RAILWAY INVESTIGATION REPORT
R98M0020

MAIN TRACK RUNAWAY AND COLLISION

VIA RAIL CANADA INC. PASSENGER TRAIN NO. 14
AND AN UNCONTROLLED FIVE-PAK MOVEMENT
MILE 105.7,
MATAPÉDIA RAILWAY COMPANY MONT-JOLI SUBDIVISION
MONT-JOLI, QUEBEC
31 JULY 1998

Transportation Safety Board
of Canada

Bureau de la scurit des transports

du Canada

Railway Investigation Report

Main Track Runaway and Collision

VIA Rail Canada Inc. Passenger Train No. 14 and an Uncontrolled Five-Pak Movement Mile 105.7, Matapédia Railway Company Mont-Joli Subdivision Mont-Joli, Quebec 31 July 1998

Report Number R98M0020

Synopsis

At 0349:18 eastern daylight time, on 31 July 1998, eastward VIA Rail Canada Inc. passenger train No. 14 collided with an empty runaway five-platform articulated container car, rolling westward on the main track, from the Matapédia Railway Company's Mont-Joli Yard at Mont-Joli, Quebec. The train had slowed from approximately 65 mph to about 40 mph on its approach to the Mont-Joli Station when the crew saw the moving equipment and applied the emergency air brake. At the time of the collision, the train had been slowed to about 30 mph and the runaway articulated car was travelling at approximately 6 mph. The force of the collision derailed the lead locomotive and jolted the passengers, railway employees, and crew on board. Three of the 341 passengers were injured. No crew member was injured.

Ce rapport est également disponible en français.

1.0 Factual Information

1.1 The Accident

VIA Rail Canada Inc. (VIA) passenger train No. 14 (VIA 14) collided with an empty five-platform articulated well car (five-pak) at a recorded time of 0349:18 eastern daylight time (EDT)[1] on 31 July 1998, just west of the Matapédia Railway Company's[2] (MRC) Mont-Joli Yard at Mont-Joli, Quebec. The five-pak was moving westward on the main track having gone through a closed switch. VIA 14 was travelling eastward from Montreal, Quebec, destined for Halifax, Nova Scotia.

At the time of the collision, the five-pak was travelling at approximately 6 mph. The leading platform was on the main track about 150 feet west of the main track intersection with the yard track. The point of impact was about Mile 105.7, on the MRC Mont-Joli Subdivision, just west of the Mont-Joli Station.

VIA 14 was comprised of four coaches, one dome car, one diner, five sleeper cars, one bar car, a baggage car and two locomotives. It was decelerating due to an emergency brake application, which was made when the crew observed the approaching five-pak. The train weighed more than 1,400 tons and was travelling at a speed of about 30 mph when it collided with the five-pak.

The five-pak and the second wheel set on the leading truck of the lead locomotive derailed. Track damage was minimal. The leading platform of the five-pak incurred severe damage, and the front undercarriage, battery box, and fuel tank of the lead locomotive received significant damage.

The emergency response and evacuation were conducted in a prompt and professional manner. Three injured passengers were administered first-aid by the VIA on-board service (OBS) personnel, who were assisted by a passenger who was a nurse and by local ambulance technicians. The injured passengers were transported by ambulance to the hospital in Rimouski, Quebec. Two were treated and released; the other refused treatment. All passenger safety equipment and associated signage were found to be without defect. All brakes on VIA 14 were functioning in accordance with their design.

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1 All times are EDT (Coordinated Universal Time (UTC) minus four hours) unless otherwise stated.

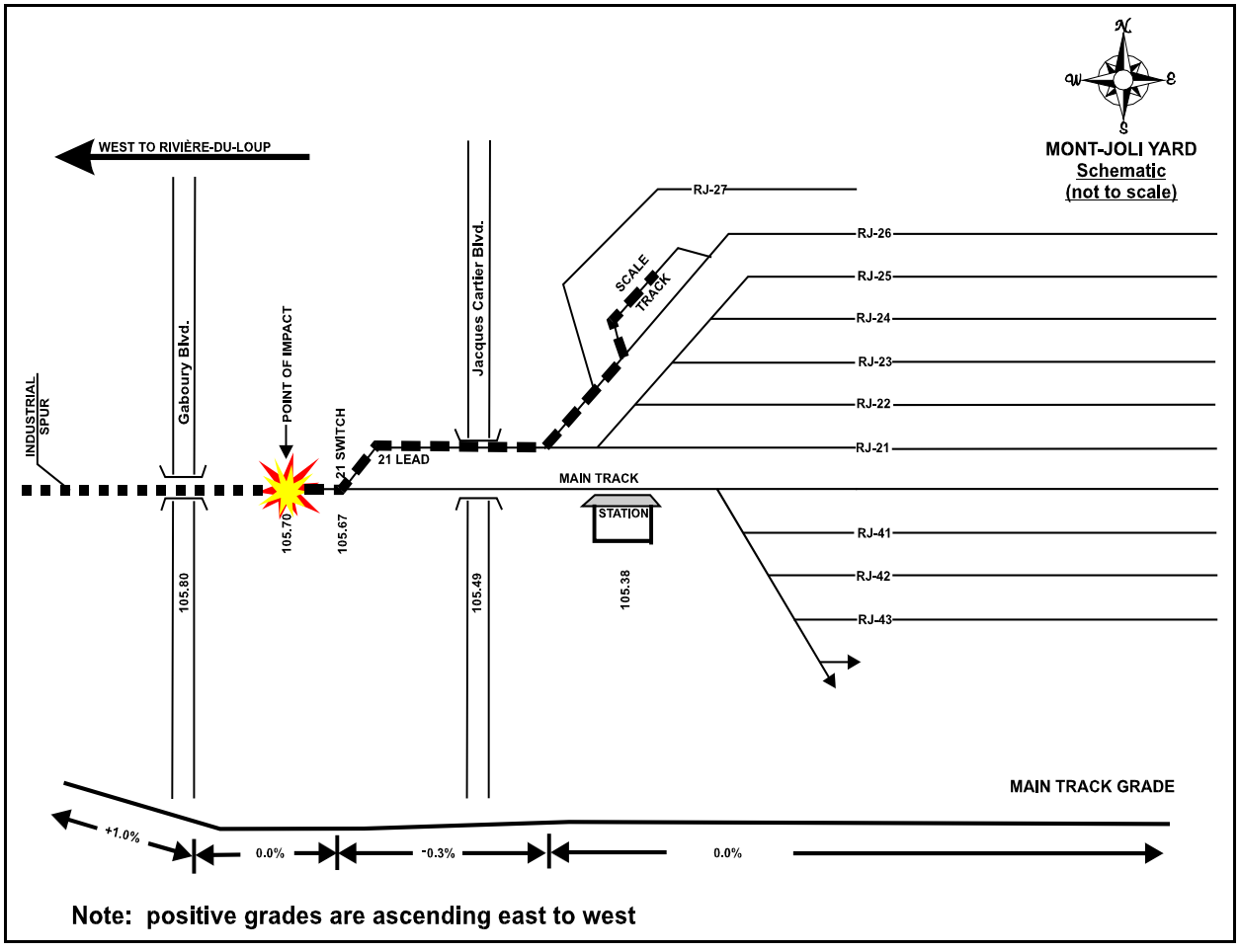
2 The name of the company was changed to Matapédia and Gulf Railway Company some time after the accident.

The damaged lead locomotive was uncoupled from the train, and an air brake test and pull-by inspection were performed. At about 0612, the train was reversed about 18 miles to Rimouski where the passengers were bused to their destinations.

1.2 Occurrence Site

1.2.1 Matapédia Railway Company (MRC) Mont-Joli Yard Layout

The MRC Mont-Joli Yard trackage extends west to Mile 105.67 and east to Mile 104.3. Mont-Joli Station is located at Mile 105.38. It supports VIA passenger ticketing and baggage services and provides an office and employee facilities for MRC and Canadian National (CN) (see Figure 1).



1.2.2 Yard Track Grade and Derails

The central trackage's grade in MRC's Mont-Joli Yard is flat. The lead track, at the west end of the yard and at the west end of scale track 26, has a descending grade of approximately 0.3 per cent to the main track. The other tracks in the westerly part of the yard also descend to the west. A split-switch derail, which will derail moving equipment at any speed on the track 21 lead, acts as the last physical defence against uncontrolled equipment movement onto the main track. This derail is located 236 feet east of the main track switch (21 switch) at Mile 105.67.

There are no impediments to using this derail other than the time and minor physical effort required to unlock it, place it in and out of the derailing position, and lock it.

1.2.3 The Scale Track

Track 26 contains an elevated weigh scale. The scale portion of the track is flat for a distance of about 70 feet with a descending grade on either side of the scale. The scale is about 15 inches higher than other tracks in its proximity. This results in its east and west track grades being significantly greater than any other track in the yard. A scale house is positioned on the north side of the scale at the midpoint of the scale.

1.2.4 Cautionary Limits

The main track from Mile 107.4 to Mile 103.0 was designated to be within "cautionary limits" in CN's Atlantic Region Time Table 75. The MRC time table specified cautionary limits from Mile 106.3 to Mile 103.0 (track operated by MRC). The MRC time table special instructions specify that "within cautionary limits, trains and engines will be governed by Rule 94.1." Canadian Rail Operating Rules (CROR) Rule 94.1 specifies that, "On a subdivision specified in the time table, in the application of caution speed as required by Rule 94, a train or engine must also be prepared to stop short of a switch not properly lined." CROR Rule 94 specifies that, "Trains and engines must operate at caution speed within cautionary limits." The CROR further define "caution speed" as "a speed that will permit stopping within one-half the range of vision of equipment or a track unit."

Before 1994, the CROR defined caution speed and dealt with cautionary limits in the following manner: "A speed that will permit stopping within one-half the range of vision of equipment or a track unit and in no case exceeding SLOW SPEED." Slow speed was defined as "A speed not exceeding fifteen miles per hour."

The rule was changed in 1994 at the request of the Railway Association of Canada (RAC), on the basis that the 15 mph speed limit could be perceived as permissible speed where the speed may need to be less for safe operation.[3]

Furthermore, CROR Rule 104, Hand Operated Switches, Special Instruction 1, Authority to Leave Main Track Switches Lined and Locked in Reversed Position, subsection (iii) reads in part "Within cautionary limits, permission to leave a main track switch in reversed position will be conferred by subdivision footnotes or special instruction." The MRC time table footnotes stated that Rule 104 (b) was applicable at switches located at Mile 105.31 and Mile 104.30. These were located east of the Mont-Joli Station.

The rules, instructions, and practices governing the operation of VIA passenger trains, within cautionary limits, are the same as for companies which operate on their own tracks.

1.2.5 Range of Vision

The range of vision from the west looking toward Mont-Joli Station during the day was determined by the TSB to be about 1,750 feet, using the switch stand and target at track 21 switch as the object to be seen. Observations by the TSB on VIA 14 approaching Mont-Joli, at about 0400, indicated that the reflection of the headlights on the reflective 21 switch target was first seen from about the same distance.

1.2.6 Wreckage

The main structural components of the first platform buckled upward about one third of the platform length from the most western extremity of that platform. The forward coupler of the platform was bent down until it touched the ties. The platform lifted up off its forward truck centre plate. The forward wheels on the five-pak derailed. The second platform moved back along the main track. The front coupler on the lead locomotive of VIA 14 sheared off and fell below the locomotive leaving gouge marks on the ties. Damage on the undercarriage of the locomotive was consistent with compression from contact with the coupler. Two wheels on the locomotive derailed. The VIA crew recalled that the impact felt like the runaway car was shoved backwards and the locomotive rode up on the forward platform, which had been bent down like a ramp. The locomotive fuel tanks were not ruptured and there was no fire. Two trucks on the five-pak derailed in the open switch points.

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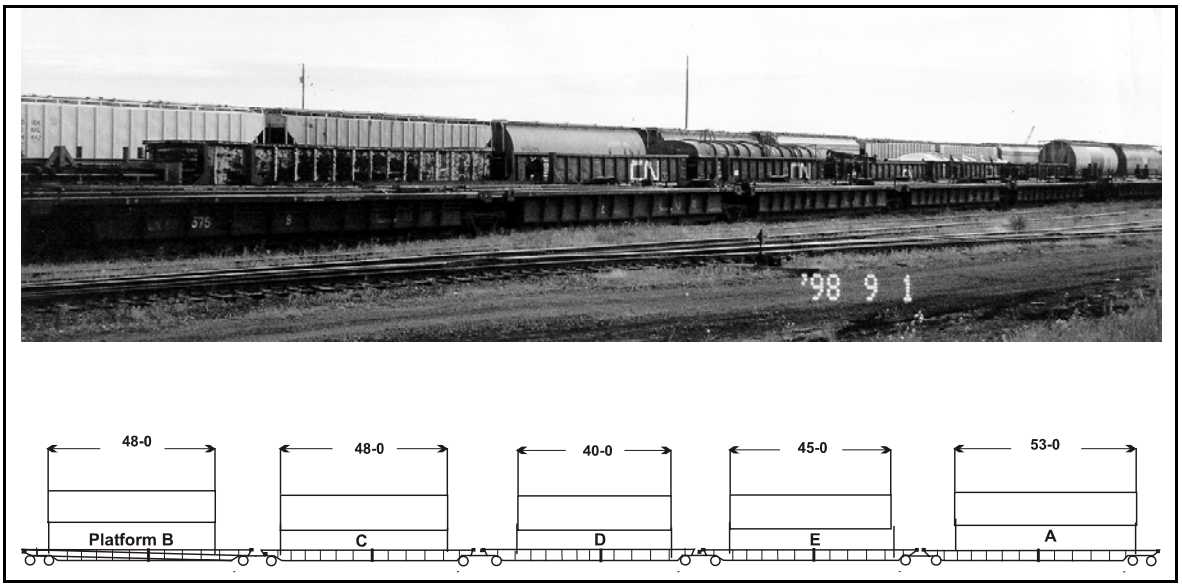
[3] In 1993, the RAC applied on behalf of its membership for a change in definition to remove the 15 mph maximum speed cap within cautionary limits as it was redundant when taken in context with the definition's primary requirement that the train must in any case be prepared to stop within one-half the range of vision. The presence of the slow speed connotation in the then existing definition, in fact, provided railway employees with a false sense of security in that the stated speed became the primary focus as opposed to the ultimate requirement—the need to stop within one-half the range of vision. The RAC indicated that the definition change would remove an operational restriction which would improve train service efficiency and allow for increased use of cautionary limits with no reduction in safety in the operation of trains or track units. Transport Canada concurred, and this change in definition was approved by the Minister of Transport in February 1994.

1.3 Five-Pak Condition and History

1.3.1 Design and Intended Usage

The five-pak, CN 683656, was owned by CN and was built in 1985 by National Steel Car in Hamilton, Ontario. The CN 683 series five-paks are articulated five-platform intermodal cars, with a 175,000-pound tare (unloaded) weight and a length of approximately 240 feet. There were 82 CN 683 series five-paks in service and they were used for transporting intermodal containers and highway trailers. This equipment has been usually operated in trains comprised of a large proportion of multi-platform cars or in intermodal unit trains



(see Figure 2).
The five platforms on this type of car share six trucks. The platforms are supported on the trucks at the coupler connections. Each platform is designated A, B, C, D, E, and the sequence of these designations from one end of the five-pak to the other is B, C, D, E, and A.

The five-pak air brake system consists of three separate sets of control valves located on the A, B, and D platforms, each of which controls two trucks. There are two Wabco truck-mounted brake cylinders on each truck which deliver brake shoe forces to all wheels. The A and B platforms are also equipped with hand brakes, each of which activates the brake shoes on two sets of trucks.

Neither MRC nor CN instructions stipulated whether multi-platform equipment should be considered to be a single car when deciding how many hand brakes are sufficient to secure the equipment.

CN 683656 was destined for storage at Rivière-du-Loup, Quebec, to await main shop maintenance. The maintenance was required to prepare the cars for a short-term lease to another railway. Six other five-paks had recently passed through MRC's Mont-Joli Yard for the same destination and reason. Before these movements, multi-platform articulated equipment had rarely passed through Mont-Joli.

1.3.2 Post-Collision Air Brake and Wheel Observations of the Runaway Five-Pak

When the undamaged end of CN 683656 was observed shortly after the collision, the hand brake was not applied and the air brakes were not applied. When the air brake system was subsequently pressurized to 90 pounds per square inch (psi), it was observed that:

- the 3/4-inch flexible air hose connection located between the A and E platforms (and between wheel sets 9 and 10) was leaking;
- the air hose connection nut had "burr" marks, consistent with torque being applied by a pipe wrench;
- the "burr" marks on the connection nut were rusted, consistent with having been there for some time;
- the threads of the connection were crossed between the male and female halves;
- cross-threading effectively seized the connection before the seat in the male half could contact the mating seat in the female half, thereby preventing a proper seal;
- all other flexible air hoses and connections appeared to be undamaged and were not apparently leaking;
- the hand brake at the undamaged end of the car, the "A" end platform, functioned as intended, although the live lever was determined to be approximately 10 inches longer than standard design;
- the air brakes functioned as intended when first applied;
- the brake shoes were within standard specifications;
- the wheels between the A and E platforms (the 9 and 10 positions), where the damaged air hose connection was located, appeared to be relatively new; and
- the brake shoes on the wheel treads of the A platform released approximately eight minutes after the emergency brake was applied. The brakes on the wheel treads of the D platform released within 60 minutes after the emergency brake was applied (the railway maximum allowable brake cylinder leakage during an Association of American Railroads (AAR) single car test is under 3 psi per two minutes).

An additional 24 CN 683 series five-paks were examined in Winnipeg, Manitoba, between 01 September and 05 September 1998. Standing leakage tests were performed on 18 five-paks (90 platforms) awaiting main shop repairs. The five-paks were fully charged and checked for brake pipe leakage. The brakes were later set into emergency and left standing. After 90 minutes, 16 five-paks (89 per cent) were observed with different degrees of leakage resulting in the brakes releasing on two or more trucks on each five-pak. As well, there were problems with the adjustment of the hand brake rigging on three of the five-paks. The horizontal lever for the truck, which was furthest away from the hand brake assembly, was moving to the end of its travel where it would contact the side sill of the car resulting in no further brake shoe force being delivered.

1.3.3 Recent Repairs

In the last two years before the occurrence, CN 683656 had five pairs of wheels replaced. The most recent change-out was on 21 April 1998, at Winnipeg Intermodal Terminal, when two pairs of wheels were changed at the No. 9 and No. 10 positions, due to a high flange and a thin rim, respectively. The other repair centres were Brampton, Ontario, and Turcot, Quebec. An off-line wheel change-out had also been performed when the car was on the Illinois Central Railway. When the wheels at the No. 9 and No. 10 positions were replaced, the coupler pin between the fourth and fifth platforms and one end of the flexible air hose between the two platforms were disconnected, and then reconnected after the repair.

The car had undergone repairs to the trucks and brakes during a servicing program in Moncton, New Brunswick, in November 1993.

AAR rules do not require a single car or repair track brake test to be performed on cars after wheels are replaced for wear-related defects, unless the car is on a shop or repair track and a single car or repair track brake test has not been performed in the last 12 months. AAR rules did not therefore require a single car or repair track brake test to be performed on CN 683656 when the wheels were last changed out in Winnipeg, as the repairs were not performed at a location designated by CN as a shop or repair track.

The car repair history record shows that the most recent air brake test on CN 683656 was a “repair track test” on 22 January 1997 performed by an American railroad.

1.3.4 Recent Inspections

The running record for CN 683656 indicated that, in the 90 days before the collision, the car was inspected and/or brake-tested 10 times as part of a train consist. No defects were noted on CN 683656 during any of these inspections or train air brake tests. More specifically, no leaking air hose connection was recorded.

In many train yards, car inspections and train brake tests are often completed with the use of a truck or an all-terrain vehicle (ATV). Observations in a sample of these yards (TSB Engineering Laboratory report LP 105/98) indicated that the high ambient yard noise levels, combined with other factors, such as wind conditions, method of transport (i.e. ATV or truck), radio communication, protective clothing (i.e., rain wear, hearing protection) and walking conditions (i.e., loose ballast), can easily mask the noise level of an air leak in a brake

line. Tests indicated that the ambient noise level in several yards varied from 71 to 80 decibels (dB), the noise level of the ATV tested was 73 to 83 dB, whereas the noise level of the air leak at 90 psi was 72 dB.

The AAR brake tests that are performed while a car is on a shop or repair track (e.g. single car test) are designed to identify maximum rates of leakage within the brake cylinder and associated piping on a single car. During this type of test, the attention of a qualified railway mechanical specialist is focussed on the individual car. Single car test requirements exist partly because train brake tests may not always verify the integrity of the piping for sustained application of the brakes on a single car.

Train air brake tests that verify the operability of the brakes on an entire train are not always performed by a mechanical specialist. Although there are requirements to ensure that all air hoses are properly connected, cocks are in the proper position and the system is free from obvious leaks (usually audible to persons close by), this type of test may not result in the identification of a leak, similar to the one that existed in the air hose connection on the five-pak.

1.4 Personnel Information

1.4.1 MRC Management

The President joined the *Société des chemins de fer du Québec* (SCFQ) in 1994. He delegated the responsibility for safe train operations to his supervisor of operations. He also relied on the fact that MRC employees had been fully trained by either CN or CANAC (a CN subsidiary which trains CN employees).

The President further relied on a safety committee where the supervisors and employees could discuss and resolve safety issues. He perceived this committee as an important conduit through which employees could channel their safety concerns up to him and he could pass on his concerns and policy direction to them.

The MRC supervisor of operations, at the time of the accident, had been working in that capacity since MRC's inception in January 1998. He had worked in a variety of positions on other railways since 1984.

1.4.2 MRC Switching Crew

The MRC switching crew comprised a locomotive engineer and a conductor. They were both trained and qualified, according to CN and MRC standards, to perform the assigned switching tasks. The conductor was a new employee who had not previously handled or secured CN 683 series five-pak equipment. Both met applicable federal government fitness and rest standards.

1.4.3 VIA 14 Operating Crew

The VIA 14 operating crew comprised a first locomotive engineer and a second locomotive engineer. They were qualified employees, each of whom had over 20 years of railway experience. Both had worked for CN before being employed by VIA and both were familiar with the territory over which they operated VIA 14. They had been together as a crew, on VIA 14 and VIA 15 assignments, for almost five years. Both met applicable federal government fitness and rest standards.

1.4.4 VIA 14 On-Board Service Crew

The VIA 14 OBS Service Manager and the service employee in charge were long-term VIA employees. All OBS employees had recently attended training sessions for first-aid, passenger evacuation, and information sessions concerning recent changes to passenger equipment and safety appliances and related safety procedures implemented by VIA.

1.5 MRC Securement of the Five-Pak and Related Switching Activities

1.5.1 Switching Task

The MRC switching crew members commenced their shift at 1800 on 30 July 1998. It was their third day of working a shift from 1800 to 0600. Before the arrival of VIA 14, they had been marshalling cars for CN train 311, which was to be made up and depart westward with another crew after the departure of VIA 14.

The switching list provided to the switching crew contained a five-pak that was to be placed at the front of CN train 311.

1.5.2 Five-Pak Placement

The MRC switching crew positioned the empty five-pak by shoving it eastward onto scale track 26. This was to facilitate locating the car on the front of CN train 311. The switching crew members recalled that the five-pak was placed on track 26 some time between 0100 and 0200. They also recalled that the approximate location of the five-pak on the track was such that two of its platforms were to the west of the scale and two were to the east, with one on the scale.

1.5.3 Five-Pak Securement

The MRC switching crew recalled leaving the five-pak on track 26 in an emergency brake application, without the hand brakes applied, with the west end brake pipe angle cock left in the open position.

Both of the MRC switching crew members were accustomed to securing cars temporarily with an emergency air brake application and without hand brakes applied. Another MRC switching crew confirmed that they regularly did the same thing. (It was observed by the TSB that other cars were left unattended without hand brakes applied after the occurrence.)

1.5.4 Securement Rules and Instructions

1.5.4.1 Securement

CROR Rule 112 provides that, "Unless otherwise directed by special instructions, a sufficient number of hand brakes must be applied on equipment left at any point to prevent it from moving."

In order to clarify exactly how standing cars are to be left, CN and Canadian Pacific Railway (CPR) have chosen to issue special instructions for the application of Rule 112 to their operations (see Appendix A). Rather than issue system special instructions, MRC chose to specify in its time table the locations where additional hand brakes were required. Mont-Joli Yard was not one of those locations.

1.5.4.2 Derails

A derail is a safety device that is designed to provide secondary protection against uncontrolled movements of train equipment onto the main track. If a sufficient hand brake application is not made, a properly designed and maintained derail, if set, will provide a secondary defence barrier by derailing the uncontrolled movement clear of the main track, but typically maintaining the equipment in the upright position.

There are three types of derails: block derails, combination derails, and switch point derails. All are permanent installations attached to the track, with the majority being manually controlled. The derail at the west end of Mont-Joli is of a manually controlled, switch point variety.

In order to move equipment westward from the yard to the main track, crews had to place the derail at the west end of Mont-Joli Yard in the non-derailing position. CROR Rule 104.5 (c) requires that, when the track is no longer in use, derails must be restored to the derailing position and secured with a lock, whether or not there is equipment on the track (see
Appendix A). This rule applied to the MRC, including the operations at Mont-Joli Yard.

1.5.5 MRC Management/Supervisory Approach to Car Securement and Derail Practices

MRC management and supervisors expected employees to comply with CROR rules 112 (Securing Equipment) and 104.5 (Derails). MRC had directly applied many of the CN General Operating Instructions (GOIs) to the MRC through an operating bulletin which made the
CN GOIs, and any CN bulletins modifying the GOIs, the applicable requirements on the MRC.

The MRC supervisor of operations took a hands-on approach to questions of hand brake and derail usage and did not hesitate to discuss related procedures with the employees if they were found to be remiss in securing cars left unattended or setting derails. The scope and volume of the duties assigned to the supervisor were such that he had only limited time for observing employee procedures and for direct supervision.

1.5.6 MRC Employee Approach to Car Securement, Derail Rules and Instructions and Training

MRC employees were aware of the MRC requirements concerning hand brakes and derails. Most MRC employees had worked with CN before joining the MRC. At CN, they received special training and information sessions from the company, their unions, and their Occupational Safety and Health (OSH) Committee concerning the use of hand brakes and derails. Two MRC employees were not ex-CN employees but had been trained or re-qualified by CANAC.

Employees were not provided with written instructions on the correct application of CROR Rule 112 when working with multi-platform cars. A five-pak is equivalent to about five conventional freight cars in length and weight, but has three separate air brake systems and two hand brakes. Employees expressed different opinions about whether multi-platform cars were to be considered as one car or more for the purpose of determining how many hand brakes to apply.

1.5.7 Subsequent Switching

After the MRC switching crew members left the five-pak unattended on the scale track, they continued switching cars to facilitate the marshalling of train 311. They were not rushed in this activity, partly due to a one-hour delay in the estimated arrival time of VIA 14 at Mont-Joli.
The event recorder on one of the three switch locomotives indicated that the switching operation was continuing close to the time of arrival of VIA 14. The event recorder indicated multiple stops and changes in locomotive direction between 0334 and 0345.

1.5.8 Switch Locomotive Securement

The MRC switching locomotive engineer moved the switch locomotives from the main track, through the 21 switch, onto the track 21 lead, lined the switch for the main track and then moved to track 24. On track 24, the locomotive engineer positioned the locomotives adjacent to the scale track, with the most easterly locomotive positioned approximately beside the scale. This movement would have involved passing by the split-switch derail, just east of the switch for track 21, after he had lined that switch for the main track. The locomotive engineer secured the locomotives by applying the air brakes, with the hand brake applied and the doors locked. The only derail between the stationary locomotives and the main track was the split-switch derail which was in the non-derailing position.

Track 27 was the track designated for unattended locomotive tie-up; there were two locomotives there at the time. It had standard derail protection, but was not used for the subject unattended and secured locomotives in track 24.

1.5.9 The Rest Break

The MRC switching locomotive engineer secured the locomotive consist at about 0344 to 0345. He then walked from the standing locomotives to the station to join the switching conductor for a rest break. He and the switching conductor were in the station at the time of the collision. There was no one in a position to observe the equipment and to safely apply hand brakes if movement occurred. During the rest break, the split-switch derail protecting the main track was not returned to the derailing position and secured with a lock.

It was common practice for switching crews to stop work between the time when a VIA train approached the Mont-Joli Station and when the VIA train departed.

1.5.10 Runaway Simulation

A car of the same type as the damaged five-pak was tested to determine the time it would take for it to reach the 21 switch and the impact point, as well as its speed at the impact location (see Appendix B). In the simulation, the speed of the five-pak as it entered the main track was approximately 6 mph and the five-pak took 277 seconds to move from the scale track to the point of collision.

1.6 VIA 14 Operations

1.6.1 Montreal to Cautionary Limits - Mont-Joli

VIA 14 left Central Station in Montreal at 1900 on 30 July 1998, destined for Halifax. As a result of a minor problem while en route,[4] VIA 14 was about one hour late when approaching Mont-Joli. Just before entering the cautionary limits at Mile 107.4, the first locomotive engineer contacted the MRC yard crew at Mont-Joli and was informed by the switching conductor that the main track was clear to the station. The VIA 14 crew proceeded with that assurance.

Except for the minor delay, the trip towards Mont-Joli was uneventful.

1.6.2 Cautionary Limits at Mile 107.4 to Point of Collision

VIA 14 continued into the cautionary limits (as of Mile 107.4) within which train speed was limited to "caution speed" in accordance with the CROR. "Caution speed" is a speed that permits the train to stop within half the range of vision of equipment or a maintenance-of-way vehicle. VIA 14 approached the 21 switch at about 40 mph. The VIA crew members both saw that the main track was clear to the station and that the 21 switch target was showing green (i.e. the switch was lined for the main track). On approaching closer to the 21 switch, they saw cars moving on the track curve to the 21 switch, running through the switch, and moving out onto the main track towards them. Significant event recorder data and related calculation results for the operation of VIA 14, within the cautionary limits, are listed in Appendix C.

An evaluation of the event recorder data indicated that:

- VIA 14 was travelling at a speed up to 58 mph, more than half a mile within the cautionary limits;
- a brake application was made about 3,000 feet before the 21 switch;
- the brake application slowed the train to about 42 mph when, about 2,100 feet before the 21 switch, the brake was released;
- when the 21 switch was first visible, the train was travelling at about 35 mph, after which it increased to a speed of 39 mph;
- an emergency brake application was made about 600 feet from the 21 switch, when the train was operating at a speed of 39 mph;
- eight seconds later, when the train was about 150 feet from the 21 switch travelling at a speed of approximately 30 mph, the train struck the runaway five-pak; and
- the front end of the locomotive stopped about 40 feet west of the 21 switch.

1.7 Safety Regulatory Regime

1.7.1 Transport Canada

[4] VIA 14 struck a piece of rubber (reported to be a marine fender) on the track at Lévis, Quebec, which was lodged under the locomotive. It took about one hour to remove it before the crew could proceed.

Transport Canada (TC) regulates rail safety for all railways under federal jurisdiction. TC sets standards by means of the *Railway Safety Act*, or by reviewing and approving and/or modifying rules submitted to it by the industry. TC then enforces compliance based on its railway monitoring program.

Regional TC officials had inspected the MRC Mont-Joli Yard twice, in accordance with TC's operations and equipment inspection programs (on 25 March 1998 and on 07 July 1998, respectively), between the time MRC took over operations from CN in January 1998 and the time of the collision. TC provided a copy of two completed operations monitoring report forms with respect to the visit to Mont-Joli Yard on 25 March 1998 by operations personnel. No MRC deficiencies with respect to equipment securement or derail usage were reported. However, it was noted that some employees had not signed the operating bulletins and that a switch had been left in the reverse position.

1.7.2 Railway Association of Canada

The Railway Association of Canada (RAC) was established in 1917 as a trade association of the Canadian railway industry. About 50 railways are currently members of the RAC and, as new short-line railways continue to be created, membership is expected to grow. The members are either under federal or provincial jurisdiction. With respect to safety, the RAC:

- is the focus for rules and standards developed under the *Railway Safety Act*;
- publishes circulars of recommended practice to its members pertaining to safety issues;
- manages a national grade crossing safety and trespassing public awareness program (Operation Lifesaver);
- trains and monitors shippers to ensure lading is properly secured when loaded on flat cars and other open top cars; and
- works with the AAR to ensure safe interchange of equipment throughout North America.

1.8 Past TSB Car Securement and Derail Usage Recommendations, Responses and Safety Actions

1.8.1 TSB Recommendations

Since 1992, the TSB has expressed concern on several occasions with respect to the securement of railway equipment and particularly with respect to the risks posed by runaways both to crews and to passengers on trains operating on main tracks. Recommendations pertinent to the circumstances of this occurrence are as follows:

> The Department of Transport conduct a field assessment of the adequacy of training and supervision by Canadian railways to ensure that personnel are correctly applying standard operating procedures when securing standing cars.
>
> (R92-14, issued September 1992)

In response, the Minister of Transport stated that the Department had intensified monitoring of car securement performance in the field and will take appropriate action to ensure that any deficiencies noted in railway training and supervision are acted upon.

The TSB also recommended that:

> The Railway Association of Canada promote, amongst its members, employee understanding of the wide variability in hand brake effectiveness [. . .] and the resultant need for extra vigilance in car securement.
>
> (R97-05, issued September 1997)

The RAC responded that its member railways have reviewed and, where necessary, revised their hand brake procedures to minimize the likelihood of unintended movements and that those reviews have resulted in new special instructions, bulletins, manuals, and training aids. The RAC also responded that it intended to ensure that all member railways would have access to materials, training aids and best practices regarding the securement of cars to start in the second quarter of 1998.

In 1997, the TSB recommended that:

> The Department of Transport develop and implement policies and procedures for a national audit program that will effectively evaluate the railways' ability to maintain national safety standards.
>
> (R97-06, issued September 1997)

The Minister of Transport responded, in part, that the Department would be developing and implementing policies and procedures for a national audit program using a performance-based approach and risk assessment practices.

TC's current approach is to ensure that there will be a safety management system in place on each railway and to audit these systems once they are in place. TC also informed that this approach would be implemented when the amendments to the *Railway Safety Act* were enacted. The revised *Railway Safety Act* came into effect in June 1999. The *Railway Safety Management Systems Regulations* are scheduled to come into effect on 31 December 2000.

1.8.2 Recent Railway Safety Actions

As a result of the 12 August 1996 collision between runaway cars and an opposing freight train at Edson, Alberta, a number of safety initiatives were taken by major Canadian railways. Most notably:

- railway systems were evaluated in terms of adequacy of secondary defences against runaways in the form of derails, and numerous new derails were installed;
- schedules of minimum hand brake application instructions were issued; and
- training was delivered to make operating employees more aware of the need for care in securing cars on track where they could run free onto the main track.

At the time these actions were taken, Mont-Joli Yard was operated by CN.

1.9 Other Factual Information

1.9.1 Compliance with TSB Reporting Requirements

On 20 June 1998, during switching operations at Mont-Joli Yard, an MRC switching crew had set car TOE 2655 on the main track after which it rolled uncontrolled and collided with car GATX 48570 and then derailed on its side. No one was injured. The crew involved was not the crew involved in the 31 July 1998 runaway collision. Contrary to *TSB Regulations*, this accident was not reported to the TSB, but was later submitted, on 22 September 1998, after the TSB learned that it had happened and requested the information. The TSB is not aware of any other occurrences that were not reported as required.

1.9.2 Runaway Frequency

For railways under federal jurisdiction, runaway frequency has averaged a total of 48 per year over the last five years (1995-1999), 9 of which occurred on the main track. The total for 1998 is 64, 11 of which occurred on the main track.

2.0 Analysis

2.1 Introduction

The analysis will address the accident, the switching crew's decisions not to apply hand brakes nor set the split-switch derail in the derailing position, MRC management and supervision overview, passenger train speed, and safety regulatory overview.

2.2 The Accident

This accident resulted from an unexpected air brake release and subsequent uncontrolled movement of the empty multi-platform car that had been left unattended and secured with an air brake application. The switching crew was accustomed to leaving equipment unattended in this manner as it was convenient, thought to be safe, and commonly practiced at Mont-Joli Yard. In this instance, the rapid rate of air brake pressure loss exhibited by this car and the improperly connected and leaking air hose resulted in the relatively quick release of the air brakes shortly after the car was left unattended.

Unknown to the crew, an air hose connection on the five-pak had been cross-threaded. As a result, it quickly leaked air pressure which released one of the three sets of air brakes on the five-pak. The other two sets of air brakes later released because of leakage from other parts of their respective air brake systems. The release of the emergency air brakes placed the equipment in a condition whereby uncontrolled movement was possible.

The five-pak began to move within seconds of the recorded time that the yard locomotives were placed on the track adjacent to the scale track. It is therefore likely that, when the vibration of the idling locomotives translated to the five-pak, the five-pak started to move. The runaway five-pak passed over the split-switch derail, which had not been set in the derailing position, contrary to standard safe operating practices. The runaway five-pak moved through the main track switch and entered the main track at approximately 6 mph in front of the passenger train operating at approximately 30 mph.

2.3 Switching Crew Decisions

2.3.1 Car Securement

Although the switching crew members were familiar with the requirements of CROR Rule 112 applicable to hand brake securement, they believed that the emergency brake was sufficient and would remain applied until they returned to place the five-pak on CN train 311. The crew members did not anticipate that a five-pak would leak all of its brake cylinder air so quickly. The

size of the car—with its multiple platforms, trucks, and air brake systems—combined with the fact that it was empty, led them to feel quite confident that the emergency air brake application would hold the car until they returned after their break.

CN 683656 had a higher-than-normal rate of brake cylinder leakage. In addition, this five-pak had a flexible air hose connection to the brake cylinders that was previously cross-threaded and leaking. This defect had existed for some time but had not been detected during numerous brake tests. Air leakage in the brake cylinders or any of the associated piping is unlikely to be detected under current train inspection practices and methods. High ambient noise levels, and the noise of trucks or ATVs commonly used when inspecting cars, mask the identification of these kinds of leaks. Also, train air brake tests cannot always identify excessive rates of brake cylinder leakage. These are normally identified during brake tests of single cars on shop or repair tracks.

Given the above-noted circumstances, not applying the hand brake as an additional defence to secure the five-pak presented a high risk of an uncontrolled movement. Simulations indicated that had either, or both, of the hand brakes been applied, the five-pak would not have run away.

Management and supervisors determined after the occurrence that there was considerable confusion with respect to the rules on hand brake securement in all possible circumstances in the Mont-Joli Yard. This inconsistency had not been previously identified because there was limited direct supervision of yard employees by MRC. TC safety inspectors had visited Mont-Joli twice since 01 January 1998 and no unsafe car securement practices were observed.

2.3.2 Derail Usage

The switching crew members knew the rules with respect to derail usage and had the opportunity to set the split-switch derail without significant time or effort. It was common practice when switching in the west end of the Mont-Joli Yard to leave the split-switch derail in the non-derailing position when switching movements were interrupted to allow other trains to pass on the main track. The crew members believed that the emergency brake would hold the five-pak stationary.

As was the case with car securement practices, management and supervisors presumed that the employees, who had been trained in derail usage, would consistently follow the applicable rules. After the occurrence, management and supervisors realized that there was considerable confusion with respect to the interpretation of the rules on derail usage in the Mont-Joli Yard. The inconsistency relating to derail usage went undetected because there was limited direct supervision of yard employees by MRC. TC inspectors had visited the Mont-Joli Yard twice since 01 January 1998 and had not detected any unsafe derail usage practices.

Given the above-noted circumstances, the practice of not consistently setting the split-switch derail in the derailing position presented a risk of uncontrolled movements rolling onto the main track and a risk of main track collisions.

2.4 MRC Management and Supervision Overview

MRC senior management was generally aware of the rules pertaining to safe operating practices in the securement of equipment and derail usage and relied on the supervisor and the employees to ensure safe operating procedures. The supervisor of operations understood the details of the hand brake securement and derail usage rules. However, he may not have had sufficient time since incorporation (January 1998) to set up and implement an effective safety management system for the MRC.

No external factor, such as regulatory action, had identified systemic unsafe operating practices within the seven months of existence of this new company which could have resulted in management and supervisors improving employee compliance with safe operating practices. At the same time, no formal safety management system was in effect to counter issues such as risky car securement and derail usage practices. It was presumed that, since employees had been trained in the safety rules and instructions, they would consistently adhere to them. There was only one supervisor of operations, who could not be present all the time as he had many duties other than direct supervision.

Given the above-noted circumstances, the limited MRC management and supervisory overview increased the risk of an uncontrolled movement damaging property and causing injury.

2.5 Speed of the Passenger Train Approaching Mont-Joli

The current caution speed definition in the CROR allows trains to operate at any speed up to the authorized maximum speed for the zone, provided that they are capable of stopping within one-half the range of vision of equipment or a track unit, and there are no other restrictions. If the main track is seen to be clear and conditions of visibility are good, crews routinely operate at speeds up to the allowed zone maximums.

The passenger train crew members complied with the definition of caution speed and were operating at a speed that would permit stopping before equipment or track units on the main track. However, the safety provisions of cautionary speed operation are not intended to avert collision with an unexpected approaching runaway movement from a yard when the switch is lined for main track movements only. Crew members regulated their speed to stop at the Mont-Joli Station.

Before 1994, movements at caution speed were limited to a maximum of 15 mph. In this occurrence, the VIA train had decelerated from 39 mph, when an emergency brake had been applied, to 30 mph, when it collided with the runaway five-pak—a reduction of 9 mph. While the risk of collision was initiated by the uncontrolled five-pak movement, the passenger train stopping distance in emergency would have been less had its speed been slower. Because the degree of damage is a function of the square of the train speed, the damage incurred would have been less. While the speed of the passenger train approaching Mont-Joli did not contribute to the cause of the impact, it did contribute to the consequences of the collision.

2.6 Safety Regulatory Overview

Under current safety regulatory philosophy, MRC is responsible for ensuring the safety of its operations. However, one of TC's legislated objectives under the *Railway Safety Act* is to promote and provide for the safety of the public and personnel, and the protection of property and the environment, in the operation of railways. TC regional safety inspectors made two inspection visits to Mont-Joli over the first half of 1998 and observed no car securement or derail misuse deficiencies.

TC has a plan which may reduce the risk of uncontrolled movements by intensifying yard inspections and requiring railways to implement safety programs that TC safety inspectors would be able to audit. However, TC's national safety audit program had not yet been implemented at the time of the occurrence. Therefore, there has been no opportunity for the benefits of this program to result in changes at the MRC or other railways under federal jurisdiction.

The RAC's plan to issue materials, training aids, and best practices regarding the securement of cars to its members (including the MRC) was not implemented at the time of the occurrence. There was therefore no opportunity for the information to benefit the MRC or other railways under federal or provincial jurisdiction.

Despite the safety actions taken by Canadian railways, TC, and the RAC, the continued frequency of runaways suggests that employees of different Canadian railway companies still do not consistently comply with required car securement and derail usage procedures.

3.0 Conclusions

3.1 Findings as to Causes and Contributing Factors

1. The switching crew members did not apply hand brake(s) on the five-pak that ran away, although they were familiar with the rules requiring them to do so. Based on their experience with other equipment, they expected the emergency air brake application to secure the five-pak adequately.

2. An abnormal rate of brake cylinder air leakage, found to exist within CN 683 series five-paks, went undetected and resulted in the air brakes on the runaway five-pak releasing before the switching was completed.

3. The switching crew members left the equipment unattended without the split-switch derail set in the derailing position when they interrupted their switching movements to allow the VIA Rail Canada Inc. (VIA) train to pass on the main track.

4. Had the split-switch derail been set in the derailing position, it would have been an effective barrier to prevent the runaway five-pak from entering the main track.

3.2 Findings Related to Risks to Persons, Property and the Environment

1. In the event of runaways on the main track, operating at cautionary speed may contribute to the degree of damage and hazard to passengers, crew, and the environment.

2. Current car inspection practices and train air brake tests in train yards are such that the detection of abnormal air brake leakage on a single car is very difficult.

3. The practice of not setting the split-switch derail in the derailing position when equipment could potentially move uncontrollably onto the main track and risk a main track collision.

4. Matapédia Railway Company (MRC) management and supervision presumed that, since employees had been trained in safety rules by Canadian National (CN) and CANAC, they would consistently adhere to them.

5. The MRC management and supervisory approach before the accident did not deter employees from using risky car securement and derail usage practices.

6. MRC management had not issued written instructions to its employees on the application of Canadian Rail Operating Rules (CROR) Rule 112 with respect to any equipment.

3.3 Findings Related to Safety Overview

1. Despite safety actions taken by Canadian railways, Transport Canada, and the Railway Association of Canada (RAC), employees of Canadian railway companies do not consistently comply with required car securement and derail usage procedures as evidenced by the continued frequency of runaways.

2. The RAC plan to issue materials, training aids, and best practices regarding car securement had not been implemented at the time of the occurrence.

3. Transport Canada's regulatory monitoring programs did not identify unsafe car securement and derail usage practices on the MRC.

4. Transport Canada's planned national railway safety audit program involving risk analysis and intensification of yard inspections may reduce the risks of uncontrolled equipment movement and associated hazards to passengers and railway employees.

4.0 Safety Action

4.1 Action Taken

4.1.1 Matapédia Railway Company

Matapédia Railway Company (MRC) management held a meeting with all employees to discuss the collision and to determine a safe operations program to reduce the risks of recurrence. A Mont-Joli Yard operating manual was prepared and reviewed on 23 October 1998 by the MRC Occupational Safety and Health (OSH) Committee. The operating manual contains information on when hand brakes should and should not be applied, and in particular, when derails should be set in the derailing position.

The supervisor of operations:

- issued a bulletin, on 23 August 1998, to require the caution speed to be no more than 20 mph when entering certain curves within cautionary limits about Mont-Joli in both directions (Operating Bulletin No. 99110101, issued on 09 August 1999, completely revised article 4.1 of the MRC time table further limiting all movements to a maximum speed of 15 mph between Mile 103.8 and Mile 106.0 within MRC cautionary limits);
- had a debriefing meeting with municipal authorities to further coordinate emergency measures planning; and
- set up a spot-check regime whereby yard switches, derails and hand brakes on standing cars are inspected at least three times per week with a minimum of 10 tracks per spot-check.

Additionally, yard crews were specifically instructed to secure cars in accordance with Canadian Rail Operating Rules (CROR) Rule 112 and related special instructions. They were specifically instructed to set the derail in the derailing position when there was a chance of an uncontrolled movement even when hand brakes were applied.

At Transport Canada's (TC) Surface Atlantic Region Annual General Meeting held on 21 March 2000, which included representatives from VIA Rail Canada Inc. (VIA), New Brunswick East Coast Railway (NBEC), New Brunswick Department of Transportation and TC, representatives of the *Société des chemins de fer du Québec* ((SCFQ), the parent company of the MRC) outlined several further initiatives being progressed. These initiatives were in training, supervision, risk management, safety management system, joint inspections with VIA, and changes at the rail traffic control office in Campbellton, New Brunswick. Although these initiatives resulted from the VIA derailment at Miramichi, New Brunswick, SCFQ officials stated that they intend to implement them in all SCFQ's subsidiary companies, including the MRC.

The following provides a few highlights for each initiative.

- Training: The SCFQ indicated a safety training officer will be hired to oversee the activities of SCFQ and its subsidiaries. A training document is being developed and will be incorporated in the railway's safety management system. TC, as a regulator, will verify the qualifications of the on-the-job trainers.

- Supervision: A transportation consultant has been hired by the SCFQ who will evaluate employees in the field, and will carry out blitzes on operating employees. Canadian National's (CN) checklist documentation will be used to help develop structured audit documentation. The audits will be conducted on a regular basis, at a frequency yet to be determined. The SCFQ noted its safety management system will formalize this process. Supervisory programs will focus on the monitoring and supervision of newly trained employees.

- Risk Management and Safety Management Systems: The SCFQ has hired a risk management consultant. The consultant's first endeavour is to carry out a pilot project with NBEC and the MRC. The consultant is tasked to bring all safety management system components together by obtaining guidance through the New Brunswick Southern Railway safety management system pilot project. A steering committee with participants from NBEC, MRC, and SCFQ will review and implement the different stages of the safety management system. TC officials will be kept informed of the progress of this initiative.

- Joint Inspection with VIA: Joint inspection of the main trackage throughout the NBEC and MRC territory was conducted with representatives of VIA, SCFQ, NBEC, and MRC. Subsequent to this inspection, an operating bulletin was issued to employees to clarify cautionary limits. Also, the visibility of a number of main track switch targets was subsequently improved by the addition of new highly reflective material.

- Rail Traffic Control Office: A commitment was made to install a communication voice recording system in the rail traffic control office to aid in future accident/incident investigation as well as regular ongoing supervision of employees.

4.1.2 Transport Canada

An operations monitoring inspection of the Mont-Joli Yard was conducted on 26 August 1998. Two deficiencies were noted. Main track switch RJ-21 was left in the reverse position without permission, and the RJ-21 split-switch derail was not in the derailing position. On 31 August 1998, MRC issued an operating bulletin allowing the 21 switch to be left lined and locked in the reverse position, and requiring trains to be prepared to stop at this switch if it is not properly

lined. (No specific mention of the position of the RJ-21 split-switch derail was made in this operating bulletin.) On 29 September 1998, officials from TC met with the MRC to further discuss safety matters.

TC advised that it would intensify its yard inspections across Canada. TC is also developing regulations requiring railways to implement a safety management system against which TC can audit. As part of TC's ongoing work on inspection programs, TC states that efforts continue to be placed in areas such as derails and safe car securement to ensure compliance. Particular attention is placed on yard and storage tracks and areas with a gradient.

The Minister of Transport recently approved revisions to the CROR, which include revisions to the derail rules. These revised rules became effective 01 July 2000. On implementation, TC indicated that both Headquarters and regional staff will monitor the railways for compliance and, when necessary, take appropriate action.

TC stated that it will continue to focus attention on MRC compliance and the safety initiatives it is implementing. In addition, TC stated that the region will intensify its monitoring attention on the issues raised as a result of this investigation.

4.1.3 Railway Association of Canada

In response to a previous TSB recommendation (R97-05, see section 1.8.1), and to ensure that all of its member railways had access to materials, training aids and best practices, the RAC committed to the development and distribution of an RAC circular of recommended practice governing the safe securement of railway equipment.

RAC Recommended Practices Circular No. 11, entitled *Safe Securement of Railway Equipment*, was published on 01 November 1999, and includes generic instructions and procedures for all railways, as well as specific General Operating Instructions (GOIs) of CN and Canadian Pacific Railway (CPR) to cover interline movements. The circular also includes a job-aid with task and safety checklists.

At the same time, the RAC arranged for the development of an equipment securement workshop. The workshop was designed to improve understanding and performance of safe securement procedures and practices amongst operating personnel within the railway industry (with emphasis added on short lines, outside industry, and customers who own or operate railway equipment). The workshop included several industry videos on the subject. The workshop package was distributed to all RAC members in the fall of 1999.

A survey was conducted during the first quarter of 2000 to determine the extent to which the workshop was being utilized. Both CN and CPR indicated that, although they made significant contributions to the development of the workshop, for the most part, they have been using their own training packages, revised operating policies, and focussed proficiency testing to improve car securement performance. CN and CPR have been promoting the use of the RAC workshop with shippers and customers as well as delivering their own equipment securement programs and conducting related awareness campaigns.

Various regional and short line railways have reported that the car securement package has been delivered to

selected personnel or has been incorporated into their operations training programs. The RAC continues to promote the use of the RAC circular and workshop during member field visits and related regulatory workshops.

4.1.4 Transportation Safety Board of Canada

The TSB wrote to TC on 25 August 1998 outlining the current statistics on runaways in Canada, reminding TC of past TSB recommendations since 1992 on related matters, and pointing out the increase in the number of runaways in 1998. The TSB suggested that TC may wish to review the past actions taken to reduce the number of runaways. A meeting was subsequently held to discuss the data but no conclusion could be made to identify specific areas of deficiency.

The TSB also issued a Rail Safety Information Letter on 21 January 1999 outlining the results of tests and observations pertaining to car inspections under certain background noise conditions and the ability to detect air brake leaks under those conditions. Following receipt of the Information Letter, TC Rail Safety inspectors initiated sample inspections in several locations across Canada. The inspections did not identify any exceptions to the effect that the railways were not performing air brake tests according to the applicable rules. TC stated that Rail Safety inspectors will continue to be vigilant for such issues through their regular monitoring activities and take whatever action is deemed necessary. In addition, TC will bring the issue of air brake testing to the attention of the railways to address concerns with the performance of brake testing in areas where excessive noise exists.

4.1.5 Canadian National

Since the accident, the maintenance program at CN's Transcona shops in Winnipeg has been completed on the entire CN 683 series five-paks. During this program, various types of maintenance were performed and the braking systems were serviced.

4.2 Safety Concerns

4.2.1 Caution Speed

Operating areas where the railways have designated cautionary limits typically involve heightened levels of overall railway activity. These can include, but are not limited to, such things as increased amounts of switching, multiple movements working at similar times, increased numbers of yard tracks or industrial sidings, and locations where track maintenance forces are concentrated. These areas by their nature present a higher number of hazards. In these locations, there is an increased risk of a movement encountering another opposing equipment or track unit, a main track switch that is in use and not lined for the main track, a main track switch that is left improperly lined, trespassers, acts of vandalism or, as in this accident, runaway railway equipment.

The present definition of caution speed does not contain the requirement not to exceed slow speed, which is a maximum of 15 mph. Train movements can now proceed through cautionary limits at speeds three to four times

that amount if certain conditions exist (i.e. if there is no other equipment or track unit in sight, and the track appears clear). Because damage is a function of train speed, a derailment or collision occurring at increased speed is likely to incur more damage. The Board is concerned that the reduced requirements of caution speed, as presently defined in the CROR, may not be providing rail movements, particularly passenger trains, with an adequate safety defence against the increased risks that can exist within cautionary limits.

4.2.2 Safe Securement of Railway Equipment

Neither MRC's nor CN's current time table and monthly bulletins provide guidance to employees on how to apply the rules and instructions pertaining to hand brakes
(CROR Rule 112) to multi-platform cars. These cars often have more platforms than air brake systems (e.g. this five-pak had only three sets of air brakes) and, frequently, multi-platform cars have only two hand brakes, regardless of the number of platforms (i.e. three, four or five). The significant initiative by the RAC referenced in Section 4.1.3 (Recommended Practices Circular No. 11, *Safe Securement of Railway Equipment*) involved participation by most of its members, including CN and CPR. It was widely circulated to all its member railways and interested customers who perform their own switching activities. However, the RAC circular has not dealt directly with the aspect of multi-platform cars and has left the matter with the individual railways to address, if they so desire.

The information in CN's Appendix A1 of RAC Circular No. 11 does not contain any instruction pertaining to this topic. CPR has an instruction about multi-platform cars in Appendix A2 of RAC Circular No. 11. However, it can be misinterpreted to mean that one hand brake on a
five-pak meets the minimum hand brake requirement.[5]

[5] CPR's instructions in Appendix A2 state, "On multi-platform cars, each platform is to be considered one car. However, if a multi-platform car has only 1 or 2 hand brakes for 3 to 5 platforms, it may be considered that the minimum hand brake requirement is met for that car."

Without specific and clearly understood guidance to employees, the application of the rules and instructions are open to varying interpretations. Proper securement of railway equipment is critical to railway safety. Therefore, the Board is concerned that some employees working for railways under federal jurisdiction and their customers may unknowingly secure multi-platform cars with less than the required number of hand brakes.

4.2.3 Temporary Securement of Equipment with Air Brakes Only

Although MRC does not, some federal railways (e.g. CN and CPR) have special instructions allowing operating employees to rely on brake cylinder air alone instead of hand brakes under certain conditions to secure equipment for short periods of time (see Appendix A). CN's instructions, unlike CPR's, do not require employees using such practices to be close enough to apply the hand brakes should unintended movement occur. Air brake equipment manufacturers do not guarantee brake cylinder integrity as a means of safe securement when equipment is left standing with the air brakes applied in service or emergency without a supply of air, and recommend the use of a sufficient number of hand brakes in all circumstances where equipment is left standing. Although all the CN 683 series five-paks have had their brakes serviced, the practice of leaving equipment secured with only the air brakes applied can leave train crews vulnerable to any rail cars with poor-performing brake systems, a condition not easily detected in the field.

The Board is concerned that the reliance on entrapped brake cylinder air instead of hand brakes to secure equipment for short periods of time may not provide an adequate safety defence against the risk of runaway equipment.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 26 July 2000.

Appendix A - CROR Rules 112 and 104.5

CROR	CROR Rule 112 requires that, "Unless otherwise directed by special instructions, a sufficient number of hand brakes must be applied on equipment left at any point to prevent it from moving."
MRC	System special instructions applicable to CROR Rule 112 - None Time table subdivision footnotes require additional hand brakes to be applied at certain locations other than the Mont-Joli Yard.
CN	CN special instructions for Rule 112 (CN Bulletin CH442/98, dated 10 June 1998) require that, unless otherwise provided, one car must have a minimum of one hand brake and 2 to 19 cars must have a minimum of two hand brakes applied before being left standing. CN special instruction 2 for CROR Rule 112 requires that, "Before relying on the retarding force of the handbrake . . . the handbrake must be tested by fully applying the handbrake and moving the car . . . to ensure the required minimum handbrake(s) application applies the retarding force necessary to prevent the equipment from moving." It is also required that "the brake piston on cars on which handbrakes are to be applied must be released before handbrakes are applied."

There are exceptions to CN's mandatory hand brake application rule, such as when leaving a portion of a train on the main track or siding, or when performing en route switching, set-off or lift, provided the standing portion left:

- is 10 cars or more;
- has air brakes applied in full service or emergency and the angle cock is fully open;
- is not on a grade in excess of 1.5 per cent; and
- will not be left in excess of 2 hours.

This exception is made with the presumption that air brake leakage would not result in air brake release within a two-hour period.

By comparison, according to the July 1998 Canadian Pacific Railway (CPR) hand brake policy, CPR requires that "a single car must always be left with the hand brake applied" and more than two cars must have more than two hand brakes applied (minimum hand brake policy 1.1 a) and b)). CPR also specifies that "on multi-platform cars, each platform is to be considered one car. However, if a multi-platform car has only 1 or 2 hand brakes for 3 to 5 platforms, it may be considered that the minimum requirement is met for that car." CPR further requires that "to ensure an adequate number of hand brakes are applied, release all air brakes and allow or cause the slack to adjust. It must be apparent when slack runs in or out, that the hand brakes are sufficient to prevent that cut of cars from moving. This must be done before uncoupling" (minimum hand brake policy 1.2). CPR further requires that "during switching, emergency air brake applications must not be relied upon to hold equipment stationary for short periods of time unless: i) there are at least 10 cars which are sufficiently charged with air AND ii) a crew member is in close enough proximity to safely apply hand brakes if unintended movement

occurs."

Under CPR's requirements, a single five-pak should have two hand brakes applied when left unattended. In this context, a single five-pak would be "unattended" when a crew member is not close enough to safely apply hand brakes to the car if it starts to move.

CROR	CROR Rule 104.5 requires: (a) The location of each derail will be marked by a sign, unless otherwise directed by special instructions. Employees must be familiar with the location of each derail. (b) A train or engine must not approach to within 100 feet of a derail set in the derailing position. (c) Except when Form S is in effect, after a derail has been placed in the non-derailing position and the track is no longer in use, such derail must be restored to the derailing position and secured with a lock whether or not there is equipment on the track. (d) Where a derail is required on a main track, special instructions will govern its operation.
MRC	System special instructions applicable to CROR Rule 104.5 - None Time table subdivision footnotes - None
CN	At the time of the accident, CN special instructions for Rule 104.5 required that: "Where one or more derail marker signs are displayed on one post, the number of signs will indicate the number of tracks equipped with derails adjacent to the sign."

Appendix B - Five-Pak Runaway Speed Simulation Results

A similar car was placed on the scale track where CN 683656 had been placed the night of the collision. It had no brakes applied, was held in place by a locomotive and the locomotive was moved away downgrade to the west from the five-pak. The five-pak moved eastward (the opposite direction to the original runaway). The five-pak was then twice moved further downgrade, to the west, to locations where it still did not move. It was then placed further downgrade, to the west, such that it began to move very slowly on its own, with the locomotive preceding the movement by about 20 to 30 feet and an MRC employee riding the five-pak, ready to apply the hand brake, if necessary. Measurements of the speed of the car were taken at six locations between the scale and the point of impact.

Location	Distance from scale house (feet)	Distance from start point (feet)	Time from start point (seconds)	Average speed from start point (feet per second/ mph)	Speed* at selected point (mph)	Locomotive speedometer reading** (mph)
start point	120	0	0	0	0	0
RJ-27 switch	289	169	40	4.23 / 2.88	5.8	not available
RJ-26 switch	380	260	65	4.00 / 2.73	5.5	3
split-switch derail	1053	933	222	4.20 / 2.86	5.7	not available
main track 21 switch	1300	1180	250	4.72 / 3.22	6.4	5
two platforms on main track	1380	1260	265	4.75 / 3.24	6.5	not available
approximate impact point	1435	1315	277	4.75 / 3.24	6.5	not available

* Note: Assuming linear acceleration—likely not exact as it appears acceleration was quick to begin with, levelled off, and then increased.

** Note: The speedometer at such low speeds is not very accurate.

Appendix C - Significant Event Recorder Data from VIA 14 Locomotive 6400

Recorded time (one hour less than EDT)	Speed (mph)	Brake pipe pressure (psi)	Throttle position	Emergency brake	Estimated distance west of 21 switch (feet)
0249:22	0	0	idle	on	40
0249:21	12	0	idle	on	49
0249:20	26	0	idle	on	77
0249:19	28	0	idle	on	116
0249:18	30	0	idle	on	149 likely point of impact*
0249:16	36	0	idle	on	256
0249:15	39	1	idle	on	311
0249:13	39	3	idle	on	425
0249:12	40	12	idle	on	483
0249:11	39	67	idle	on	541
0249:10	39	99	1	off	598 emergency application
0249:09	39	101	2	off	655
0248:49	35	95	4	off	1722 21 switch visible
0248:46	37	90	1	off	1881
0248:42	42	81	1	off	2113 brake release
0248:34	50	83	1	off	2653
0248:30	53	85	2	off	2955 brake application
0247:59	58	100	2	off	5478
0246:32	70	101	3	off	11118

* Note: Impact mileage was the mileage of the 21 switch plus 149 feet (105.67 + 149 feet = 105.70)

Appendix D - Glossary

AAR	Association of American Railroads
ATV	all-terrain vehicle
CN	Canadian National
CPR	Canadian Pacific Railway
CROR	Canadian Rail Operating Rules
dB	decibel
EDT	eastern daylight time
five-pak	five-platform articulated well car
GOI	General Operating Instructions
mph	mile per hour
MRC	Matapédia Railway Company
NBEC	New Brunswick East Coast Railway
OBS	on-board service
OSH	Occupational Safety and Health
psi	pound per square inch
RAC	Railway Association of Canada
SCFQ	*Société des chemins de fer du Québec*
TC	Transport Canada
TSB	Transportation Safety Board of Canada
VIA	VIA Rail Canada Inc.