RAILWAY OCCURRENCE REPORT
R96T0080

COLLISION / DERAILMENT

CANADIAN NATIONAL
MILE 0.0, HALTON SUBDIVISION
TORONTO, ONTARIO
06 MARCH 1996

Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

Railway Occurrence Report

Collision / Derailment

Canadian National
Mile 0.0, Halton Subdivision
Toronto, Ontario
06 March 1996

Report Number R96T0080

Synopsis

On 06 March 1996, at approximately 1600 eastern standard time, in Canadian National (CN) MacMillan Yard, a remotely controlled yard assignment being moved southward on a track that was lined at a crossover for an adjacent track was pulled through the crossover and collided with a standing train, derailing seven cars. There were no injuries or loss of product, but a loaded tank car containing a dangerous good and another with a residue of a dangerous good were heavily damaged.

The Board determined that the yard assignment crew momentarily lost point protection for their movement and operated it in an area that was not known to be safe.

Ce rapport est également disponible en français.

1.0 Factual Information

1.1 The Accident

The CN MacMillan Yard, located at Mile 0.0 of the Halton Subdivision, is a major switching and hump facility. At any given time, several yard assignments are engaged in train marshalling activities in the yard.

The two crew members (a yard foreman and a yard helper) of the 1500 West Control Yard Assignment (the yard assignment) reported for duty at approximately 1445, on 06 March 1996. The yard foreman conducted a job briefing using a CN Job Briefing Form as a guide and completed the form.

Each of the crew members was equipped with a locomotive control system (LCS) beltpack, which had been powered up and tested as required. The crew obtained their marshalling instructions from the yard coordinator, inspected their locomotives, and moved them over to track C-06.

The yard assignment, operating under remote control, began switching at approximately 1500.

After performing several switching moves involving tracks C-06, C-07 and C-10 (during which time the yard coordinator advised them that train M-383-31-06 (train 383) had pulled out onto the Halton Outbound Track), the crew began a move southward from track C-06 with 59 cars. The yard foreman was positioned in the lead locomotive at the south end of the movement. The yard helper was controlling the assignment from a position approximately 36 cars back from the head end.

Train 383, comprised of 3 locomotives, 34 loaded cars and 33 empty cars, was standing on the Halton Outbound Track awaiting a permissive signal to enter the Halton Subdivision to proceed to Sarnia, Ontario.

The yard movement was stopped on the instruction of the yard foreman while he detrained and lined a crossover for the track adjacent to the Halton Outbound Track. The yard foreman then instructed the yard helper to begin pulling again and assumed a position on the roadway on the west side of the yard assignment. The assignment accelerated southward to approximately 8 mph. The yard foreman observed that the rearmost cars of train 383 were positioned on the Halton Outbound Track just north of the point where the track curves to the east. As the yard assignment moved southward, the locomotive consist disappeared from the yard foreman's view behind the tail-end cars of train 383.
At approximately this time, the yard helper detrained from his position on the east side of the movement so as to be near switches that would be used when moving northward. The yard helper could not see the yard foreman and assumed that he was still riding the lead locomotive, protecting the point. The yard foreman then radioed the yard helper to determine if he could see the locomotive consist from his position and was informed that he could not. The yard foreman then advised the yard helper that the Halton Outbound Track crossover was only 10-12 car lengths further. This message was received by the yard helper as garbled and unintelligible. At

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

this time, approximately 1600, the yard coordinator interceded and advised the yard crew that the crossover should be lined for their route. At this time, the yard helper responded that he was stopping the movement, and executed a stop command. Before the brakes applied, the locomotives entered the crossover and struck train 383, derailing seven cars.

When the yard assignment stopped, the yard helper, unaware of the collision, tried to reverse the movement but found the locomotives did not respond to his commands. At this time, the yard coordinator advised the yard crew that their yard assignment had been involved in a serious accident. The yard crew immediately reported to the yard coordinator's office, as required by company instructions.

Four of the derailed cars had rolled down a small embankment onto a paved yard roadway. Car DLCX2040, a load of ethylene oxide, UN1041, was extensively damaged and came to rest inverted and resting on the dome. Two tank cars containing residue of a petroleum product also derailed. One of these remained upright while the other had been knocked onto its side.

Ethylene oxide is compressed gas that is flammable over a wide vapour/air concentration range and if contaminated may polymerize violently. The vapours are heavier than air and are very toxic. The presence of the inverted and damaged car DLCX2040 evoked concern, and yard emergency procedures were immediately implemented. The local fire department was advised and the CN Special Commodities Officer (SCO) established a security perimeter around the site. Chemical emergency teams from Sarnia and Fort Saskatchewan, Alberta, responded per the activated Emergency Response Assistance Plan. A Transport Canada emergency response expert monitored the site. The yard assignment locomotives could not be shut down by remote control and remained running in proximity to car DLCX2040 and the residue tank car resting on its side. The locomotives remained running while the site was checked for leaking product. Once it was determined that the derailed tank cars were not leaking, a CN employee approached the running locomotives and carried out a shut-down procedure with the exterior fuel shut-off control, without incident.

1.2 Damage to Equipment

The two yard assignment locomotives and three cars from train 383 received minor damage. Four cars from train 383 were extensively damaged.

1.3 Other Damage

Approximately 250 feet of track was damaged, and there was damage to one crossover switch.

1.4 Method of Train Control

Yard assignments operate independently under the general supervision of a yard coordinator.

1.5 Weather

It was calm and clear with a temperature of minus 5 degrees Celsius.

1.6 Dangerous Goods Handling

Removal of product from car DLCX2040 began at approximately 0345, on 08 March 1996, after the other cars had been re-railed and the damaged track repaired. An exclusion zone of approximately 200 metres square was established around the tank car during transshipping. Pressurized nitrogen was used to force the ethylene oxide into another rail tank car. The local fire department was on site during the transshipping, as were an ambulance service and chemical industry experts. The transshipping was completed without incident.

1.7 Other Information

1.7.1 Locomotive Control System

LCS is a method of controlling locomotives from a remote location. In a flat switching application, the system requires two operators, and has three major components:

1. *Locomotive-based Equipment*

   A standard yard locomotive is equipped with an LCS radio receiver to receive radio commands from a remote location. Locomotive commands are converted to electronic signals by an on-board computer.

2. *The Beltpack Controller*

   The operator's portable control device sends basic command signals to the locomotive. The beltpack is equipped with an electronic messenger that will, when activated by the operator, provide an audible indication of the status of certain locomotive operating features or operating requirements through the operator's portable railway radio.

3. Radio Repeater Station

A strategically located transceiver receives and retransmits messages between the locomotive and the beltpack. The transceiver has a range of 2.5 miles. Under certain conditions (i.e., proximity with the locomotive, or transceiver malfunction), the system can be adjusted to work without the transceiver, but at a greatly reduced range (1 mile).

The LCS is designed to allow the control to be passed back and forth between the two operators, who can be located hundreds of metres from each other. This is referred to as "pitch and catch" of the controlling signal. Use of the system requires effective two-way radio voice communication, and strict adherence to applicable company instructions and Canadian Rail Operating Rules (CROR).

The LCS has a number of built-in safety features, among which is an automatic emergency brake application in response to certain situations. If a beltpack operator falls down (tilting the beltpack more than 45 degrees), if radio communication between the beltpack and the locomotive becomes interrupted, or if the beltpack operator fails to manipulate the controls (or activate a reset safety feature) for a period of 60 seconds, the LCS will automatically perform an emergency brake application.

1.7.2 Operating Instructions and Requirements

The MacMillan Yard Operating Manual outlines that employees carrying out LCS operation are responsible for point protection, and if the route to be used is not known or seen to be clear, an employee must be in position at the leading end of the movement, to ensure protection. CROR Rule 115, applicable in this instance, states that, when equipment is pushed by an engine, a crew member must be on the ground in a position to observe the track to be used and to give signals or instructions necessary to control the movement. This rule provides that, if the way is seen or known to be clear, an employee need not be so positioned.

2.0 Analysis

2.1 Introduction

The operation of train 383 played no role in the accident. The yard assignment was operated, without point protection, through a crossover and into the side of the standing train. There was considerable potential for a dangerous goods release, with its attendant risk to public safety and the environment. It is evident that LCS flat switching, although carried out at low speeds, is not without risk.

2.2 Consideration of the Facts

2.2.1 The Accident

Point protection was lost at a critical time. If the yard foreman had remained on the locomotive, he would have seen that the crossover was not lined for his route, and he would have had enough time to stop. It is clear that both employees were conscious of the need to ensure continuous point protection and were aware that the crossover was a potential hazard. An observant employee would have anticipated that point protection would be lost as the yard assignment moved alongside train 383, and realized that the safe course of action would have been to assume control of the movement and to ride on the leading locomotive.

2.2.2 LCS Operation

LCS operation allows flat switching operations with a two-person crew. Safe LCS operation depends on the crew seeing—or knowing—that the route a movement is following is clear. This accident demonstrates what can happen when there is a momentary lapse in adherence to this requirement. Had the yard foreman positioned himself on the east side of the movement, in a position to see that the route was clear, he might not have discerned or noticed that the crossover was lined for the Halton Outbound Track; in this alternative scenario, the result would likely have been the same. This accident could best have been averted if the yard foreman had assumed control of the locomotives and ridden the point.

The locomotives could not be shut down with the LCS, and as long as they remained running, they presented a source of ignition. Had the dangerous goods tank cars leaked product, the presence of running locomotives would have presented a serious danger. As it was, an employee placed himself at possible risk to make the area safe. A remote shut-down feature would increase safety in such situations.

This accident has also shown how quickly a routine yard operation can degenerate into an unsafe situation. It is noted that, other than company procedures and CROR requirements, there are no safeguards to prevent an LCS movement from inadvertently entering a main track.

2.2.3 Dangerous Goods Response

The risks associated with the damaged tank cars, particularly car DLCX2040, were quickly evaluated and an appropriate emergency response was initiated. The transshipping of the ethylene oxide was carried out with minimal risk.

3.0 Conclusions

3.1 Findings

1. The operation of train 383 played no role in the accident.

2. The yard assignment was inadvertently operated into the side of train 383.

3. The yard assignment crew momentarily lost point protection.

4. Safe LCS operation requires strict adherence to company instructions and careful attention to the method of operation.

5. LCS operation offers no method for remote locomotive shut-down.

6. The risk associated with the damaged tank cars carrying dangerous goods was quickly assessed and an appropriate emergency response was initiated. The load of ethylene oxide was transshipped with minimal risk.

3.2 Cause

The yard assignment crew momentarily lost point protection for their movement and operated it into an area that was not known to be safe.

4.0 Safety Action

4.1 Action Taken

In October 1996, the TSB forwarded a Rail Safety Advisory to Transport Canada (TC), with copies to Canadian National, Canadian Pacific Railway and the Railway Association of Canada, addressing safety issues associated with the usage of Locomotive Control Systems (LCS). The TSB suggested that TC, in conjunction with the railways, may wish to review LCS procedures, with a view to ensuring the adequacy of monitoring movements under LCS control.

In response, TC indicated that there are no specific federal regulations and rules that govern the recovery method or any other aspect of LCS. TC indicated that the operating employees have to comply with all applicable CROR and other applicable federal regulations.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Maurice Harquail, Charles Simpson and W.A. Tadros, authorized the release of this report on 10 September 1998.