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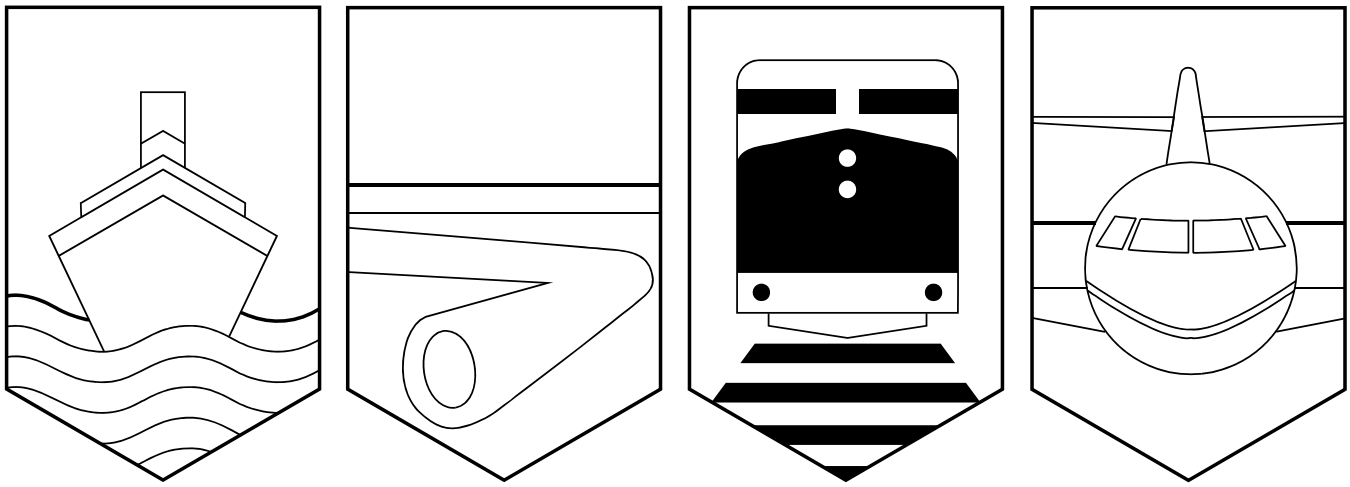

RAILWAY OCCURRENCE REPORT

CROSSING ACCIDENT

CANADIAN NATIONAL
TRAIN NO. 313-1M-14
MILE 47.48, MONT-JOLI SUBDIVISION
CAUSAPSCAL, QUEBEC
14 DECEMBER 1994

REPORT NUMBER R94M0100

Canada

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Canadian National
Train No. 313-1M-14
Mile 47.48, Mont-Joli Subdivision
Causapscal, Quebec
14 December 1994

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Synopsis

At approximately 1300 eastern standard time (EST), 14 December 1994, a trailer loaded with wood chips disengaged from a tractor-trailer on the public crossing at Mile 47.48 of the Canadian National (CN) Mont-Joli Subdivision in Causapscal, Quebec. At approximately 1410 EST, westward train No. 313-1M-14 struck the trailer, derailing the locomotive consist and several cars. The derailed train continued on, damaging the bridge over the Matapédia River just west of the crossing, resulting in the trailing locomotive and nine cars falling onto the river bank. No dangerous goods were involved and no one was injured. The rail traffic controller supervising rail traffic on this section of track was aware that the track was obstructed.

The Board determined that the obstructed track was not blocked from use on the computer-assisted train control system as required by company procedures. Thus, the train was inadvertently given clearance to proceed and it struck the truck trailer on the track.

Ce rapport est également disponible en français.

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1.0 Factual Information

1.1 The Accident

Train No. 313-1M-14 (train 313) departed Matapédia, Quebec, at approximately 1230[1], bound for Rivière-du-Loup, Quebec. At approximately 1410, as the train approached the public crossing at Mile 47.48 of the Mont-Joli Subdivision in Causapscal, Quebec, a large trailer loaded with wood chips was obstructing the track at the crossing. The locomotive engineer initiated an emergency brake application. The locomotive engineer and the conductor then threw themselves on the floor of the locomotive operating compartment.

The train struck the trailer, and the lead locomotive unit continued onto the railway bridge, beyond the crossing, before coming to a stop in a derailed condition on the west end of the bridge. After contact, flying wood chips obscured the accident scene. When the flying debris had settled, it was discovered that the eastern span of the three-span bridge had collapsed and that the second locomotive and nine cars had fallen to the river below.

1.2 Injuries

There were no injuries.

1.3 Damage to Equipment

Nine freight cars were destroyed and two locomotives sustained extensive damage.

1.4 Other Damage

Approximately 800 feet of track was destroyed. One of the three spans of the bridge was destroyed.

The tractor-trailer was destroyed.

1.5 Personnel Information

The train crew consisted of a conductor and a locomotive engineer, positioned in the lead locomotive. Both were qualified for their respective positions and met fitness and rest requirements established to ensure the safe operation of trains.

[1] All times are eastern standard time (Coordinated Universal Time (UTC) minus five hours) unless otherwise stated.

1.6 Train Information

The train included 2 locomotives, 16 loaded cars and 7 empty cars. It weighed about 1,700 tons and was approximately 1,300 feet in length.

1.7 Occurrence Site Information

1.7.1 The Crossing

The Mont-Joli Subdivision stretches westward from Campbellton, New Brunswick (Mile 0.0), to Rivière-du-Loup, Quebec (Mile 188.8). The maximum permissible train speed for freight trains at Mile 47.48 is 45 mph. At the point of the collision, the single track is level and tangent.

The road at the crossing is lightly used and generally runs between the rail track and the Matapédia River. Westbound vehicles must make a 90-degree turn to access the crossing. A VIA Rail Canada Inc. (VIA) station is immediately north-east of the crossing. The crossing is equipped with automatic warning devices (flashing lights and bell).

Road conditions at the time of the accident were good, but the surface was snow-covered.

1.7.2 Post-Accident Description

The first span of the three-span bridge completely collapsed. The trailing locomotive came to rest on its side on the dry river bottom on the north side of the bridge. The nine cars were piled up between the crossing and the first bridge support at various angles. Several cars loaded with logs lost their lading which was scattered throughout the derailed locomotive and cars. The east end of the last derailed car was just west of the crossing, canting downwards on the river bank.

1.8 Method of Train Control

1.8.1 General

Train movements on the subdivision are governed by the Occupancy Control System (OCS) authorized by the Canadian Rail Operating Rules (CROR) and supervised by a rail traffic controller (RTC) located in Montreal, Quebec.

1.8.2 Computer-assisted Train Control System

With the computer-assisted train control system, the RTC is able to electronically issue, cancel, cancel and re-issue five types of clearances and enter train locations. Entrance and exit limits, restrictions and bulletin numbers are entered semi-automatically. The computer program verifies the permissibility of a requested clearance and generates completed clearances. The database is automatically updated whenever a clearance is issued, cancelled or fulfilled.

1.9 Weather

The temperature was minus 20 degrees Celsius with light winds and clear visibility.

1.10 Recorded Information

The event recorder on the lead locomotive malfunctioned and could not provide data. However, the event recorder from the trailing locomotive recorded a sudden loss in brake pipe pressure at a time of 1511:30, while the train was travelling at 39 mph in throttle position No. 5, before being reduced to the "idle" position. Forward motion dropped dramatically at a time of 1511:49 (27 mph to 7 mph), and forward motion ceased at a time of 1511:54.

1.11 Other Information

1.11.1 The Trailer

The trailer was approximately 15 metres in length and weighed approximately 30,000 kilograms.

1.11.2 The Truck Driver

The truck driver arrived at a factory, near the crossing, at approximately 1230. While in the factory yard, he disconnected the trailer but noted that the hydraulic system was frozen such that the trailer could not be unloaded. In order to allow the system to thaw, he reconnected the trailer to move it to a garage. He verified that the trailer was properly coupled by moving the rig in a forward direction and applying the trailer brakes. Once he was satisfied that the trailer brakes applied and that the trailer remained connected, he departed for the garage. He did not visually inspect the hook-up between the jaw of the fifth wheel and the kingpin of the trailer.

At approximately 1300, the driver turned onto the crossing, the trailer disengaged from the tractor and dropped onto the road surface, completely blocking the crossing. The truck driver immediately alerted CN employees, working near the Causapscal VIA station, of the positioning of the trailer relative to the crossing and was informed by one of the CN employees that the appropriate authority had already been notified. The driver then returned to the scene and awaited the arrival of his supervisor.

The train arrived while the driver and his supervisor were attempting to lift the trailer with a front-end loader. They had cleared the area upon the activation of the automatic warning devices.

1.11.3 Disengagement

To connect the trailer and the tractor, the kingpin of the trailer must be set into the jaws of the fifth wheel of the tractor. The driver must perform a visual examination underneath the tractor-trailer to verify that the connection between the kingpin and the fifth-wheel jaws has been made.

Trailers can travel considerable distances with an incomplete connection. Sharp turns can trigger the disengagement of the trailer and the tractor, if the connection is not complete.

In this instance, the fifth-wheel device was found to be operating as designed after the disengagement. The extreme cold, however, had thickened the lubricant on the mating surface and the locking mechanism, impairing the movement of the jaws.

1.11.4 The Track Foreman

At approximately 1230, the work gang foreman working at Causapscal advised the RTC responsible for the Mont-Joli Subdivision that the main track was blocked by a trailer and that efforts were being made to remove it from the track. He further advised that he would notify the RTC when the removal was completed. The foreman relied solely on the RTC to ensure that movements in both directions were stopped before reaching the blocked crossing.

At approximately 1312, the foreman received a call from the RTC requesting an update. The foreman advised the RTC that the obstruction was not yet removed; however, he estimated that it would be removed within 10 minutes.

1.11.5 Rail Traffic Control

1.11.5.1 Rail Traffic Controller

In addition to controlling train movements on 10 subdivisions, the RTC had to provide protection for track maintenance activities, report all known defects or unsafe track conditions to the appropriate personnel, plan and prioritize such activity, receive and issue additions to the Tabular General Bulletin Order (TGBO) or receive and issue General Bulletin Orders (GBOs)[2], issue and cancel clearances, respond to requests for Track Occupancy Permits (TOPs) not to come into effect until the following day, and field any other communication from any moving train operating on any subdivision for which he/she is responsible. Performing the various duties of the RTC demanded high levels of concentration.

1.11.5.2 Rail Traffic Controllers' Manual

The CN *Rail Traffic Controllers' Manual* outlines that, when advised of a dangerous condition, the RTC must:

1. apply blocking to prevent any trains from entering the point where the condition exists,

2. issue a GBO to the crew on the train approaching the point where the condition exists,

3. apply blocking behind the train when the GBO has been issued to the crew on the approaching train.

1.11.5.3 Issuing Blocking

Known as JJJ protection, the function of issuing blocking allows an RTC to take a section of track out of service or protect against any situation that could interfere with train operation. Both the application and cancellation of a JJJ protection simply involve the calling up of two screens and the use of several prompts. A narrative is required to briefly explain the reason for the protection.

[2] GBO - Instructions regarding track condition restrictions and other information which affect the safety and movement of a train or engine. A GBO applies in the OCS and Centralized Traffic Control System (CTC). It may also apply in other methods of train control where specified in special instructions.

1.11.5.4 Recorded RTC Action

At 1236, as indicated by the RTC voice recording, the RTC received notification of the blocked crossing from the track foreman. The RTC immediately notified Work Extra 3557, operating under a clearance (No. 1664) allowing movement between Mile 33.0 and Mile 48.0, of the obstruction. The RTC was advised by the crew members of Work Extra 3557 that they were in the siding at Causapscal, Mile 47.0. The RTC did not apply blocking in the computer system to protect train movement at the crossing.

At 1317, the RTC issued clearance No. 1675, authorizing train 313 to proceed from Mile 24.0 to Mile 47.0 and to protect against Work Extra 3557 between Mile 33.0 and Mile 47.0 (i.e., radio Work Extra 3557 for permission to proceed prior to passing Mile 33.0).

At 1318, Work Extra 3557 radioed the RTC to inquire into the location of train 313. They reminded the RTC that they could not contact train 313 by their train radio to give them permission to enter their limits. The blocked crossing was discussed. The RTC advised them to proceed eastward to Sainte-Florence, Mile 41.0, make contact with train 313, and take the siding at Mile 41.0 to allow train 313 to proceed. The RTC further advised Work Extra 3557 to call him once in the siding at Sainte-Florence. At 1358, after contact from Work Extra 3557 in Sainte-Florence, the RTC cancelled clearance No. 1664, authorizing Work Extra 3557 to operate between Mile 48.0 and Mile 33.0. At 1401, he entered data into the computer indicating that train 313 was at Mile 41.0 and, at 1404, issued clearance No. 1680 allowing train 313 to proceed from Mile 41.0 to Mile 76.0 with no restrictions.

At 1410, the RTC received a call from train 313 advising that their train had derailed.

1.11.6 Train 313 and Work Extra 3557

Train 313 proceeded to Mile 32.5 and stopped as they were unable to contact Work Extra 3557 to gain permission to enter their work limits. Work Extra 3557, proceeding eastward, established contact with train 313 when they were in the vicinity of Mile 44.0. At that time, they authorized train 313 to proceed to Mile 41.0. After Work Extra 3557 cleared the main track at Mile 41.0, the crew members conversed with the crew of train 313 and gave them authority to proceed within their (Work Extra 3557) limits to Mile 48.0. The locomotive engineer of train 313 then reminded the crew of Work Extra 3557 that his limits only allowed him to proceed to Mile 47.0. The crew of Work Extra 3557 did not mention that the track was blocked at Mile 47.0.

1.11.7 Risk Assessment

RTCs are constantly assessing risks and hazards while controlling train movements. There is no formal training offered geared toward improving their risk assessment abilities. Their initial training, coupled with their experiences gained on the job, form the basis of their risk assessment capabilities.

1.11.8 Situational Awareness

"Situational awareness can be defined as all the knowledge that is accessible and can be integrated into a coherent picture, when required, to assess and cope with a situation."[3] A person performing a complex job in a continuously changing environment, such as an RTC, depends upon situational awareness when making and implementing plans to control rail movements. Situational awareness for an RTC is about perceiving information from a number of sources and coordinating that information to expedite the movement of trains and minimize conflict with other users of the rail system.

Situational awareness does not happen instantaneously, but develops on three different levels. First, the person, in this case, the RTC, has to perceive the situational elements from information displays and radio communications. The person then integrates the information by using his/her experience and knowledge. Finally, the person projects the information into the future to make and/or revise plans as tasks are completed or delayed and new developments arise.

One of the prerequisites to achieve situational awareness is an appropriate mental model of how aspects of the situation, in this case, the RTC, the rail system, and users of the system, interact and affect each other. Situational awareness is impaired when the mental model is faulty due to inadequate or incomplete information. It is also impaired when a delay in carrying out a task is imposed by distractions or the requirement to attend to other tasks, and results in the abandonment of the original task.

1.11.9 RTC Training

The CN RTC training program included two phases: theoretical and practical. The theory facet, of approximately eight weeks duration, was presented at the CN training facility in Gimli, Manitoba. Student RTCs were evaluated in precision, rules appreciation, stress factors and reaction, planning, flexibility, adaptability and personality. The students also received a general evaluation of their performance during CTC and OCS simulations. The practical phase of the RTC training was conducted in the home terminal where each RTC was observed and evaluated performing RTC duties.

The RTC supervising rail movements on the Mont-Joli Subdivision at the time of the occurrence received training in Gimli from 20 March 1989 to 27 April 1989. He gained satisfactory ratings in all aspects of RTC duties of his final assessment. It was noted throughout, however, that he encountered

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[3] N.B. Sarter and D.D. Woods, "Situation awareness: A critical but ill-defined phenomenon," *The International Journal of Aviation Psychology*, 1 (1) (1991), pp. 45-57.

difficulties in applying the required blocking when issuing authorities and that, in his final CTC simulation, he "still encountered problems with forgetting to apply blocking."

The practical phase of his training in Moncton, New Brunswick, over a month period, resulted in a satisfactory rating.

2.0 Analysis

2.1 Introduction

The train was operated in accordance with company procedures and government safety standards. The crew received authorization to proceed past the accident location although the RTC had been made aware that the crossing was obstructed. The analysis will therefore focus on the actions taken by the RTC upon learning of the obstructed track condition. The general conduct of the other railway employees, having knowledge of the blocked track, and the operation of the truck will also be explored.

2.2 RTC Actions

In the existing situation, procedures required the RTC to apply immediate blocking to the affected track to ensure that clearances over the crossing could not be issued. Although the RTC had intended to apply blocking, he delayed its application to deal with other tasks, relying on his memory to ensure safe train movement. Despite indications about the obstructed track on at least two occasions, he continued to rely on his memory and delayed any intention to block. As the delay prolonged and his workload increased, his intention to apply blocking was reduced by the other tasks to the point where he forgot about blocking completely. Had the RTC applied blocking as required, he would have put in place a defence far more reliable than memory that would have ensured consideration of the obstructions in future clearances and helped him maintain good situational awareness.

During the RTC's training at Gimli, instructors noted that he encountered difficulties in applying correct blocking. This tendency did not, however, manifest itself in field training or in his subsequent duties. It cannot be said, therefore, that training requirements were not sufficient to meet operational needs although it is apparent that an identified and apparently uncorrected deficiency did in fact re-surface.

2.3 Tractor-Trailer Connection

By not visually examining the hook-up between the fifth-wheel jaw of the tractor and the kingpin, the driver of the tractor-trailer did not confirm that the proper connection had been made and that the operation of the unit could be made safely. The incomplete connection resulted in the disengagement of the trailer from the tractor as the driver negotiated the sharp curve onto the crossing.

Collisions between commercial vehicles and trains at crossings at grade with life-threatening consequences are a continuing area of concern.

2.4 Action of the Track Foreman

The track maintenance foreman discussed the crossing problem with the RTC and made arrangements to call the RTC when the vehicle was clear, but all concerns about trains approaching the hazard were left to the RTC. He met the minimum CROR requirement.

2.5 Crew Coordination

The nature of railway operations and culture is such that the RTC is responsible to direct train movements safely and efficiently, and other employees, such as train crews and maintenance-of-way forces, do not question, discuss or otherwise consider the RTC actions. Furthermore, the RTC does not offer explanation or enter into any extraneous communication relative to his/her duties and decisions.

Although the RTC, the maintenance-of-way employees and the crew of Work Extra 3557 were aware that the crossing was blocked by the trailer and that efforts were underway to remove the trailer, exchange of the information required to ensure an appropriate awareness of the situation on the part of all involved was lacking. When the RTC issued clearance No. 1675 for train 313 to proceed to Mile 47.0, no mention was made of the obstruction at that location. When Work Extra 3557 allowed train 313 to enter their work limits to proceed to Mile 47.0, no mention was made of the blocked crossing. When the track foreman contacted the RTC to inform him that the crossing was blocked, no discussion ensued as to what process would be used to ensure that train movement over the crossing was stopped. He also did not feel the need to ask for track protection, such as a TOP, to place himself in a position to monitor progress of the trailer removal and advise approaching trains accordingly. Furthermore, approximately 60 minutes before the occurrence, the foreman informed the RTC that the recoupling would take 5 to 10 minutes and that he would call the RTC when the crossing was cleared. However, he did not call back the RTC to inform him that the recovery would take longer than his original estimate.

The essence of good crew coordination is the effective utilization of available resources to ensure the safe completion of the operation. Although there is no procedural or regulatory requirement for any of the individuals involved in this occurrence, other than the RTC, to further participate in the management of the situation, effective coordination and participation by all involved employees would have reduced the reliance of the safety management system on one individual and thereby would have increased the likelihood of a safe outcome.

3.0 Conclusions

3.1 Findings

1. The train was operated in compliance with company procedures and government safety standards.

2. The driver of the tractor-trailer did not visually ensure that the trailer was securely connected to the tractor before driving onto a public roadway.

3. The trailer separated from the tractor while making a 90-degree turn to access the crossing.

4. The rail traffic controller (RTC) did not take Mile 47.48 out of service in the computer-assisted train control system as required by railway procedure when informed by the foreman that the track was obstructed.

5. The RTC inadvertently authorized train 313 to proceed through and beyond the crossing.

6. There was insufficient exchange of information to ensure an awareness of the situation on the part of all involved.

7. Railway procedures and culture do not encourage crew coordination to maintain situational awareness.

3.2 Cause

The obstructed track was not blocked from use on the computer-assisted train control system as required by company procedures. Thus, the train was inadvertently given clearance to proceed and it struck the truck trailer on the track.

4.0 Safety Action

4.1 Action Taken

Following this occurrence, CN evaluated several factors regarding the rail traffic controller's (RTC) workload, including the amount and the complexity of the information to be treated, the task organization, the work area physical arrangement, and the individual factors (e.g. training). As a result of this evaluation, CN did minor reorganizing and redistribution of the RTC territory. In addition, supplemental training was given to the controller, and a close follow-up has been done to ensure continuing competency.

4.2 Safety Concern

In its 1993 report on a derailment at St. Lazare, Manitoba (R91W0189), the Board expressed concern about the extent to which communication breakdowns between operating crews, maintenance forces and RTCs were apparently contributing to railway occurrences. While it was recognized at that time that initiatives were being taken, especially in the training of CN maintenance forces in the aspects of teamwork, the Board believed that measures may have to be taken on a broader scale by the railways.

In complex situations involving many key participants, the more persons having an overall awareness of the evolving situation, the higher the likelihood that an oversight or failure by any one individual will be noticed. In this occurrence, a better exchange of information regarding the blocked crossing and the affected train movements would have given all persons involved an appreciation of the overall situation. This, in turn, could have prompted questions on the status of the crossing when the clearance to proceed was finally given to train 313.

The Board is concerned that the railway culture does not encourage the timely sharing of information vital to complete situational awareness. Without this extra layer of defence, the likelihood of occurrences such as this persists.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, Benoît Bouchard, and members Maurice Harquail, Charles Simpson and W.A. Tadros, authorized the release of this report on 13 December 1996.