA-002

Date of Occurrence: 06-Jul-2013

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PREPARED BY

T. Gasbarro (Senior Multi-Media Investigations Services Specialist)

APPROVED BY

M.E. Givins, P.Eng. (Manager, Recorder and Vehicle Performance)

RELEASED BY

L. Donati, Ph.D. (Director of Operational Services)

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REVISION

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## **1.0 INTRODUCTION**

- 1.1 On 06 July 2013, shortly before 0100 Eastern Daylight Time, eastward Montreal, Maine & Atlantic Railway freight train no. 2 (MMA 002), which had been parked for the night at Nantes, Quebec, mile 7.40 of the Sherbrooke subdivision, started to roll uncontrolled. The train travelled a distance of about 7 miles and over 13 crossings, reaching a speed of 65 mph. At about 0115, while approaching the centre of the town of Lac-Mégantic, Quebec, 63 tank cars carrying petroleum crude oil, UN 1267, and 1 buffer car derailed. As a result of the derailment, about 6 million litres of petroleum crude oil spilled and there were fires and explosions, which destroyed 40 buildings, 50 vehicles and the railway tracks at the west end of Mégantic Yard. A total of 47 people were fatally injured.
- 1.2 Security camera video footage acquired by the TSB shows the freight train passing a level crossing minutes prior to the derailment. The DVD was forwarded to the Engineering Laboratory of the Transportation Safety Board (TSB) of Canada for analysis.

## **2.0 EXAMINATION AND ANALYSIS**

- 2.1 The security camera was mounted under the eave on the southeast corner of the Dépanneur Voisin/Ultramar gas station at 2174 Route 161, Nantes, Quebec (Figure 1). The level crossing at Highway 161 can be seen in the image (Figure 2) and is located about 109 meters away from the camera. The camera's central lens axis was pointed approximately 87 degrees from north (Figure 3).
- 2.2 The video, titled "File20130706011033.Avi", is an Audio Video Interleave (.avi) file recorded at 700x480 pixels. The video begins at 1:10:33 (hour:minutes:seconds) am Eastern Standard Time and ends at 1:15:33 for a total of 5 minutes.
- 2.3 The video was recorded using a GeoVision GV-1120 digital video recorder hardware/software system located at the Dépanneur Voisin/Ultramar gas station. The proprietary codec and player was downloaded from GeoVision in order to play back the video sequence.
- 2.4 In the video sequence, the level crossing signal lights can be seen activated at 1:10:52 am on 6 July 2013. The lead locomotive – MMA 5017 crosses highway 161 27 seconds later at 1:11:19 am . The train is travelling at a converging angle of 26 degrees to the GeoVision's cameras lens axis (Figure 3).
- 2.5 The 5 locomotives, a VB car (specialized caboose) and a boxcar (pebble car) can be seen passing over the level crossing. The total length of the MMA 2 freight train was about 4700 ft. The entire train took 1 minute and 47.5 seconds to pass over the crossing at Highway 161. Using the formula, velocity = distance/time, the unattended train was travelling at approximately 29 mph (46 kph) as it passed over the level crossing.

## 2.6 THE UNKNOWN LIGHT SOURCE

- 2.6.1 The video sequence revealed unknown light sources (Figure 4) as train MMA 002 crossed Highway 161. Initially the unknown light sources were thought to be sparking or heating of the brake shoes, evidence of applied brakes. Further examination revealed a total of 3 light sources – a single light followed by two next to each other. After careful examination of the video, the light sources were observed to be too high in the video frame to be considered as part of the brakes or wheels of the locomotives or cars (Figure 5). With the train travelling at a converging angle of 26 degrees to the camera's lens axis (Figure 3), the side and rear windows of the VB car would have been exposed to the security camera as the train passed by.
- 2.6.2 Further investigation revealed that the light sources were interior lights left on in the rear of the VB car. The lights were emanating through the 3 windows in the rear and side of the passing VB car (Figure 6). Two or more interior lights in the rear of the VB car may have been left switched on (Figure 7) prior to the train rolling down the grade from Nantes.
- 2.6.3 Although there was no electrical power in the locomotives themselves, the VB car has its own independent battery system which could power its interior lights.

## 3.0 CONCLUSIONS

- 3.1 Unattended freight train MMA 002 passed over the level crossing at Highway 161 at a speed of 29 mph (46 kph).
- 3.2 The unknown light sources emanating from freight train MMA 002 as it rolled by Highway 161 were not related to the brakes or wheels.
- 3.3 The source of the unknown light was determined to be the interior lights of the VB car.



Figure 1: Security camera on the Dépanneur Voisin/Ultramar gas station (yellow arrow). Red arrow points to the direction of the railway crossing over Highway 161.



Figure 2: Still image captured at 1:10:52 am. Shows activation of the crossing lights (yellow box) before freight train MMA 002 passes by.

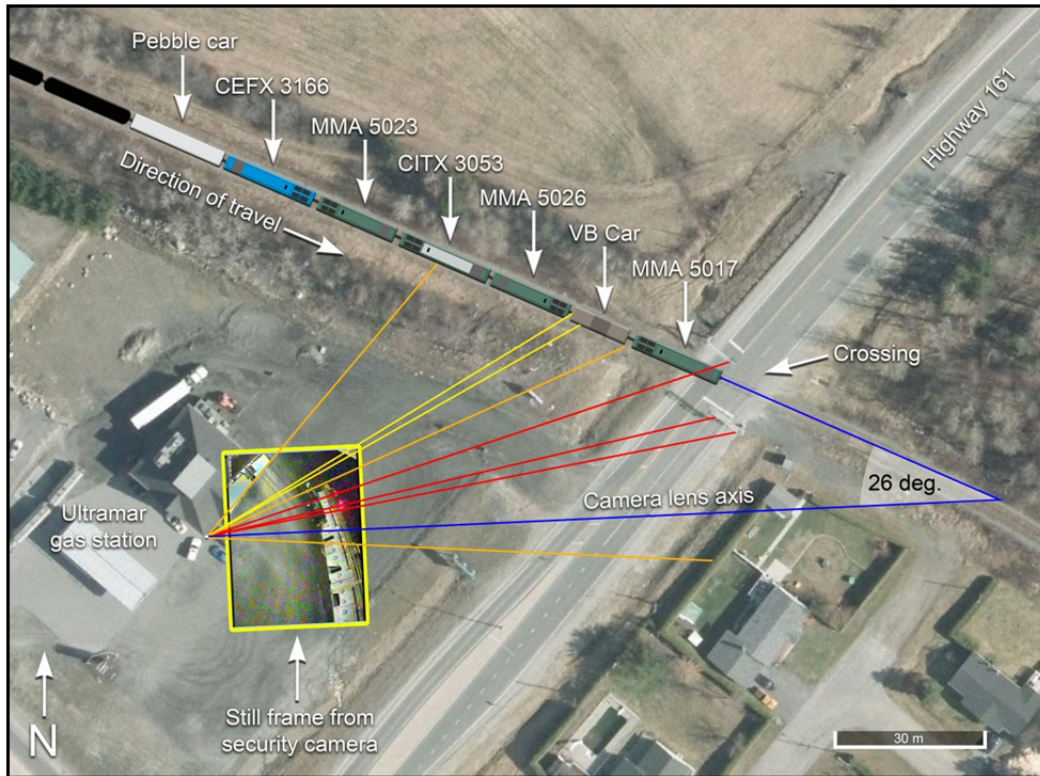


Figure 3: Still image positioned over an aerial photograph. The red lines are pointing to the signal lights. The orange lines point to ground objects and the yellow lines are pointing to lights emanating from the VB car. The angle between the camera lens axis and the tracks is 26 degrees.



Figure 4: Unknown light source passing from left to right with train MMA 002 at 1:11:21 am (yellow circle).

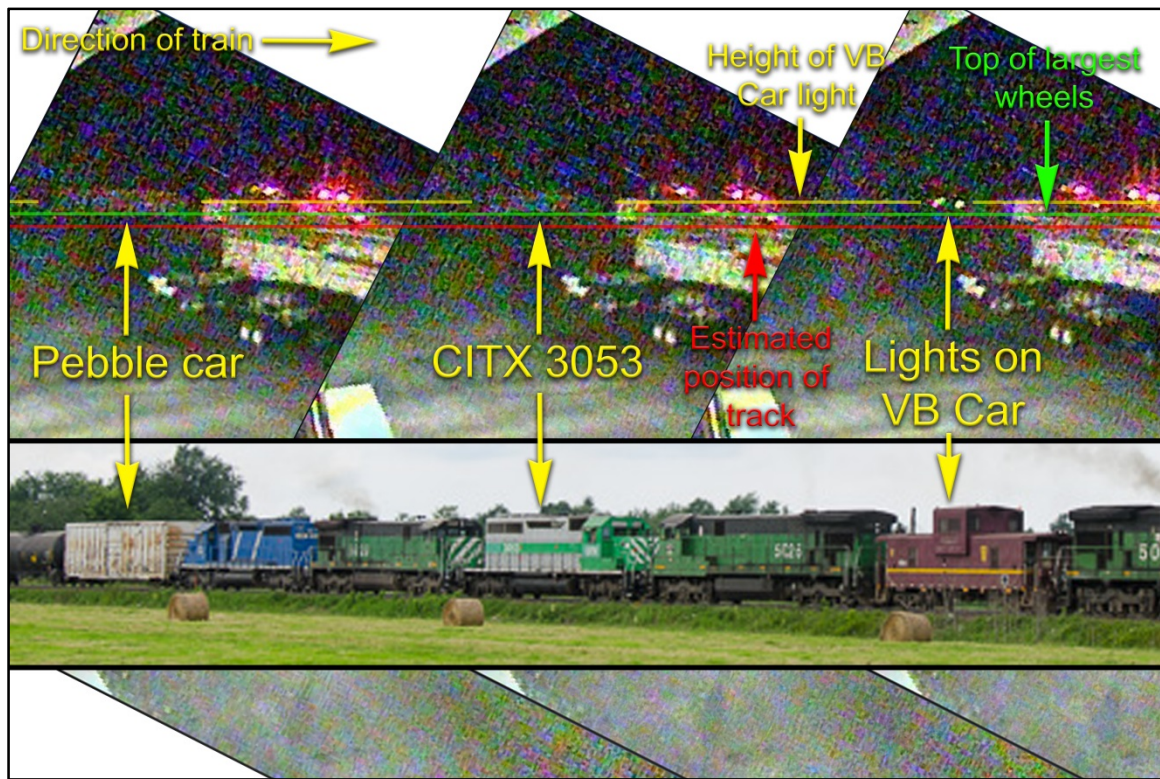


Figure 5: The unknown light source when positioned relative to the Pebble car and locomotive CITX 3053. The lights are approximately mid height of the VB car and above wheel height.



Figure 6: The 3 areas of illumination observed in the security camera video.

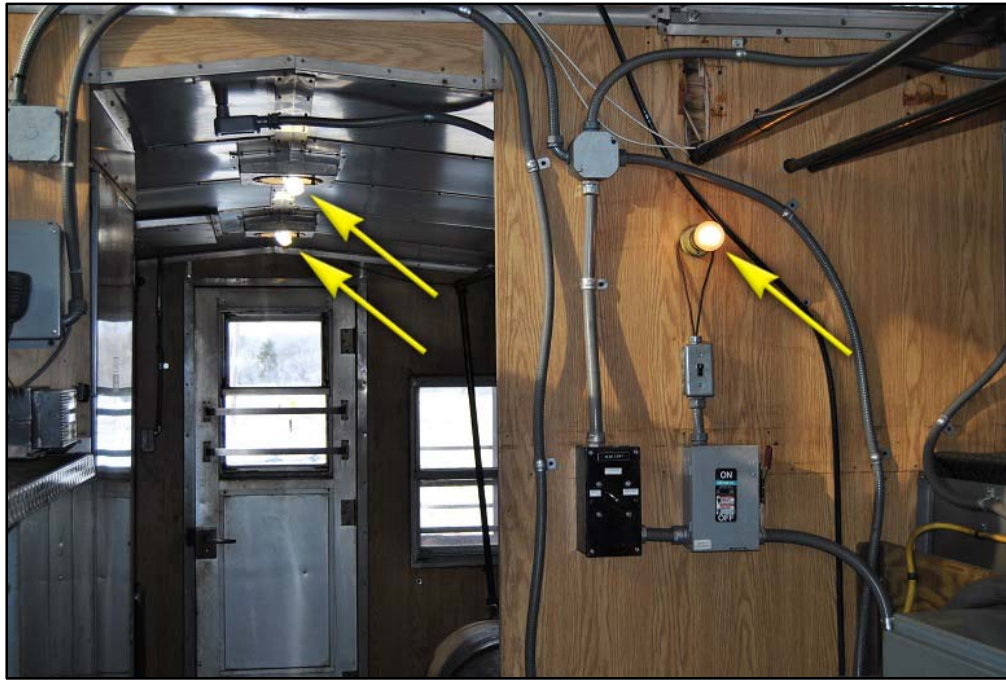


Figure 7: Inside view of the rear of the VB car showing position of light bulbs and rear windows.