

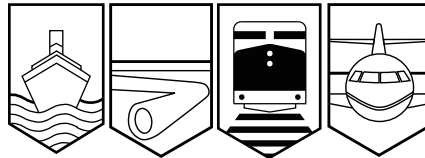
Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

RAILWAY INVESTIGATION REPORT

R00V0206



COLLISION

BETWEEN

CANADIAN PACIFIC RAILWAY FREIGHT TRAIN 401-10

AND

CANADIAN NATIONAL HI-RAIL TRUCK

MILE 65.05, CANADIAN NATIONAL ASHCROFT SUBDIVISION

MARTEL, BRITISH COLUMBIA

13 DECEMBER 2000

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

Collision

Between

Canadian Pacific Railway Freight Train 401-10

and

Canadian National Hi-rail Truck

Mile 65.05, Canadian National Ashcroft Subdivision

Martel, British Columbia

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Summary

On 13 December 2000, at 1231 Pacific standard time, westward Canadian Pacific Railway freight train 401-10 collided with an eastward Canadian National maintenance-of-way Hi-rail truck at Mile 65.05 of the Canadian National Ashcroft Subdivision. There were no injuries. The Hi-rail truck sustained considerable damage.

Ce rapport est également disponible en français.

Other Factual Information

On 13 December 2000, at 0937 Pacific standard time (PST),¹ a Canadian National (CN) maintenance-of-way (MOW) crew received a track occupancy permit (TOP) from a rail traffic controller (RTC) to occupy the main track between Basque and Martel, British Columbia, on the CN Ashcroft Subdivision (Figure 1).

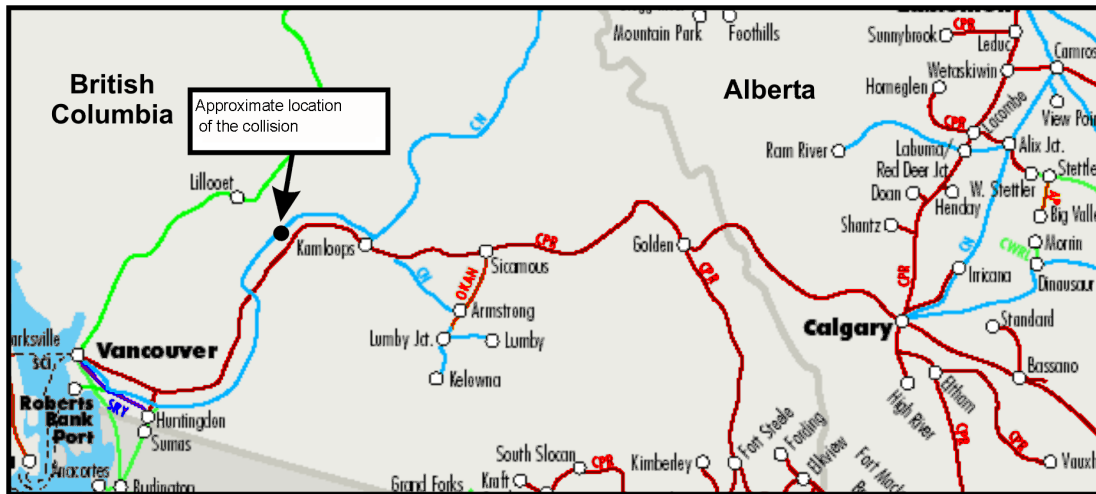


Figure 1. Location map

Shortly after 1000, the MOW crew cleared their Hi-rail truck from the main track at a public crossing at Mile 65.2. The crew foreman contacted the RTC and cancelled his TOP. The RTC advised him that he would have to wait for three trains (CN 415², CN 413 and CP 857) to pass before another TOP would be issued. The MOW crew travelled by road to Spences Bridge before returning to the crossing. CN 415 passed the crossing at approximately 1100.

After they returned to the crossing, the MOW crew observed CN 413 pass by at about 1145. The foreman made another request for TOP authority and the RTC advised that he would have to wait for one more train. CP 857 was aligned by the RTC from the Canadian Pacific Railway (CPR) Thompson Subdivision onto the CN Ashcroft Subdivision. It arrived at Coho, British Columbia, at 1206. In addition, the RTC lined up a fourth train, CP 401, on the same route, and it arrived at Coho at 1220.

After a westward CPR train with lead locomotive No. CP 9665 (CP 857) cleared his location, the foreman reported the train's passing to the RTC at 1224. The RTC advised him that he could only have the main track for about 40 minutes, as another westward train (CN 711) would be approaching Coho at about 1310. The RTC then issued a TOP to the foreman to occupy the main track between Signal 577 at Basque and Signal 677 at Martel behind CP 9665 West (CP 857) that had left Mile 65.2 at 1224. The TOP also contained an instruction to call the RTC before 1310. The

¹ All times are Pacific standard time (Coordinated Universal Time minus eight hours) unless otherwise indicated.

² References to train numbers (i.e., CN 415, CN 413, CP 401) denote a freight identification number used to describe the train service/schedule offered to rail customers. Since these identification numbers are not displayed on the train, the identity of each train is officially designated by referencing the lead locomotive initials, number and direction.

TOP was copied and repeated by the foreman and made complete by the RTC at 1227. All four MOW crew members, including the foreman, read and initialled the TOP, indicating that they understood its contents. Figure 2 depicts the area covered by the TOP limits.

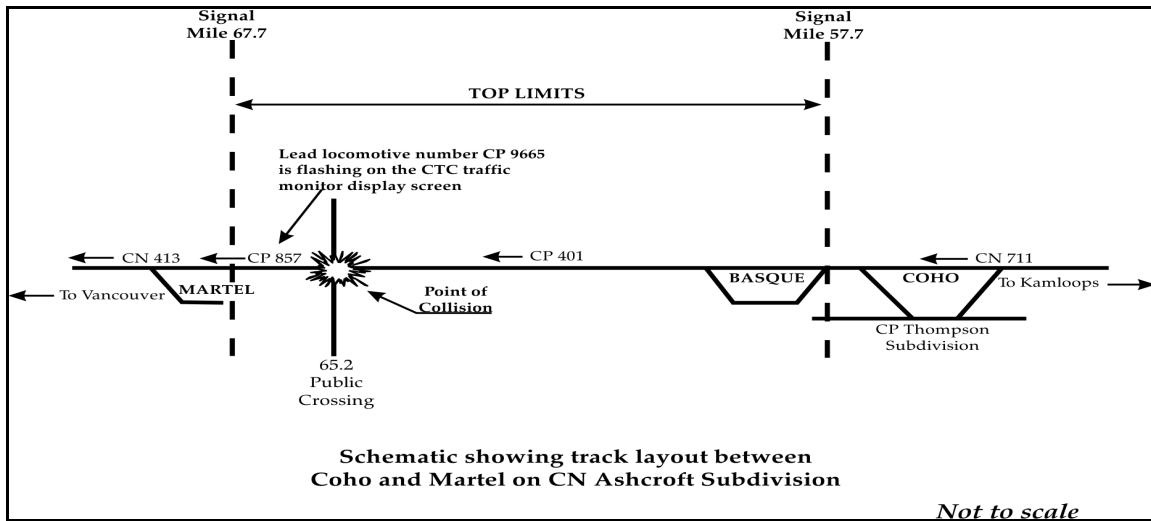


Figure 2. Schematic indicating TOP limits

The weather was cloudy, -14°C, with good visibility.

The MOW crew placed the Hi-rail truck on the main track at Mile 65.2 and were proceeding eastward when they observed a westward freight train rounding the curve ahead. The foreman stopped the Hi-rail truck. All crew members exited the vehicle and ran clear.

While CP 401 was travelling at a speed of about 38 mph, the crew observed the Hi-rail truck and the locomotive engineer placed the train brakes in emergency. The train struck the stationary Hi-rail truck at a speed of about 30 mph. The collision occurred at Mile 65.05 at 1231. At 1320, after conducting the required emergency procedures and removing the Hi-rail truck from the track, the foreman cancelled his TOP and rail traffic was restored.

There were no injuries to the MOW or train crews. The Hi-rail truck was severely damaged. The locomotive was not damaged. There was no track damage.

CP 401 comprised 2 locomotives and 15 loaded multi-platform container cars. It was 3250 feet in length and weighed 2380 tons. The train crew consisted of a locomotive engineer and a conductor, who were both located in lead locomotive CP 9119. They were qualified for their respective positions and met established fitness and rest standards. The train departed Kamloops, British Columbia, shortly after 1000. At approximately 1220, CP 401 was routed by the RTC from the CPR Thompson Subdivision onto the CN Ashcroft Subdivision at Coho, Mile 57.2 of the Ashcroft Subdivision. Approaching Coho, the crew announced their train identification number, location, signal indication and intended route on the CN standby channel as required by the Canadian Rail Operating Rules (CROR). There were no dangerous goods on their train, so they were not required to contact the CN RTC. Approaching Basque, the crew made a similar announcement.

Leaving Basque on a clear signal indication at 1223, the crew overheard a request for a radio check. They responded twice, and then again while passing Mile 60.0 at about 1225, but there was no answer.

The method of train control on the CN Ashcroft Subdivision is the Centralized Traffic Control System (CTC) authorized by the CROR and supervised by an RTC located in Edmonton, Alberta. CTC is an independent train control system designed for high-traffic-density territory such as the Ashcroft Subdivision. Train movements are governed by signal indications. Within CTC, there are controlled locations at which the RTC can control switches and set controlled block signals at stop or request that they display a permissive signal indication. The RTC does not normally know the exact permissive indication that results. Signals between controlled locations are not controlled by the RTC, but are actuated automatically by the rolling stock that approaches them. The signal indications displayed are also dependent upon the conditions of the blocks into which the signal governs movements.

Hi-rail equipment does not activate the signal system. Track unit and track work activities are controlled through the issuance of authorities or flag protection. The RTC must therefore establish signal blocking protection before issuing authorization to a foreman.

Through a joint running agreement, eastward CPR and CN freight trains operate over CPR track from Vancouver, British Columbia, to Coho and westward CPR and CN freight trains operate over CN track from Coho to Vancouver. The joint running agreement increased westward trains from 11 to 26 (CPR—15, CN—11), with 12 eastward CN trains operating from Coho to Kamloops. The average total was 38 trains per day on that section of track. Notwithstanding the joint running agreement, both railways may operate in either direction on their respective subdivisions.

The gentle grade on CN track favours high-tonnage trains through the Fraser Canyon, resulting in a need for additional track maintenance. The authorized train speed is 40 mph for passenger trains and 35 mph for freight trains. Express freight trains are allowed to exceed the authorized freight train speed by 5 mph.

When joint running commenced in January 2000, CN established a daily maintenance window lasting three to four hours. It was expected that MOW crews would be able to perform maintenance work uninterrupted during this time and trains would operate normally for the remainder of the day. Further, MOW crews would still be able to work between trains at times outside the maintenance window. However, designated “express” trains would not be delayed by the maintenance window and the railway would not establish a maintenance window when multiple trains were expected. On the day of the accident, between the beginning of the RTC’s shift at 0700 and 1231, the time of the accident, nine westbound trains were routed over the Ashcroft Subdivision after they arrived at Coho. There was no scheduled maintenance window on that day.

The *Rules for the Protection of Track Units and Track Work* provide the RTC and foreman with a number of options to permit occupancy of the main track by a track unit and/or the performance of track work. One option is to issue a TOP, provided for in CROR Rules 49 and 49.2 (relevant portions quoted).

Rule 49. TRACK OCCUPANCY PERMIT

- (a) when authorized by a TOP, track units may be operated and track work may be carried out on the main track without flag protection.
- (b) the limits of a TOP must be defined as between two identifiable locations. . . .

Rule 49.2. BEFORE ISSUING TOP AUTHORITY

Before issuing TOP authority, the RTC (or signalman within an interlocking) must;

- (i) ensure there is no conflicting train or engine within, or authorized to enter, the TOP limits to be granted unless such train or engine has been restricted by train order or in accordance with Rule 311, Rule 567.1 or Rule 618; and
- (ii) in CTC and controlled interlockings, block at Stop all devices controlling signals governing the movement of trains or engines into the limits to be granted. Signal blocking applied to protect a TOP must be maintained until the TOP is cancelled to the foreman.

In CTC, the TOP limits are usually defined as between two controlled block signals, such as Signal 577, the east switch at Basque, and Signal 677, the east signal at Martel. The RTC is required to block at stop all signals governing movements into the proposed limits. Trains are not permitted to enter or move within the limits of a TOP without the permission of the foreman. Traditionally, TOPs were not issued in CTC while any train movements occupied the proposed block. Amendments to the *Rules for the Protection of Track Units and Track Work* in the early 1990s provided the RTC with the option of issuing a TOP while trains remained within the proposed limits, provided that such trains are authorized to move in one direction only and have left the location where a foreman would enter the main track. Rule 823 of the *Rules for the Protection of Track Units and Track Work* states that the RTC must:

- (a) not issue the TOP to the foreman except at the location where the foreman will enter the limits of the proposed TOP;
- (b) not issue the TOP if any of the trains or engines are authorized to make a reverse movement within the limits of the proposed TOP;
- (c) not authorize any of the trains or engines to make a reverse movement within the limits of the proposed TOP;
- (d) before issuing the TOP, verify that each train or engine has left the location where the foreman will enter the limits of the proposed TOP; and
- (e) on the TOP, designate the last train or engine authorized to proceed, and indicate the time and location where the designated train or engine has left.

Rule 823 of the *Rules for the Protection of Track Units and Track Work* authorizes a follow-up TOP, which allows an MOW crew to commence work before the last train has cleared the limits of the TOP. At the time of this occurrence, there was no restriction on the number of trains within the TOP limits, provided the requirements of Rule 823 were met.

The RTC verified that CP 857, the second-to-last train from the foreman's information, had passed by Mile 65.2. The RTC indicated that he believed he had identified and indicated the last train on the TOP. He did not realize that the train was not CP 401, the last one.

As trains approach a controlled block, the RTC, using the CTC push button display section of the console, must align the required switches and request signal indications. Once the controlled block is occupied, the semi-circular CTC traffic monitor screen displays a white occupancy light. The system enables the RTC to create a red illuminated indicator in association with a track occupancy. RTCs normally assign a train's lead locomotive number to the indicator. When more than one train occupies the controlled block, the first train's indicator flashes red to warn of the presence of one or more trains following in that block.

At the time of this occurrence, the Ashcroft Subdivision RTCs used a paper "train information sheet" in addition to electronic media, such as Train Operation Planning and Control (TOPC), to record operating information such as a train's time of departure from its originating station, its time at various stations, meets with trains en route and any significant delays encountered. The train information sheet not only provided a written record of train movements and track maintenance activity, it also served as a memory aid for RTCs in carrying out their duties. A review of the train information sheet for the day of the occurrence revealed that the arrival of CP 401 (CP 9119 West) on the Ashcroft Subdivision at Coho had been recorded by the RTC at 1220.

Also available to the RTC was a cathode-ray tube monitor that displayed a real-time report of all train movements on the Ashcroft Subdivision as each train passed a control signal location. The RTC did not consult the train report prior to issuing the TOP to the foreman.

The RTC was qualified for his position and had worked as an RTC for 18 of his 28 years of service with the railway. He had spent the last six years working on the day shift from 0700 to 1500, Monday to Friday, on the Ashcroft Subdivision. He had slept about six hours the previous night and felt that he was rested when he reported for duty. The workload on this day shift typically consisted of the issuance of 60 to 80 TOPs and the control of 10 to 15 trains. The day of the accident was, in the RTC's opinion, a normal day with 10 westward trains within the first six hours of the shift. The increase in the number of westward trains, as a result of the joint running agreement, resulted in increased communications between the RTC and his CPR counterpart.

Although the TOP involved in the occurrence was designated as No. 124, it was only the 24th TOP that the RTC had issued during his shift. Of those 24 TOPs, he had cancelled 18. The RTC indicated that, as a result of the foreman at Mile 65.2 repeatedly contacting him for track time to get his work done, he felt under pressure to provide track time for the foreman.

The MOW foreman commenced working for the railway in July 1995 and qualified as a track maintainer/foreman in 1998. He had gained experience in both CTC and Occupancy Control System territory. Although he had not taken the MOW foreman's training course, he was

qualified as a relief foreman. He was familiar with the territory, having worked on the Ashcroft Subdivision on a number of occasions as a labourer and track maintainer. On the day of the accident, he was rested and midway through his first week as a relief foreman.

As part of training for track maintenance employees, when a track unit occupies a main track, it is recommended that a radio announcement be made on the engineering radio network every five miles or sooner, stating the type of unit, location, direction of travel and destination. At the time of the occurrence, the foreman had not yet made his announcement. He was about to do so when he saw the train and left the vehicle.

Analysis

In this occurrence, an authorized train movement was in collision with an authorized track unit movement. CP 401 was operated in compliance with government regulations and company operating practices. The MOW crew was in possession of a valid TOP, indicating that the last train had departed their location when there was another train operating within the limits of the TOP. Neither crew played a role in the cause of the accident. The analysis will examine railway operating practices, the circumstances of the RTC overlooking the presence of CP 401, and the risk associated with the issuance of a follow-up TOP without making the proper safety checks.

In the first communication, the RTC indicated to the foreman that he would have to wait for three trains (CN 415, CN 413, CP 857) before the MOW crew would be able to get back on the main track. After CP 857 entered the block between Basque and Martel at 1211, the RTC aligned CP 401 onto his territory (the train sheet indicated that he recorded its arrival at Coho at 1220). The CTC traffic monitor display screen red indicator for CP 857 would have been flashing, indicating a following train (CP 401).

While the RTC was aware of the fourth train (CP 401), it is apparent that he formulated his work plan around an earlier direction to the foreman that the MOW crew would have to wait for three trains, with CP 857 being the last. Although he had aligned CP 401 onto his territory and recorded its arrival, he did not adjust his plan to include the additional train and he forgot about its existence when he issued the TOP. Subsequent communication between the foreman and the RTC concerning the passing of the third train (CP 857) may have helped reinforce the erroneous perception that all authorized train movements had passed the foreman's location.

Although visual cues, in the form of the flashing red indicator light on the CTC traffic monitor display screen, would have drawn his attention to the presence of another train (CP 401) in the TOP limits, the RTC did not consult the indicator. Instead, he used information provided by the foreman and mistakenly assumed that CP 857 was the last train. Further, without checking his train sheet, the train report, the traffic monitor display screen or contacting the trains directly, the RTC determined that there were 40 minutes available before the arrival of the next westward train (CN 711) at Basque, and with the acceptance of the foreman, he issued the TOP. Had he completed any one of these aforementioned checks, he would have noticed another train (CP 401) in the block. Therefore, several safety defences provided by the existing system failed to prevent an employee error that resulted in overlooking the presence of train CP 401. This oversight led to the issuance of a TOP between two trains, which put the MOW crew and CP 401 on a collision course.

The foreman was not aware of the number and order of trains when he reported train CP 857 to the RTC. He relied on the RTC to ensure that it was safe to operate within his TOP limits. The practice of issuing a follow-up TOP when there is more than one train in the block poses a risk that a train may be overlooked, setting up a possible collision.

Consolidation of CN and CPR train operations through the Fraser Canyon increased traffic volume westward and reduced the time available for track maintenance. CN's original plan to give the MOW personnel a maintenance window of three to four hours a day was not always initiated due to the increased number of priority trains that could not be delayed. The absence of an assigned maintenance window on this portion of the track prompted continual requests by MOW personnel for the issuance of TOPs, resulting in the issuance of short-duration TOPs between trains. The constant pressure of repeated requests for track time may have influenced the RTC to deviate from the procedure for making proper safety checks to ensure that CP 857 was in fact the last train in the block to pass the foreman's location.

The MOW crew did not make the recommended radio announcement upon entering the main track. This may not have adversely affected safety because recommended procedures suggest that the announcement be made over the engineering radio channel. It would not have been heard by the crew of CP 401, as their radio was monitoring the designated operating standby channel. However, because the location, direction of travel, and destination of the Hi-rail vehicle was not announced, there was no possibility for anyone on the radio network to detect the potential for a collision.

Radio announcements made by CP 401 were likely within range of the Hi-rail truck. Although the investigation did not determine why the MOW crew did not intercept these transmissions, it is possible that communications on other channels interfered with the scanning of the train standby channel by the multi-channel scanning radio in the Hi-rail truck. This is consistent with normal operation of this type of radio.

Radio announcements serve as a supplementary defence by providing other railway employees with reminders of an approaching train or track unit movement. The primary defence remains the requirements for and the issuance of CROR sanctioned "authorities" for movement of trains and protection of track units or track work. Such authorities carry with them stringent procedural measures that are generally effective at ensuring that there is no conflict between authorized activities.

Findings as to Causes and Contributing Factors

1. Safety defences provided by the existing system failed to prevent an employee error that resulted in overlooking the presence of train CP 401 in the block. This oversight led to the issuance of a TOP between two trains, which put the MOW crew and CP 401 on a collision course.
2. The absence of an assigned maintenance window on this portion of the track prompted continual requests by MOW personnel for the issuance of TOPs, resulting in the issuance of short-duration TOPs between trains. The constant pressure of repeated requests for track time may have influenced the RTC to deviate from the procedure for making the proper safety checks to ensure that CP 857 was in fact the last train in the block to pass the foreman's location.

Finding as to Risk

1. The practice of issuing a follow-up TOP when there is more than one train in the block poses a risk that a train may be overlooked, setting up a possible collision.
2. Because the location, direction of travel, and destination of the Hi-rail vehicle was not announced, there was no possibility for anyone on the radio network to detect the potential for a collision.

Other Findings

1. Had an announcement been made on the engineering channel only, it would not have been heard by the crew of CP 401, as their radio was monitoring the designated operating standby channel.

Safety Action Taken

On 02 January 2001, Transport Canada issued a *Railway Safety Act* Section 31(3) order, prohibiting CN from issuing a follow-up TOP if there is more than one train in the block. This order applies on all subdivisions controlled by the Edmonton Rail Traffic Control Centre.

In April 2001, CN issued instructions to all engineering employees that general broadcasts on a designated operating channel be initiated by the track unit operator at regular intervals. Broadcasts should include the following information:

- (a) identification of the track unit,
- (b) present location, and
- (c) direction of travel.

CN is in the process of eliminating the train information sheet, as systems such as TOPC and other electronic media contain all the information that an RTC would have recorded on the train information sheets, thereby eliminating the possibility of transcription errors.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 12 November 2002.