Rail Accident Investigation Branch

RAIB Bulletin 03/2009

Locomotive struck by runaway train from quarry October 2008

Description of the incident and findings of the RAIB

1. In October 2008 a main line locomotive, travelling at 16 km/h (10 mph) on a freight only branch line, was struck from behind by a runaway train travelling at 41 km/h (25½ mph). The runaway train weighed 1700 tonnes (1673 tons) and was formed of a 4-axle diesel shunting locomotive and 16 loaded 4-axle mineral wagons. The collision caused the shunting locomotive and five wagons to derail.

Figure 1: derailed shunting locomotive and mainline locomotive

Figure 2: derailed wagons

2. Prior to the accident, the main line locomotive departed the quarry exchange sidings when the exit signal changed to a proceed aspect, the route having been set from the signal box, four miles away. The signal indicated that the trap points had been set for the move to the branch line and that the line was clear ahead.
3. After the main line locomotive had departed, a shunting locomotive, manufactured in the United States, began marshalling a train for a later departure to the national rail network. Whilst travelling at less than 6.5 km/hr (4 mph) on a falling gradient a brake failure occurred affecting the whole train. The crew made various attempts to bring the train under control, but as the speed increased, they eventually abandoned the train.
4. The train was then directed on to the branch line because the trap points had not been restored to their normal position. As speed continued to increase the shunting locomotive sustained damage when it passed through a tunnel which was smaller that the height of the locomotive. It caught up with the light locomotive after travelling over 1.5 km (1 mile).

5. The shunting locomotive suffered significant damage from the collision, the derailment of its rear bogie and from hitting a bridge girder. The main line locomotive only received minor damage. The first four wagons were derailed and travelled down a steep embankment, sustaining serious damage. The fifth wagon, although derailed, remained in line with the track, a section of which was totally destroyed. No-one was seriously injured as a result of the collision.

Figure 3: collision damage to derailed locomotive

Figure 4: derailed 3^{rd}, 4^{th} and 5^{th} wagons

6. The cause of the brake failure was the double fracture of a 5 mm diameter roll pin on the shaft between the main brake handle and cams operating air valves on the train's brake pipe. This prevented any movement of the brake handle from exhausting the train brake pipe and thus causing an application of the train brakes.

Figure 5: brake handle

Figure 6: shaft in brake handle

7. A direct air brake was also available but this only acted on the four axles of the locomotive. It was applied by the driver during attempts to bring the train under control, however the braking force was easily overcome by the weight of the train.

Figure 7: collar showing fractured pin

Figure 8: Top view of collar showing parts of fractured pin

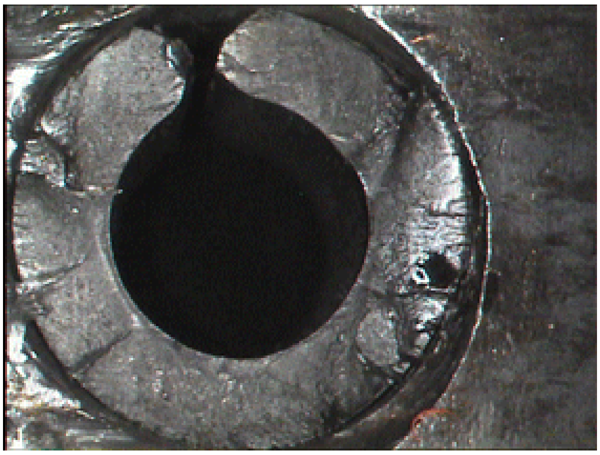

Figure 9: one of the fracture surfaces (photo taken with x50 magnification)

Figure 10: one of the fracture surfaces (photo taken with x100 magnification)

8. The design of the locomotive's braking system included a deadman pedal[1] which required continuous pressure from the driver's foot to inhibit the application of the brakes whilst the locomotive was in motion. The system also included a feature that disabled the deadman pedal whenever a minimum pressure of 30lb/sq in (2.08 bar) was detected in the locomotive brake cylinders (this is a feature fitted to some shunting locomotives that enables the driver to leave his seat to observe the passage of the train, or to move to the control position on the other side of the cab). Had the locomotive direct air brake been released, then the deadman function would have become operative and the train brakes would have applied. This had not been recognised as a need within the training programme for quarry drivers and shunters.
9. Apart from the main brake handle and the deadman function there was no other means in the cab of exhausting the train's brake pipe and bringing the train under control.
10. The locomotive is the only one of this type, and with this type of brake controller, operating in the UK.

[1] The now colloquial term for the Driver's Safety Device (DSD). Originally it was a sprung handle that the driver had to hold over. Should they fail to do so the Traction Power would be removed and the brakes applied. The Driver's Safety Device must be depressed and released in response to an audible cue, making it impossible to defeat (definition taken from Ellis' British Railway Engineering Encyclopaedia) © Iain Ellis. www.iainellis.com

11. The signalling controls for the branch line were such that the trap points did not automatically restore to their normal position immediately after the passage of a train. The controls required the signaller to cancel the route; however, there were no instructions that this cancellation had to be undertaken immediately after the departure of the train. Any requirement to do so might cause the signaller to be unavailable for other more immediate activities. This was the situation at the time of the runaway. The retained position of the trap points for train departure provided the window of opportunity for the runaway train to access the branch line, rather than being diverted away from it.

Learning Points

12. The RAIB has decided not to conduct a full investigation as it does not believe that a full investigation would lead to the identification of any further significant lessons that would improve the safety of the railways or prevent railway accidents and incidents. However the RAIB does believe that there are some valuable learning points to be disseminated to other operators.

13. These learning points are:

- the need for a 'brake of last resort' to be available in the cab of an industrial or shunting locomotive where there is a possibility that:

  a. a train brake control failure could result in the loss of ability to exhaust the train pipe; and

  b. if the train ran away it could cause significant risk to third parties.

  (The maintainer of the locomotive has already fitted a similar locomotive working in a nearby quarry with a train pipe exhaust cock to mitigate the risk of a similar failure. It is intended to fit the locomotive involved in the runaway during its repair).

- the need to consider the use of self-restoring trap points, or controls operated by the industrial operator, for trapping runaway vehicles.
- the need to consider specific instructions to signallers to address any similar situations.

14. The RAIB has involved the operator with the preliminary examination and has written to them with its conclusions and decision. The RAIB has also contacted the National Transportation Safety Board in the United States and the Transportation Safety Board in Canada in view of the brake control equipment being of a design that was in widespread use in North America.

The events described above took place at Bedlam Quarry 6 October 2008.

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