Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

RAILWAY INVESTIGATION REPORT

R06W0079

DERAILMENT

CANADIAN PACIFIC RAILWAY
TRAIN C06-22
MILE 17.4, EMPRESS SUBDIVISION
NEAR SWIFT CURRENT, SASKATCHEWAN
22 MAY 2006

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

Derailment

Canadian Pacific Railway
Train C06-22
Mile 17.4, Empress Subdivision
Near Swift Current, Saskatchewan
22 May 2006

Report Number R06W0079

Summary

On 22 May 2006, at approximately 1330 central standard time, westward Canadian Pacific Railway freight train C06-22 derailed 22 cars at Mile 17.4 of the Empress Subdivision near Swift Current, Saskatchewan. Twenty-one residue tank cars and one ballast car derailed. There were no injuries.

Ce rapport est également disponible en français.

Other Factual Information

On 22 May 2006, at approximately 1224 central standard time,[1] Canadian Pacific Railway (CPR) freight train C06-22 (the train) departed Swift Current, Saskatchewan,[2] destined for the Town of Leader (see Figure 1). The train was comprised of 3 locomotives, 66 empty hopper cars, 6 loaded ballast cars and 21 residue tank cars. It weighed 3899 tons and was 5819 feet long. The three members of the train crew (a locomotive engineer, a conductor, and a trainman) were qualified for their respective positions, and met regulatory fitness and rest standards.

On the day of the occurrence, only two crew members were on board. The trainman was following the train in his personal vehicle and meeting the train whenever switching operations were required. The crew took this approach for personal reasons on that particular day. Management had not been made aware of these arrangements.

At the time of the occurrence, the weather was clear with a temperature of 31°C.

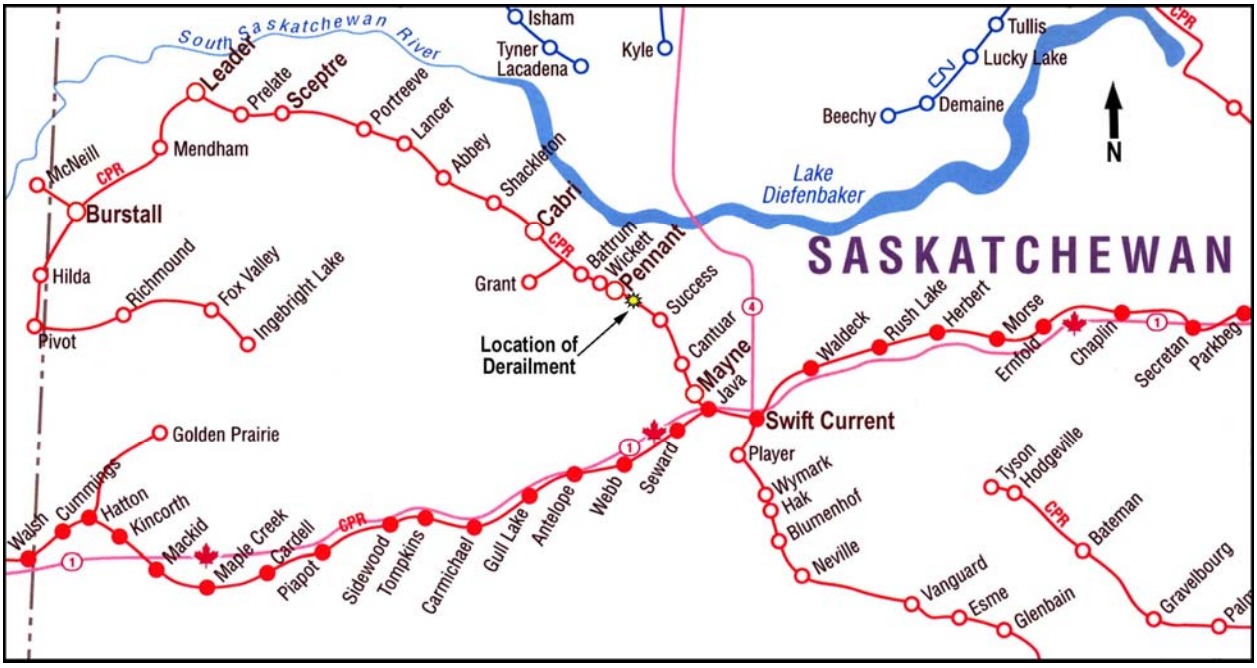

Figure 1. Route map identifying location of derailment (Source: Railway Association of Canada, *Canadian Railway Atlas*)

1. All times are central standard time (Coordinated Universal Time minus six hours).

2 All locations are in Saskatchewan.

Train Handling Before the Derailment

Based on the locomotive event recorder (LER) download, there were no train handling exceptions between the outer main track at Swift Current (Mile 1.7 of the Swift Current Subdivision) to the junction switch at Mayne (Mile 6.0 of the Empress Subdivision). The train arrived at Mayne at approximately 1233. At Mayne, the train was slowed to 2.7 mph while the trainman lined the switch for the Empress Subdivision.

After leaving the switch at Mayne, the train was consistently operated above 20 mph up to the point of derailment. The only deviation occurred when the speed was reduced to 20 mph as the train passed through a hot box detector (HBD). This HBD recorded speed for all passing trains. An LER download from the previous trip by the same train crew over the same territory indicated a similar pattern of train operation.

Other than slowing the train in the vicinity of the HBD, the crew took no action to reduce train speed until just before the derailment. With the head end of the train at approximately Mile 19.1, the locomotive engineer initiated an emergency brake application. At the time of the derailment, train speed was approximately 27 mph.

Site Inspection Following the Derailment

The first derailment marks found on the rail were at Mile 17.4. A second set of marks were found at the east end spiral of the curve at Mile 17.6. At both locations, the south wheel derailed to the field side of the rail, and the north wheel dropped into the gauge side of the rail (see Photo 1).

Photo 1. Point of derailment (Mile 17.4)

The 22 derailed cars (71st car—CP457276 to 92nd car—GATX201295) came to rest in the vicinity of Mile 18.39 (see Figure 2). The lead locomotive came to a stop at Mile 19.16.

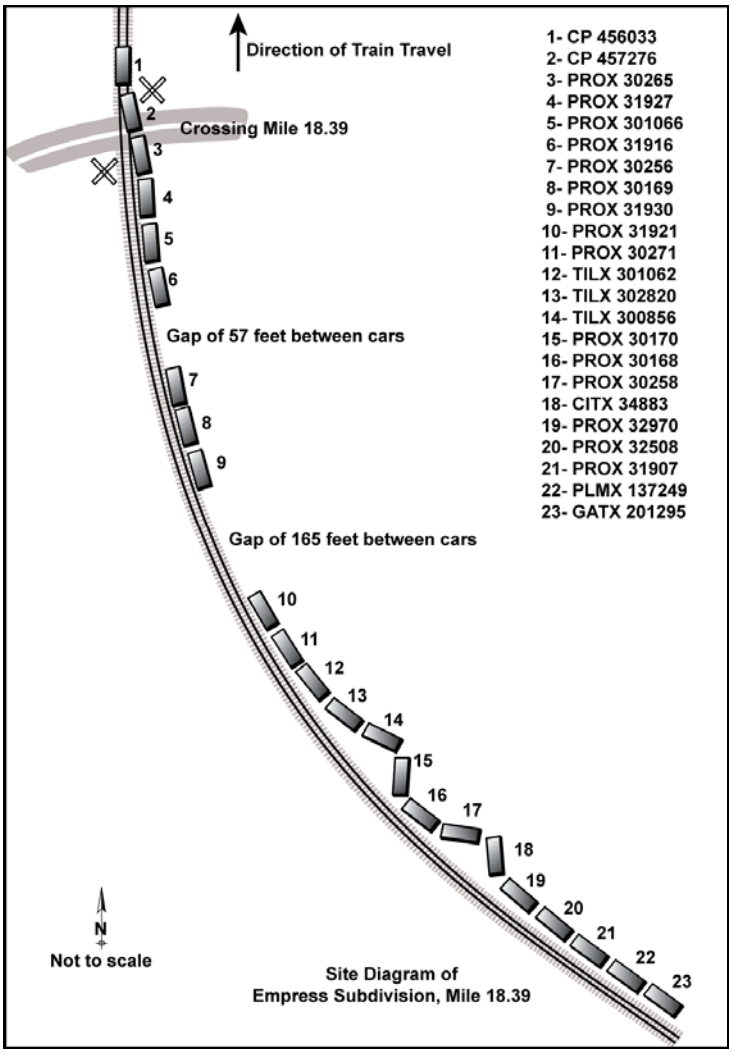

Figure 2. Schematic of derailment site

The trailing truck of car PROX 31921 (79th car) and the leading truck of car PROX 30271 (80th car) had the most damage to the wheels, side frames, and bolsters, which indicates that one of these cars was the first to derail. Both cars PROX 31921 and PROX 30271 were residue tank cars that last contained liquefied petroleum gas (UN 1075).

Mechanical Information for Cars PROX 31921 and PROX 30271

Following the derailment, qualified CPR inspectors, in the presence of TSB investigators, performed a mechanical inspection on both cars PROX 31921 and PROX 30271. The measurements taken on the trucks were found to be within acceptable limits. For comparison, a car (PROX 31248) similar to the derailed cars was also inspected. It had wear characteristics similar to cars PROX 31921 and PROX 30271, and these wear measurements were also within acceptable limits.

These three cars were built in April 1996 (car PROX 312480), February 1997 (car PROX 30271), and August 2001 (car PROX 31921).

Subdivision Information

The Empress Subdivision is Class 2 track from Mile 0.0 (Mayne) to Mile 89.3 (end of subdivision). Train movements are governed by the Occupancy Control System, in accordance with the *Canadian Rail Operating Rules*. The maximum operating speed for freight trains operating over Class 2 track is 25 mph.

Particulars of the Track

Throughout the subdivision, the track consisted of 100-pound jointed rail secured to softwood ties with two spikes per single-shouldered tie plate. The ties were box-anchored every second tie. The ballast was a mixture of crushed rock and crushed washed stone.

The track in the area of the derailment was within the guidelines for Class 2 track. The joints were not battered. The ties at the joints were sound and the number of defective ties in the vicinity was low. The maximum cross-level through the derailment area was 11/16 inch.

Track Restrictions on the Empress Subdivision

Between Mile 25.0 and Mile 87.0 (Leader East), track speed had been reduced to 10 mph due to track condition. This speed restriction was listed in the Temporary General Bulletin Order for the Medicine Hat Terminal and had been in place since 29 September 2005. There was no immediate plan for remedial action to improve the track condition to allow the removal of this track restriction.

Equipment Restrictions on the Empress Subdivision

The track between Mile 0.0 and Mile 87.0 had a maximum permissible speed of 25 mph. The Monthly Operating Bulletin for the Alberta Service Area listed three equipment restrictions for the Empress Subdivision:

- carrying empty tank cars: restricted to 20 mph;
- carrying empty tank cars and loaded covered hopper cars: restricted to 15 mph; or
- carrying empty tank cars and other equipment: restricted to 20 mph.

The last restriction applied to the train in this derailment.

The equipment speed restrictions were in place to reduce the potential for harmonic rock and roll associated with particular combinations of equipment. Following a derailment on 14 July 1999 (R99C0069), CPR conducted a number of computer simulations using NUCARS[3] of various equipment combinations and speeds on the Empress Subdivision. This analysis determined that the potential for harmonic rock and roll for empty tank cars increases substantially when operating above 20 mph on the Empress Subdivision.

Before the occurrence, not all of the crew members operating over the Empress Subdivision were aware of the reasons for these equipment speed restrictions.

North Grain Train Assignment

The occurrence train was an assignment commonly known as the North Grain Train. This was an unassigned train operating out of Swift Current with three crew members: a locomotive engineer, a conductor, and a trainman. Given that there was only one crew and one train operating regularly out of Swift Current, the same three crew members normally operated the train. All three crew members had been operating generally in the area and had been working the North Grain Train Assignment particularly for quite some time.

The normal crew routine for this assignment was to report to Swift Current Yard at approximately 0700 on Monday and build the train. Usually, the crew completed this in late morning and then went for lunch while the paperwork was completed. They then boarded the train and departed for Leader with an intermediate stop in Cabri (Mile 34.9). The crew would report off-duty in Cabri and then on-duty again.

Depending on their arrival time in Leader, the crew would sometimes stop in Cabri for a meal. They would usually arrive in Leader between 1900 and 2100 depending on the number of en route stops required to drop off grain cars. They were then off work in Leader until late afternoon on Tuesday, usually until 1600 or 1700. Around that time, they would depart Leader for Burstall to conduct switching operations, returning to Leader around 2400 or 0100 on Wednesday morning. The crew would book minimum rest of six hours, exclusive of call time, returning to Swift Current on Wednesday. En route, the crew would collect the grain cars that had been dropped off on Monday and stop at Cabri, booking off-duty and then on-duty, which allowed them to proceed to Swift Current in two duty tours.

This sequence was repeated on Thursday, Friday, and Saturday, with Sunday as their usual day off. They normally worked three weeks before being off for miles.[4]

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3 The industry developed the New and Untried Car Analytic Regime Simulation (NUCARS), a general multi-body rail vehicle dynamics computer simulation model designed to simulate the dynamic interaction of rail vehicles with track.

4. Operating employees are restricted to a maximum number of miles per month. Once reached, they are off for miles for the remainder of the month.

About 18 months before the occurrence, the crew deviated from this schedule. On their own initiative, they began to tie up around Sceptre (Mile 75.8) after 12 hours on the first day. The next day, they would return to work a bit earlier, departing for Burstall to switch at the Gas Plant. This arrangement continued for about three weeks until CPR received complaints about the fumes from the idling locomotives. After some discussion between management and the crew, the crew reverted to taking the train all the way to Leader on the first day.

Sometime around December 2005, the crew had approached the Road Manager with their concerns about how track condition was affecting their ability to complete their assignment on time.

Typical Work Schedule

To understand the crew's work schedule for this assignment, a crew member's work history for April and May 2006 (up to the day of the occurrence) was reviewed. This work schedule was representative of the schedule for the other two crew members. The following observations were drawn from this review:

- The crew's normal work schedule consisted of a trip from Swift Current to Leader with a stop at Cabri on Monday, a trip from Leader to the Gas Plant on Tuesday, and a trip from Leader returning to Swift Current with a stop at Cabri on Wednesday. These trips were repeated on Thursday, Friday, and Saturday, respectively. The crew had Sunday off. Of the six weeks reviewed, this full schedule was completed for four of the six weeks.

- For the four weeks when the full schedule was completed, the crew worked an average of 70 hours 56 minutes each week (ranging from 68 hours 15 minutes to 74 hours 26 minutes).

- During the six-week period, the crew completed the westward trip between Swift Current and Leader 18 times. For all 18 trips, the trip was conducted as two tours of duty with the crew booking off and then back on at Cabri. On half of those trips, the crew booked off and then back on at the same time. For these nine trips, no rest break was taken at Cabri (the intermediate terminal).

- For the 18 trips between Swift Current and Leader, the average duty time for the crew (not including any rest time at Cabri) was 13 hours 19 minutes (ranging from 11 hours 20 minutes to 16 hours 41 minutes).

Work/Rest Rules for Railway Operating Employees

The *Work/Rest Rules for Railway Operating Employees* (June 2005) were established pursuant to Section 20(1) of the *Railway Safety Act*. Section 5.1 of these rules sets out the maximum hours of service for operating employees.

> 5.1.1 a) The maximum continuous on-duty time for a single tour of duty operating in any class of service, is 12 hours, except work train service for which the maximum duty time is 16 hours. Where a tour of duty is designated as a split shift, as in the case of commuter service, the combined on-duty time for the two on-duty periods cannot exceed 12 hours.
>
> 5.1.2 Ticket splitting in order to circumvent compliance with subsection 5.1.1 is prohibited.
>
> 5.1.3 The maximum combined on-duty time for more than one tour of duty, operating in any class of service, cannot exceed 18 hours between "resets" as outlined in subsection 5.1.4.

For these rules, shift or tour of duty is defined as "a single continuous period on-duty in any class of service, except split shifts, which are comprised of distinct duty periods." Ticket splitting is defined as a situation in which "operating employees are placed off-duty and on-duty, while en-route, expressly for the purpose of circumventing the maximum on-duty time provisions contained in subsection 5.1.1."

Section 6.2 of the *Work/Rest Rules for Railway Operating Employees* deals with the development and implementation of fatigue management plans. This section provides additional detail on how the operating company should handle multiple tours of duty.

> 6.2.3 a) Fatigue management plans shall address how operating employees, who work more than one tour of duty under the provisions of subsection 5.1.3, will be afforded the opportunity to be involved in the decision to accept a subsequent tour of duty, based on their fitness at that time.
>
> b) Where railway companies have processes in place that provide rest provisions that allow employees to elect to take rest prior to a subsequent shift or tour of duty, such will satisfy the requirements of paragraph a).
>
> c) Fatigue management plans shall also address the circumstances under which operating employees in road service, not taking rest, will be provided the option to take a break of up to 45 minutes off-duty between consecutive working tours of duty where the combined on-duty time will exceed 12 hours.

These sections reinforce the importance of involving the employee in the decision to work more than one tour of duty and the need to provide an opportunity to rest between tours of duty. Practices that constitute ticket splitting reduce or eliminate the opportunity for crew members to recuperate between tours of duty.

When crews work more than 64 hours (on duty) in 7 days, the *Work/Rest Rules for Railway Operating Employees* require that a specific fatigue management plan be in place.

Transport Canada's Interpretation Manual for Work/Rest Rules

A document entitled "Transport Canada Rail Safety Interpretation Manual for Work Rest Rules" was developed to help Rail Safety inspectors interpret the *Work/Rest Rules for Railway Operating Employees*. With respect to Section 5.1.3, the document provides examples of what would constitute ticket splitting. These examples involve situations in which a train crew is ordered between two stations (station A and station Z). In these examples, the crew is advised to book off at an intermediate station (station M) and then book back on and

- crew the first train beyond the intermediate station (M to Z),
- crew the first train back toward their originating station (M to A),
- crew another train beyond the intermediate station or back to their originating station, or
- change their train designation (for example, from a freight train to a work train).

The distinction between the situations described above and a situation in which a train crew operates the train between the two stations as originally ordered and then accepts a second tour of duty in accordance with Section 5.1.3 centres around the crew's ability to book rest at the original terminating station (Z). In those circumstances, when called at station A, the crew members know that they may be required to work up to 12 hours and will be able to book rest at station Z in accordance with either the *Work/Rest Rules for Railway Operating Employees* or the collective bargaining provisions should they feel that they require rest.

Section 5.1.3 of the *Work/Rest Rules for Railway Operating Employees*, which allows for 18 hours of service in two tours of duty, forms the basis for pool or turnaround service. When a train run is consistently assigned to an intermediate terminal, the crew members are able to book rest at the intermediate terminal in accordance with their collective agreement and the *Work/Rest Rules for Railway Operating Employees*. When a crew is ordered to book off and back on at a location other than their ordered terminal, the crew is denied the opportunity to effectively manage fatigue.

Canadian Pacific Railway's Fatigue Management Plan

CPR's General Fatigue Management Plan, dated 19 October 2005 (page 7), states that

> Additionally operating employees who work more than one tour of duty in any 24-hour period are afforded the opportunity to be involved in a decision to accept a subsequent tour of duty, based on their fitness at the time, in accordance with collective agreement provisions in force.
>
> Operating employees in road service working a subsequent tour of duty, who do not take rest, will be provided the option to take a break of up to 45 minutes off duty between working tours of duty, where the combined on-duty time will exceed 12 hours.
>
> Such a break is recommended in order to avoid "off and on" situations, which for all practical purposes would have operating employees in road service working 18 continuous hours on-duty time.

In addition to its General Fatigue Management Plan, CPR has a document entitled "Specific Fatigue Management Plan: 64 hours in 7 days." This document outlines the procedure to follow when an employee works more than 64 hours in 7 days. The procedure indicates that, upon return to the home terminal, the number of hours on duty for the preceding 168 hours (7 days) will be calculated. If this value exceeds 64 hours, the employee will be subject to a mandatory 24 hours free from duty exclusive of call time. In addition, if the mandatory off-duty period ends between 2200 and 0400, the employee may elect to extend the off-duty time until 0400. On completion of 24 hours free from duty, the seven-day clock is reset to zero. In the case of the occurrence crew, this requirement would be satisfied each week as the crew had Sunday as a regular day off.

Management's Overview of the North Grain Train Assignment

The three crew members worked out of Swift Current Yard although they were managed from the Medicine Hat Terminal. They were supervised by a Road Manager who was responsible for operations on the Maple Creek and Empress subdivisions. The Road Manager was one of four managers who reported to the Manager of Operations in Medicine Hat. The Manager of Operations reported to the Service Area Manager (Operations) for the Alberta Service Area. The Service Area Manager (Operations) was one of three for the Alberta Service Area (with the other two Service Area Managers having responsibility for Engineering and Mechanical). The three Service Area Managers reported to an Assistant Vice-President.

The Road Manager, Manager of Operations, and Service Area Manager (Operations) overseeing the North Grain Train Assignment were all relatively new to their positions. The Road Manager had been in his position since August 2005 (nine months before the occurrence). The Manager of Operations and the Service Area Manager (Operations) had been in their positions for just over a year. Each of the three managers described their transition into their position as being relatively smooth. Although there had been an issue with employee absenteeism, it had largely been dealt with. The working relationship between management and employees at the Medicine Hat Terminal (including the crew for the North Grain Train Assignment) was described as positive.

Under CPR's Performance Management System, each manager had targets for monitoring the performance of their employees. For example, the Road Manager was required to perform eight train rides and 20 rules tests each month. Information from these observations was kept in a central database. Each higher level manager would monitor their reports to ensure that the appropriate number of observations was being conducted.

When monitoring crew performance, the choice of train to ride or the choice of crew to observe was left to the discretion of the Road Manager. There was no requirement to monitor specific crews or to ensure that all crew members were observed periodically. However, there is a policy that states that all locomotive engineers must be ridden with and evaluated at least once every three years.

The Road Manager managed approximately 120 employees, including the three on the Empress Subdivision. Most of the Road Manager's performance management activities had been focused on crews operating on the Maple Creek Subdivision. This subdivision is main-line track and is

closer to the Medicine Hat Terminal, where the Road Manager's office is located. Since taking the position, the Road Manager had visited the occurrence crew once (September 2005). Because the crew was switching cars at the Gas Plant and did not begin work until approximately 1700, the Road Manager did not have the opportunity to ride with the crew to verify operating practices.

The Manager of Operations for the Medicine Hat Terminal and the Service Area Manager (Operations) were not aware of any operational issues with the North Grain Train Assignment. The Manager of Operations monitored crew operations in his territory using reports from CPR's Compliance Assurance Monitoring System and conducting a minimum of two train rides per month. In addition, he monitored crew duty times through the automatic reporting of any crew with a single tour of duty over 10 or 12 hours. The occurrence crew had not appeared on these reports as each of their individual tours of duty was below that threshold. The Manager of Operations believed that the North Grain Train Assignment was being operated in accordance with company policies and procedures because there had been no previous problems with derailed cars or damaged equipment during switching operations. Likewise, the Service Area Manager felt that the operation was running smoothly because no issues had been brought to his attention by the crew or by the customers.

Management's Expectations Regarding Speeding on the Empress Subdivision

The crew had not been disciplined for speeding, nor did the Road Manager have any indication that the crew had been speeding. Nevertheless, he spoke to the crew about speed limits to make it clear that speeding would not be tolerated, particularly beyond 2 mph in excess of the speed limit.

Factors Contributing to Rule Violations

J. Reason defines violations as "deliberate—but not necessarily reprehensible—deviations from those practices deemed necessary (by designers, managers, and regulatory agencies) to maintain the safe operation of a potentially hazardous system."[5] He further distinguishes between routine violations and exceptional violations. Routine violations are those that have become habitual. They are most heavily influenced by the natural human desire for expediency combined with a work environment that allows these violations to continue through lack of observation or enforcement. By comparison, exceptional violations are more likely to be one-time occurrences. They are frequently observed when operators find themselves in situations in which a task cannot be completed in the given conditions if procedures are followed.[6]

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5. J. Reason, *Human Error,* New York: Cambridge University Press, 1990, p. 195.

6. Ibid., p. 196.

S. Dekker describes how the gap between procedures and practices in an organization is not constant but changes slowly over time in a process of "organizational drift." To satisfy competing goals while completing work, people find more expedient ways of doing things. Each incremental departure from the standard way of doing things is not, on its own, reprehensible, but may serve to slowly erode the safety margin in the system. He indicates that "Past success is taken as a guarantee of future safety. Each operational success achieved at incremental distances from the formal, original rules can establish a new norm. From here, a subsequent departure is once again only a small incremental step."[7]

Transport Canada's Overview of the Empress Subdivision

Transport Canada (TC) had conducted several track and operational inspections on the Empress Subdivision in the two years before the occurrence, scheduling them by using a risk-based process involving various criteria.

For track inspections, the following four approaches were used to determine the specific track locations to inspect:

- Stratified Random Sample Program—This is a proactive program that uses a random generator to select portions of subdivisions (which have been coarsely stratified by risk). This approach allows TC to provide general track oversight and compliance monitoring.

- Risk-Based Targeting—Risk indicators (for example, track geometry reports, rail flaw reports, tonnage reports) are used to identify subdivisions that may have high track defect rates or marginal track conditions with a higher probability of defects occurring.

- Complaint/Derailment Follow-up—Inspections are performed as a follow-up to complaints or after a derailment if it is believed that it may be track-related or if there has been some level of non-compliance with track standards.

- Audit Program—Track may be inspected during the verification portion of general audits on railways.

For monitoring train operations, annual inspection programs were developed based on risk assessment. Some of the risk factors considered included accident/incident history, traffic volume, compliance history, complaints, and railway activity level.

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7. S. Dekker, *Ten Questions About Human Error: A New View of Human Factors and System Safety,* New Jersey: Lawrence Erlbaum Associates, 2005, p. 149.

Analysis

There were no indications of equipment irregularities contributing to this accident. The analysis will focus on the sequence of events leading up to the derailment. It will consider the role of track condition on the Empress Subdivision and the role of human factors relating to the operation of the North Grain Train Assignment.

The Accident

At Mile 17.4, marks on the rail indicated that a car had derailed to the field side of the north rail. The first car to derail was most likely either car PROX 31921 or car PROX 30271, which were both residue tank cars. A second set of marks at Mile 17.6 indicated that a second car had derailed to the field side of the north rail. These two cars were pulled in the derailed position, and then began to stringline the rest of the train around the curve. Once the lateral forces on the rail became large enough, the rail began to roll, resulting in the derailment of an additional 20 cars. With the head end of the train at approximately Mile 19.1, the locomotive engineer initiated an emergency brake application. The lead locomotive came to rest at Mile 19.16.

The train derailed while it was proceeding at approximately 27 mph, a speed that is known to be conducive to harmonic rock and roll in empty tank cars. In addition, the witness marks on the rail were consistent with a harmonic rock and roll derailment. With the presence of harmonic rock and roll, wheel lift likely occurred for the two empty tank cars (PROX 31921 and PROX 30271) leading to the derailment.

Train Speed Violation

For most of the trip leading up to the derailment, train speed had been consistently maintained above 25 mph (that is, at least 5 mph above the allowable speed when carrying empty tank cars). The only exception was a deliberate slowing of the train to 20 mph when passing through an HBD. This pattern of train handling indicates that this speed violation was likely intentional. Furthermore, the LER download from the previous trip showed a similar pattern, which suggests that this was an accepted crew practice.

Violations of formal rules, standards, or procedures are likely to be minimized in a work environment where the rules and procedures are optimized for the conditions in which the work is conducted and where there is ongoing supervision to ensure that work is being conducted in the manner expected.[8]

In this occurrence, the North Grain Train Assignment was operated by crew members who were based in Swift Current. There was little direct supervision or intervention by management as no recent train rides, downloads, or rules tests had been conducted for this crew. This arrangement had been working for some time with no problems reported. However, track conditions and work requirements were making it more difficult for the crew to complete their

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8. J. Reason, *Human Error,* New York: Cambridge University Press, 1990, pp. 95–196.

assignment in a reasonable amount of time. Due to long-standing slow orders and increasing switching volumes, the work days were regularly exceeding 12 hours, increasing the likelihood of speeding.

Management Overview of the North Grain Train Assignment

CPR had performance management requirements for all operations managers. However, these requirements were based on conducting a specific number of observations each month and were not tied to specific train crews. Therefore, it was possible for individual crews, particularly those operating from locations away from a main terminal, to be without direct supervision for long periods of time.

In this occurrence, the train crew worked out of Swift Current Yard but were managed from the Medicine Hat Terminal. Most of the performance management activities had been focused on other crews operating on other main-line track. Minimal direct supervision of the North Grain Train Assignment allowed the practice of speeding to continue. Management's focus on main-line operations created a risk that operational deviations on branch lines would be undetected and uncorrected.

Work/Rest Rules for Railway Operating Employees

The *Work/Rest Rules for Railway Operating Employees* were devised to help ensure that the performance of operating employees would not be unduly affected by fatigue. From a fatigue management point of view, this crew was fortunate in that, being in a pool with one crew and a single train, their work schedule was more predictable than that of a typical unassigned crew. In addition, the crew often had more than the minimum rest at their away from home terminal. However, due to track condition, equipment restrictions, and increasing switching work required en route, it was taking the crew longer to complete their assignment. Specifically, when the crew travelled between Swift Current and Leader, the work days were routinely around 14 hours, and the work weeks were averaging 71 hours.

Under the *Work/Rest Rules for Railway Operating Employees*, a crew can work a maximum of 12 hours on a single tour of duty or up to 18 hours in two tours of duty. The ability of a crew to work up to 18 hours in two tours of duty was included in the *Work/Rest Rules for Railway Operating Employees* to facilitate pool or turnaround service. A crew arriving at an intermediate terminal has the opportunity to book rest if they feel they are not fit for further duty. However, the *Work/Rest Rules for Railway Operating Employees* prohibit "ticket splitting" to allow a crew to work more than 12 hours per day. Interpretation documents for the Work/Rest Rules emphasize that the crew must be able to manage fatigue by being allowed to book rest rather than accept a second tour of duty.

The company's fatigue management plan states that crews working two tours of duty will be encouraged to take a break between tours. However, the crew only occasionally exercised this option. There was no indication that booking rest at Cabri was encouraged. In addition, when the crew booked off in Cabri, it was never intended that they terminate at this location. Instead, by booking rest at Cabri, the crew was able to satisfy the requirements of the *Work/Rest Rules for Railway Operating Employees*. The interpretation of the *Work/Rest Rules for Railway Operating*

Employees that allows a trip, which routinely exceeds 12 hours, to be planned as two tours of duty creates a situation in which crews may routinely exceed the 12-hour maximum tour of duty and work up to 18 hours with little or no rest break. This increases the risk that crew performance will be adversely affected by fatigue.

Findings as to Causes and Contributing Factors

1. The train derailed while it was proceeding at approximately 27 mph (7 mph above the limit), which is a speed known to be conducive to harmonic rock and roll in empty tank cars. With harmonic rock and roll, wheel lift likely occurred for at least two of the empty tank cars, leading to the derailment.

2. Due to long-standing slow orders and increasing switching volumes, the work days were regularly exceeding 12 hours, increasing the likelihood that speeding would occur.

3. Minimal direct supervision of the North Grain Train Assignment allowed the practice of speeding to continue.

Findings as to Risk

1. Although Canadian Pacific Railway has a performance management program, the requirements of this program are not tied to individual crews. This can lead to specific crews going significant periods of time without performance monitoring, thus increasing the risk that performance issues (for example, ignoring procedures) will go undetected.

2. The interpretation of the *Work/Rest Rules for Railway Operating Employees* that allows a trip, which routinely exceeds 12 hours, to be planned as two tours of duty creates a situation in which crews may routinely exceed the 12-hour maximum tour of duty and work up to 18 hours with little or no rest break. This increases the risk that crew performance will be adversely affected by fatigue.

Safety Action Taken

Transport Canada (TC) discussed with Canadian Pacific Railway (CPR) the application of *Work/Rest Rules for Railway Operating Employees*. Based on these discussions, TC indicated that CPR has stopped the practice of booking the crew on and off, and has also modified its fatigue management plans accordingly. In addition, TC's Railway Safety inspectors will continue to monitor CPR's operations to ascertain that the *Work/Rest Rules for Railway Operating Employees* are being complied with.

Following the derailment, CPR implemented the following actions:

- To allow the crew to get out of Swift Current Yard more efficiently, the Swift Current Road Switcher is now responsible for building and preparing the North Grain Train for departure. This will result in the crew having fewer hours on duty between Swift Current and Leader.

- The crews have been instructed to not use Cabri as a final terminal where they could book off duty, book on duty, or book rest. If they cannot complete the tour of duty between Swift Current and Leader within 12 hours, the train must be stopped and secured. The crew will then be transported to Leader for rest and the work will be completed the following day.

- During CPR's annual objective setting meetings, remote or isolated areas will be identified and targets will be developed to ensure that all employees are observed over the course of the year. The Manager of Operations will review the targets with the Road Manager.

- For regular assigned crews who work a regular road assignment/train that does not normally report at Medicine Hat or complete their tour at Medicine Hat, the crew will be ridden and evaluated at least twice a year. In addition, these crews will be proficiency tested at least four times a year, and randomly downloaded at least twice a year.

- Reports at Medicine Hat will be reviewed quarterly to determine which Running Trades Employees (RTE) have not yet been tested. Each Medicine Hat RTE will be tested at least once a year.

- All Medicine Hat RTEs attended a four-hour safety meeting, which included a clear and comprehensive discussion of this occurrence. During these discussions, company expectations about speeding and rule violations were highlighted.

- CPR will conduct a thorough review of this incident through its senior safety oversight committee. This committee will consider the application of corrective actions at other terminals throughout the system.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 17 May 2007.

*Visit the Transportation Safety Board's Web site (**www.tsb.gc.ca**) for information about the Transportation Safety Board and its products and services. There you will also find links to other safety organizations and related sites.*