Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

RAILWAY INVESTIGATION REPORT
R05Q0040

CROSSING COLLISION

VIA RAIL CANADA INC.
TRAIN 603
MILE 175.86, SAINT-MAURICE SUBDIVISION
MONET, QUEBEC
22 AUGUST 2005

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Railway Investigation Report

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Mile 175.86, Saint-Maurice Subdivision
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Summary

On 22 August 2005, at about 1915 eastern daylight time, westbound VIA Rail Canada Inc. train 603 collided with a tractor-trailer loaded with logs at a private crossing at Mile 175.86 of Canadian National's Saint-Maurice Subdivision. The locomotive and three of the four cars derailed. A train crew member and a Canadian National foreman riding on the locomotive were slightly injured. Approximately 1900 litres of locomotive fuel was spilled.

Ce rapport est également disponible en français.

Other Factual Information

At 1200 eastern daylight time[1] on 22 August 2005, VIA Rail Canada Inc. (VIA) train 603 (the train) departed Hervey, Quebec, bound for Senneterre, Quebec. Two locomotive engineers and a Canadian National (CN) foreman were on board the locomotive. One on-board service employee and 18 passengers were in the cars. All employees were qualified for their respective positions and met rest and fitness requirements.

While approaching the private crossing at Mile 175.86 (see Figure 1), located near the station at Monet, Quebec, the locomotive engineer suddenly saw a tractor-trailer entering the crossing from the south. The locomotive engineer had no time to sound the whistle or apply the brakes, and the locomotive struck the trailer, which was loaded with logs. The locomotive derailed and came to rest canted to one side beside the track. The locomotive fuel tank ruptured and about 1900 litres of diesel fuel spilled into the ditch. The first three cars derailed but remained upright on the track. The heavy truck tractor was pushed into the ditch on the north side of the crossing with only minor damage, and the trailer was completely destroyed.

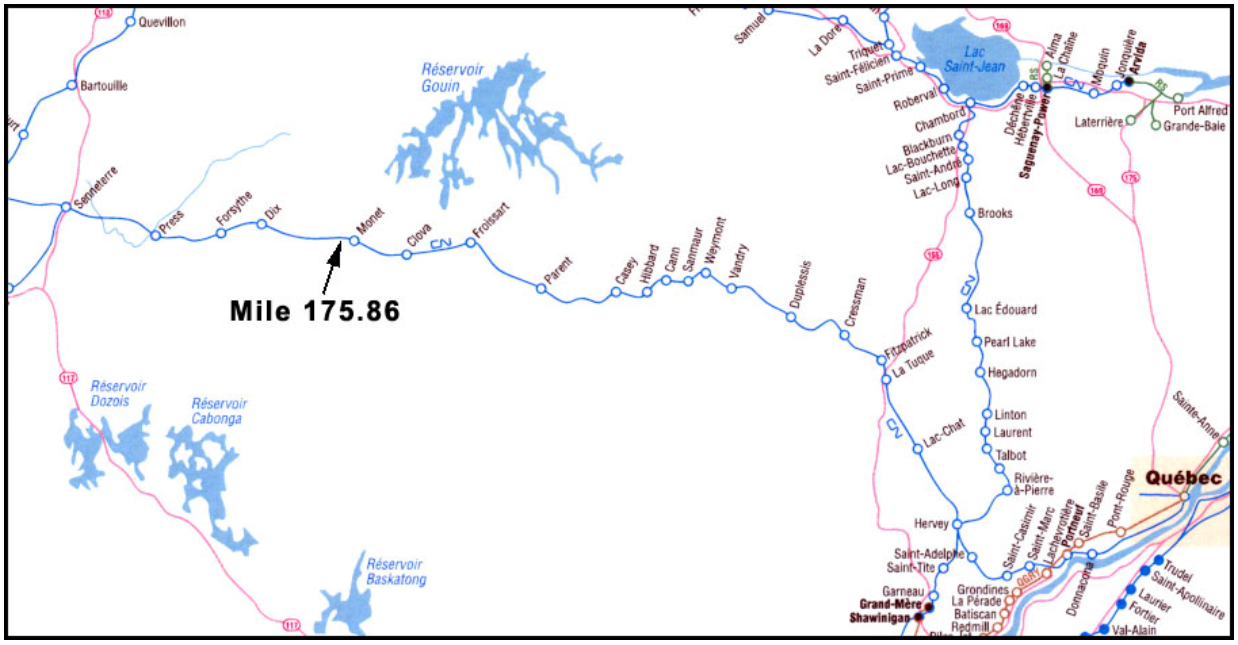

Figure 1. Accident site

No passengers were injured, and they evacuated the train without incident under the supervision of the on-board service employee. One of the two locomotive engineers and the CN foreman were injured. A nurse travelling on the train administered first aid before they were transported by ambulance to the hospital at Senneterre, some 160 km away. The driver of the tractor-trailer was not injured.

The locomotive event recorder indicated that the train was travelling at 51 mph and the throttle was in position No. 2. The emergency brake application was initiated from the train brake pipe. The temperature was 14°C, the sky was partly cloudy and visibility was good.

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1 All times are eastern daylight time (Coordinated Universal Time minus four hours).

The heavy truck had a combined maximum gross weight of 29 000 kg and was 2.9 m wide and approximately 21 m long. Highway controllers from the *Société de l'assurance automobile du Québec* (Quebec's automobile insurance agency) reported that the post-accident examination of the tractor-trailer revealed no defects. The heavy truck tachograph indicated 50 km/h at the time of the collision.

On the day of the accident, the truck driver started his shift around noon. At about 1900, he picked up a trailer loaded with logs in a felling area about 2 km south of the track and started out for Senneterre. Shortly after he left, he met two other trucks not far from the crossing at Mile 175.86, and he squeezed right to let them pass. The driver did not stop at the stop sign or slow down before entering the crossing, and he did not see the train.

The driver knew the route and had made one or two round trips a day since the beginning of the month. He was paid by the hour, not by the load. He was off duty the week before the accident and had a good night's sleep. He was in compliance with the duty and rest time standards prescribed by the Quebec *Highway Safety Code*. The police report prepared by *Sûreté du Québec* (Quebec provincial police) officers does not indicate any unusual behaviour or condition exhibited by the driver.

The driver held a valid Class 1 licence, which is mandatory for tractor-trailer drivers. He had 92 months of experience driving heavy trucks and had been working for Pointe-Nor Inc. of Senneterre since 16 May 2005. Pointe-Nor Inc. hauls logs for a logging company over a distance of about 160 km from the felling areas to saw mills and paper mills.

The instructions issued by the logging companies and their subcontractors required the truckers to maintain contact with other forestry vehicles and radio their location on citizen's band (CB) and very high frequency (VHF) radios. The truckers were not advised of the probable train schedule and had no direct contact with the trains. They had to assume that a train could go by at any time.

The logging road leading to the crossing at Mile 175.86 was owned by the paper producer Smurfit-Stone of La Tuque, Quebec, and was operated by Abitibi Consolidated Inc. of Senneterre. Traffic volume consisted of five logging vehicles per hour. The planking on the crossing measured 9.75 m in length and was in good condition. The road was 6.75 m wide and crossed the track at right angles. Being a private crossing, it was not subject to Rule 14(l) of the *Canadian Rail Operating Rules* (CROR) and trains were not required to sound the whistle.

Stop signs, at a height of 1.8 m, were installed on both sides of the track at a distance of 4 m from the rails on the south side and 8 m from the rails on the north side. They were visible from about 75 m from the crossing. Advance stop signals were posted about 400 m from the crossing. The road was level on the south approach, and the north approach had a 4 per cent ascending gradient in the immediate vicinity of the track. The terrain on both sides of the road was wooded right up to the stop signs.

For a truck stopped at the stop signs, the sightlines measured from the driver's seat were as follows:

Measured Sightlines from Stop Signs		
	Northbound Vehicle	**Southbound Vehicle**
Looking Eastward	500 m	90 m
Looking Westward	135 m	470 m

The day after the accident, the occurrence was reconstructed using a heavy truck similar to the one involved in the collision. The dimensions and positions of the side mirrors and cab A-pillar relative to the driver were similar. The reconstructed scenario revealed that the mirrors and cab A-pillars obstructed the sightlines when the truck was stopped at the stop sign. In these conditions, a passenger train could not be seen until it was 30 m from the crossing.

The Saint-Maurice Subdivision runs from Fitzpatrick (Mile 0.0) to Senneterre (Mile 256.9), and consists of a single main track. Train movements are governed by the Occupancy Control System (OCS) in accordance with the CROR, and are supervised by a rail traffic controller based in Montréal, Quebec. Daily traffic volume on this subdivision is about two or three freight trains and one passenger train. In the accident area, the maximum speed is 50 mph for passenger trains and 40 mph for freight trains. The track is tangent and runs east-west, with an east-to-west ascending gradient of 0.1 per cent between Mile 175.3 and Mile 175.9.

Between Fitzpatrick and Senneterre, the Saint-Maurice Subdivision crosses over 600 km of logging roads in the Abitibi-Témiscamingue and Haute-Mauricie regions. The track is intersected by 18 public crossings and 28 private crossings, 10 of which are owned by logging companies.

Logging roads are used by natural resources industry vehicles and by other vehicles used for recreational purposes. Road maintenance and the enforcement of the provincial *Highway Safety Code* are the responsibility of the logging companies. The speed of logging vehicles is checked regularly when the vehicle tachographs are read, but there is no system for monitoring compliance with stop signs. The *Sûreté du Québec* does not patrol logging roads much because of the distances involved and their limited radio coverage. *Sûreté du Québec* officers patrol logging roads within the range of their radio base stations, and they only go beyond that range in extreme emergencies.

CN maintenance staff and train crews reported that most truckers and other drivers do not obey the posted signs and drive through crossings without stopping. The truckers operating on the logging roads are convinced that they would not have time to clear the crossing if a train was coming. They also confirmed that the common practice is to slow down rather than make a full stop at crossings with stop signs posted, so they can accelerate faster and minimize their exposure time on the track.

Depending on where cutting operations are going on at any given time, traffic volume on the different logging roads can vary considerably. Sudden increases resulting in traffic volumes of up to 24 vehicles per hour have been observed by train crews and other railway employees. These abnormal situations have prompted CN personnel to voice their concerns to their local joint workplace safety and health committee regarding safety at private crossings.

In spring 2005, following a safety assessment, CN modified its signage and erected whistle signs at six private crossings where safety was considered inadequate. All these crossings were in the Senneterre area, but the crossing at Mile 175.86 was not included because no cutting was going on in the immediate area of that crossing when the assessment was done.

Further to its regulatory mandate and pursuant to the *Railway Safety Act*, Transport Canada (TC) undertook a review of the regulations governing crossings to better address current needs. As a result, several preliminary drafts of the Grade Crossing Regulations and the companion document entitled "RTD 10 – Road/Railway Grade Crossings: Technical Standards and Inspection, Testing and Maintenance Requirements" (RTD 10) have been written, the most recent dating from December 2002.

Under RTD 10, the minimum sightline distances ($D_{Stopped}$) for the type of vehicle and the crossing involved in this accident should be calculated as follows (see Appendix A):

- southbound vehicle:

  $D_{Stopped}$ = 1499 feet = 457 m

- northbound vehicle:

  $D_{Stopped}$ = 941 feet = 287 m

Under the program put in place by TC for crossing supervision, about 5 per cent of crossings are to be inspected annually. Inspections under this program are detailed inspections designed to assess crossing safety, gather data on road and rail traffic, and evaluate such elements as the condition of the roadway and approaches, the road surface, sightlines, and signal system condition. TC adopted a risk-based approach, and therefore assigns greater priority to public crossings and locations about which complaints have been made or where accidents have occurred.

As a result, detailed inspections are rarely conducted at private and farm crossings. They may, however, be examined by a TC infrastructure inspector during the course of a track inspection. These summary inspections include the condition of the planking and whether or not vegetation is growing immediately adjacent to the crossing, but sightlines are not measured. The crossing at Mile 175.86 had never been thoroughly inspected, but it was inspected in November 2004 by the rail infrastructure inspector and no deficiencies were reported.

As written, the draft Grade Crossing Regulations would require road authorities and railways to do periodic detailed safety assessments of some road-railway crossings, including those on private roads maintained by logging or mining companies. Detailed safety assessments must be conducted before a new crossing is built or whenever a significant change occurs in the use of

the intersecting road or the railway operation that could adversely affect safety at the crossing. Any responsible authority that is aware of a condition or situation that could compromise safety at a crossing must notify the responsible authorities and conduct a joint detailed safety assessment within a reasonable period of time.

In April 2005, TC released a document entitled *Canadian Road/Railway Grade Crossing Detailed Safety Assessment Field Guide* (TP 14372E). The purpose of the guide is to assist individuals in conducting a safety assessment of crossings in accordance with the draft Grade Crossing Regulations. It provides an overview of the safety assessment objectives and process, guidelines for selecting an assessment team and developing a program, and methodologies for conducting crossing assessments.

Analysis

The truck and the physical condition of the truck driver did not contribute to the accident. The analysis will therefore focus on the driver's actions, the sightlines at the crossing, *Highway Safety Code* enforcement on private roads, and the effect of changes in logging traffic on crossing safety.

In the southwest and northeast quadrants, the sightlines at the crossing did not comply with the draft RTD 10, but they were adequate in the southeast and northwest quadrants. The sightline was 500 m in the southeast quadrant, where the truck was coming from; consequently, a truck driver would have had ample time to stop at the stop sign, observe the track to see if it was clear, and safely move through the crossing. However, the driver did not stop at the stop sign, and he maintained constant speed on the approach to the crossing while the train was coming.

Because the roadside area was wooded right up to the immediate vicinity of the track, the driver could not see along the track beyond the road right-of-way, and therefore he could not see the approaching train. After passing the stop sign, the truck travelled the crossing clearance distance plus a portion of the vehicle length before impact, that is, some 20 to 25 m. As the vehicle was travelling 13.8 metres per second (m/s), it covered this distance in less than 2 seconds, which did not give the locomotive engineer enough time to sound the whistle or apply the brakes before the locomotive struck the trailer loaded with logs.

Since the speed of the train was 22 m/s, it must have been approximately 30 to 40 m from the crossing. At that point, the train was probably partially masked by the tractor cab A-pillar and side mirror.

The truckers who ply the logging roads were convinced that they would not have time to clear the crossing if a train came, and they therefore adopted practices that did not comply with the existing signage. They slowed down instead of stopping completely at crossings with stop signs. These practices are widespread, since only the speed of logging vehicles is checked regularly when the tachographs are read, and compliance with stop signs and other rules of the road is not consistently monitored by the *Sûreté du Québec* or commercial operators. This lack of enforcement does not foster driver compliance with the rules of the road, and thereby increases the risk to the public.

Although truckers had to take into account that a train could come along at any time and were not advised of the probable train schedule, the driver did not take any particular precautions when approaching the crossing. The driver often went through crossings without seeing a train, given the low volume of rail traffic in the area where he worked. As a result, it is possible that he became desensitized to the risk posed by rail traffic. When individuals are repeatedly exposed to risk but experience no adverse consequences, they gradually transition from a state of alertness and preparedness to a relaxed or normal state. Being exposed to risk with no adverse effects, the person pays less and less attention to the source of the risk, particularly if the indicators that reveal the presence of the risk do not change significantly.

Operating a tractor-trailer is a complex activity in which the driver may be required to perform several conflicting tasks, leading to inadequate observation of driving conditions. Studies show that inadequate observation is a factor in 23 per cent of all traffic accidents.[2] The driver knew the road and was aware of the crossing. However, he had just met other vehicles and had to pull over to the right to let them go by on the narrow road. He was concentrating on that manoeuvre, and this distracted him from the other tasks that he was required to perform before entering the crossing. His customary behaviour was therefore altered, and as a result, contrary to the common practice on these roads, he did not slow down.

Depending where cutting operations are going on at any given time, vehicle traffic volume on the different logging roads can vary considerably and can create unsafe conditions at private crossings, as reported by CN employees. Following a safety assessment, CN made specific improvements at the crossings where safety was deemed inadequate. However, the other crossings affected by the changing traffic volumes, including the crossing at Mile 175.86, were not considered because there was no mechanism in place to formally analyze risks before a felling operation is relocated and no dialogue between the parties concerned.

TC inspection programs are based on risk. As a result, detailed inspections are rarely conducted at private crossings, even though the volume of traffic can fluctuate considerably and create unsafe conditions when felling operations are relocated. However, the draft Grade Crossing Regulations require road authorities and railways to conduct periodic detailed safety assessments on certain road/railway crossings, including those on private roads maintained by logging companies. The assessments are required when a significant change occurs in road use or railway operations that could adversely affect safety at the crossing. When implemented, this initiative should reduce the risk of crossing accidents.

Findings as to Causes and Contributing Factors

1. In the quadrant that the tractor-trailer was coming from, the sightline was adequate and would have allowed the driver to stop at the stop sign, observe the track to see if it was clear, and safely move through the crossing. However, the driver did not stop and drove his vehicle into the crossing while the train was approaching.

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2 John E. Lee, *Review of Human Factors and Ergonomics*, Chapter 4, Driving Safety.

2. The driver often went through crossings without seeing a train, given the low volume of rail traffic in the area where he worked. As a result, it is possible that he became desensitized to the risk posed by rail traffic.

3. The driver was distracted from the other tasks that he was required to perform before entering the crossing. His customary behaviour was therefore altered, and as a result, he did not stop nor slow down.

Findings as to Risk

1. On some tractor models, the side mirror and cab A-pillar create a blind spot that can obstruct the driver's view at a crossing and mask an approaching train.

2. In the southwest and northeast quadrants, the sightlines at the crossing did not comply with the draft "RTD 10 – Road/Railway Grade Crossings: Technical Standards and Inspection, Testing and Maintenance Requirements." As a result, they would not allow a heavy vehicle stopped at the stop sign to proceed safely through the crossing if a train was coming.

3. The lack of *Highway Safety Code* enforcement at crossings does not foster driver compliance with the rules of the road, and thereby increases the risk to the public.

4. Even though the volume of traffic on logging roads can fluctuate considerably and create unsafe conditions at crossings, there was no mechanism in place to formally analyze risks before felling operations are relocated and no dialogue between the parties concerned.

5. The periodic detailed safety assessments called for in the draft Grade Crossing Regulations will permit more effective management of significant changes in road use or rail operations, thereby reducing the risk of accident at crossings.

Other Finding

1. Because the roadside area was wooded right up to the immediate vicinity of the track, the train crew did not see the truck until it entered the crossing. Consequently, the locomotive engineer had no time to sound the whistle or apply the brakes before the locomotive struck the trailer loaded with logs.

Safety Action Taken

The crossing sightlines were improved on both sides of the crossing by cutting additional brush and trees. The safety instructions of the logging company responsible for harvesting were reinforced and emphasis was put on the strict compliance with the stop signs at crossings. Furthermore, all drivers of loaded trucks must stop at the south side of the crossing and drop a copy of the load waybill in a box installed at the crossing.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 27 September 2007.

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Appendix A – Minimum Sightline Distances

Minimum sightlines can be calculated using the draft "RTD 10 – Road/Railway Grade Crossings: Technical Standards and Inspection, Testing and Maintenance Requirements." For a crossing with stop signs, the minimum sightline can be designated $D_{Stopped}$, which is a length of track calculated from the grade crossing that is equal to the distance that a train will travel at the maximum railway operating speed in the time it takes for a design vehicle to traverse the clearance distance.

$D_{Stopped} = 1.47 \times VT \times T_d$ where VT is the maximum train speed and T_d is the departure time.

> Departure time T_d is the time required to cover the crossing clearance distance. The departure time takes into account the specific characteristics of the crossing (for example, road gradient) and the time required for the driver to look in both directions along the rail line and put the vehicle in motion. The crossing clearance distance is the distance from a point in advance of the crossing, 5 m from the closest rail, to a point 2.4 m beyond the farthest rail. The total distance that the vehicle must travel to completely clear the crossing is the sum of the clearance distance and the vehicle length.
>
> Departure time T_d =T+J+G
> T = acceleration time on horizontal roadway
> J = 2-second perception and reaction time
> G = effect of road gradient

For the type of vehicle and the crossing involved in this accident, the following characteristics were identified:

- Crossing clearance distance: 8.9 m
- Length of tractor-trailer: 21 m
- Acceleration time on horizontal roadway to completely clear the crossing: T = 10.8 s

$D_{Stopped}$ for a southbound vehicle:

> 4% ascending gradient, so the time is increased by 170%
> Departure time T_d = 20.4 s
> $D_{Stopped} = 1.47 \times VT \times T_d$
> $D_{Stopped}$ = 1499 feet = 457 m

$D_{Stopped}$ for a northbound vehicle:

> No gradient (0%)
> Departure time T_d = 12.8 s
> $D_{Stopped} = 1.47 \times VT \times T_d$
> $D_{Stopped}$ = 941 feet = 287 m