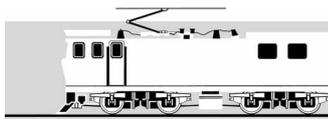
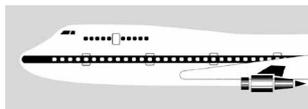


RAILWAY OCCURRENCE REPORT

04-111

express freight Train 736, track occupation irregularity
involving a near collision, Christchurch

14 April 2004



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Report 04-111

express freight Train 736

track occupation irregularity leading to a near collision

Christchurch

14 April 2004

Abstract

On Wednesday 14 April 2004 at 1504, Train 736, a Christchurch-Picton express freight service, was signalled into the Christchurch-Belfast section of the Main North Line that was already occupied by a track maintenance gang. The occupation had been authorised by an outgoing train controller.

Three track maintenance personnel had to take evasive action when the train passed through their worksite.

There were no injuries or equipment damage.

Safety issues identified included:

- the lack of forward planning on the train control diagram
- the unintentional removal of a control block instead of a control tag from the section of track that was already occupied.

Two safety recommendations were made to the Chief Executive of ONTRACK¹ to address these issues.

¹ Access provider of the controlled network since 1 September 2004.

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Abbreviations

| | |
|------------|-----------------------------|
| CTC | Centralised Traffic Control |
| km | kilometre(s) |
| MNL | Main North Line |
| PIC | person in charge |
| TWC | Track Warrant Control |
| Tranz Rail | Tranz Rail Limited |
| UTC | co-ordinated universal time |
| VDU | visual display unit |

Data Summary

| | |
|--------------------------------|---|
| Train type and number: | express freight Train 736 |
| Date and time: | 14 April 2004, at about 1504 ² |
| Location: | 8.17 km MNL, between Christchurch and Belfast |
| Persons on board train: | 2 |
| Persons at worksite: | 3 |
| Injuries: | nil |
| Damage: | nil |
| Operator: | Tranz Rail Limited (Tranz Rail) |
| Investigator-in-charge: | P G Miskell |

² Times in this report are New Zealand Standard Times (UTC+12) and are expressed in the 24-hour mode.

1 Factual Information

1.1 Narrative

- 1.1.1 On Wednesday 14 April 2004, at 1439, No.2 shunt departed Christchurch to shunt the sidings at Belfast on the Main North Line (MNL).
- 1.1.2 At about 1448, after No.2 shunt had cleared 8.17 km, the person in charge (PIC) of a Transfield Services³ Christchurch track gang radioed train control and requested a 30-minute track occupation to undertake routine track maintenance at that location.
- 1.1.3 The train controller authorised the requested track occupation until 1520 and informed the PIC that the next train through the section would be either Train 736, a Christchurch-Picton express freight service scheduled to depart Christchurch at 1530, or No.2 shunt returning from Belfast. The train controller recorded the track occupation on the train control diagram and applied a control block⁴ on the Centralised Traffic Control (CTC)⁵ visual display unit (VDU) to protect the occupation.
- 1.1.4 At about 1452, in preparation for a change of shift, a handover occurred at train control. The outgoing train controller (train controller 1) drew the attention of the incoming train controller (train controller 2) to the active track occupations occurring at the time. In addition to the worksite at 8.17 km, there was a contractor authorised to occupy the track at No.3 points, Belfast.
- 1.1.5 At 1456, the contractor at No.3 points Belfast informed train controller 2 that he was clear of the track.
- 1.1.6 At about the same time, the locomotive engineer of No.2 shunt requested a route into the sidings at Belfast. Train controller 2 removed the 2 control blocks; one protecting the contractor and the other protecting the occupation at 8.17 km and set the route.
- 1.1.7 After No.2 shunt had entered the loop, train controller 2 restored No.3 points to normal but did not reinstate the control block in the Christchurch-Belfast section to protect the track maintenance gang working at 8.17 km.
- 1.1.8 At 1504, train controller 2 authorised the entry of Train 736 to the occupied Christchurch-Belfast section by clearing Signal 2R at Christchurch to proceed. At about 1517, the locomotive engineer informed train controller 2 that he had had a “nasty” incident when he passed through a worksite at about 8 km. The track maintenance gang had not completed their work.
- 1.1.9 Shortly afterwards, the PIC of the worksite at 8.17 km advised train controller 2 of the incident and also confirmed that his gang was safe.

1.2 Site and signalling information

- 1.2.1 The MNL between Signal 2R at Christchurch and Picton was single line over a distance of 347.60 km. Train movements and track occupations on the line were controlled from the national train control centre in Wellington.
- 1.2.2 The CTC signalling system operated between Signal 2R at Christchurch and Belfast and from Vernon to Picton. In these sections the train controller controlled points and signal indications and monitored progress of trains on a VDU as they travelled through the track circuited areas.

³ Transfield Services was responsible for the inspection, maintenance and renewal of the rail infrastructure.

⁴ The control block described the application of a pseudo occupation on the CTC VDU to remind the train controller that a section of track was occupied.

⁵ CTC was a signalling system that provided the ability to automatically control points and signals from a remote location.

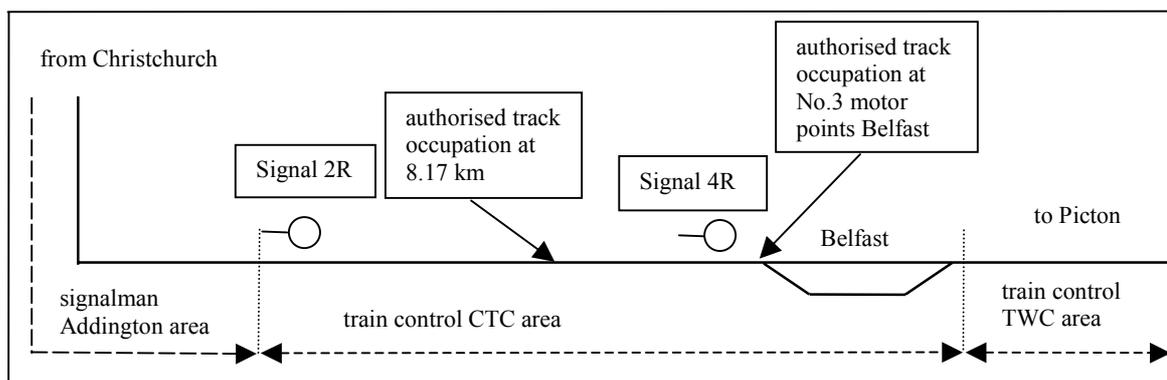


Figure 1
Christchurch-Belfast section (not to scale)

- 1.2.3 The MNL from Belfast to Vernon was operated by Track Warrant Control⁶ (TWC), and proportionally represented the principal operating system on the line.
- 1.2.4 Signal 2R at Christchurch defined the boundary between the area operated by the signalman at Addington signal box, and that signalled and controlled by the train controller. The signal was equipped with a special release mechanism that required both the signalman and the train controller to interact simultaneously to place the signal to proceed.

Control block procedures

- 1.2.5 On 30 June 2003, as part of enhanced track occupation procedures, the use of control blocks became mandatory on the MNL.
- 1.2.6 A control block application was operated on the CTC signalling system VDU by a train controller. The block protected an occupied section of track between facing signals by preventing the signalling of a subsequent movement into the occupied section.
- 1.2.7 When a train controller applied a control block, the system automatically applied a separate control tag⁷ to relevant signals, points and track circuits. In the CTC section between Christchurch and Belfast, the control block applied tags to Signal 2R at Christchurch, and Signals 4LA and 4LB at Belfast (see Figure 2).
- 1.2.8 The control block feature displayed a thin red line superimposed on the affected track circuit on the train controller's VDU to provide a visual reminder.
- 1.2.9 The application of 2 adjacent control blocks, one at Belfast, and the other in the section between Christchurch and Belfast, created an overlap situation (see Figure 2). To allow a train to be routed from the section, provision was made for the removal of an appropriate control tag within a control block section to permit the changing of a set of points and the clearing of a signal.

⁶ Track Warrant Control was an operating system where occupation of the main line was controlled by instructions called track warrants issued by a train controller.

⁷ A control tag was a lock applied to a separate signalling item within a control block section.

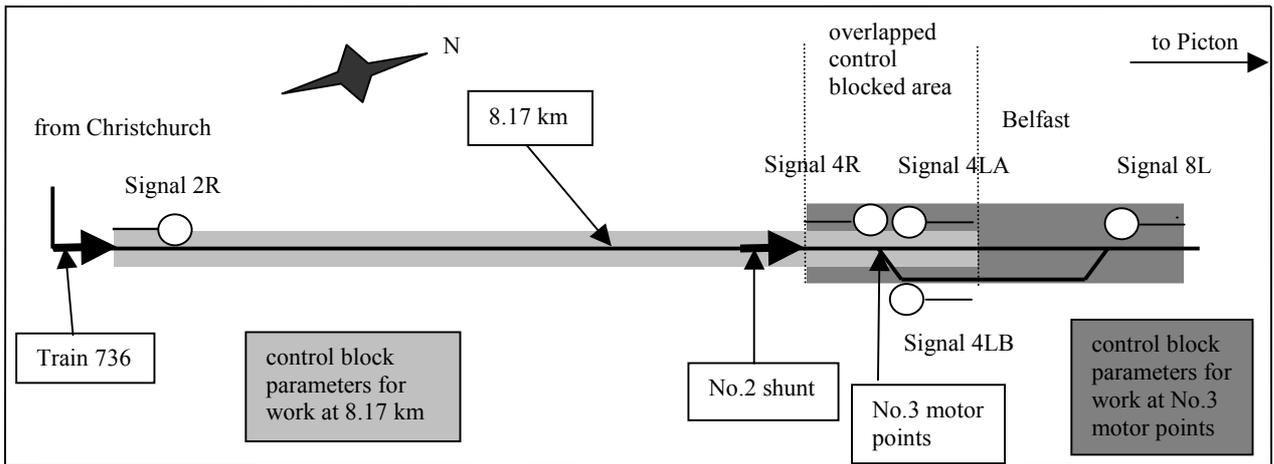


Figure 2
Christchurch-Belfast section showing the overlapped control blocked area (not to scale)

1.3 Personnel

Train controller 1

- 1.3.1 Train controller 1 was certified to the MNL desk on 7 November 2003. Following his certification, he underwent a series of audits with the latest being performed on 3 March 2004 (desk audit) and on 12 March 2004 (tape audit).
- 1.3.2 On the day of the incident, train controller 1 commenced duty at 0630 hours and controlled train movements and track occupations on the MNL. He had protected the contractor's intermittent occupation at Belfast by applying a control block between Signal 4R and Signal 8L. The control block was applied and lifted to permit train movements through Belfast at various times throughout the day.
- 1.3.3 When train controller 1 authorised the track occupation at 8.17 km, he drew a horizontal line on the train control diagram between 1450 and 1520, endorsed with the metrage and the radio call sign of the PIC (see Figure 3). Although train controller 1 applied the control block, he did not confirm with the PIC that the control block had been applied.

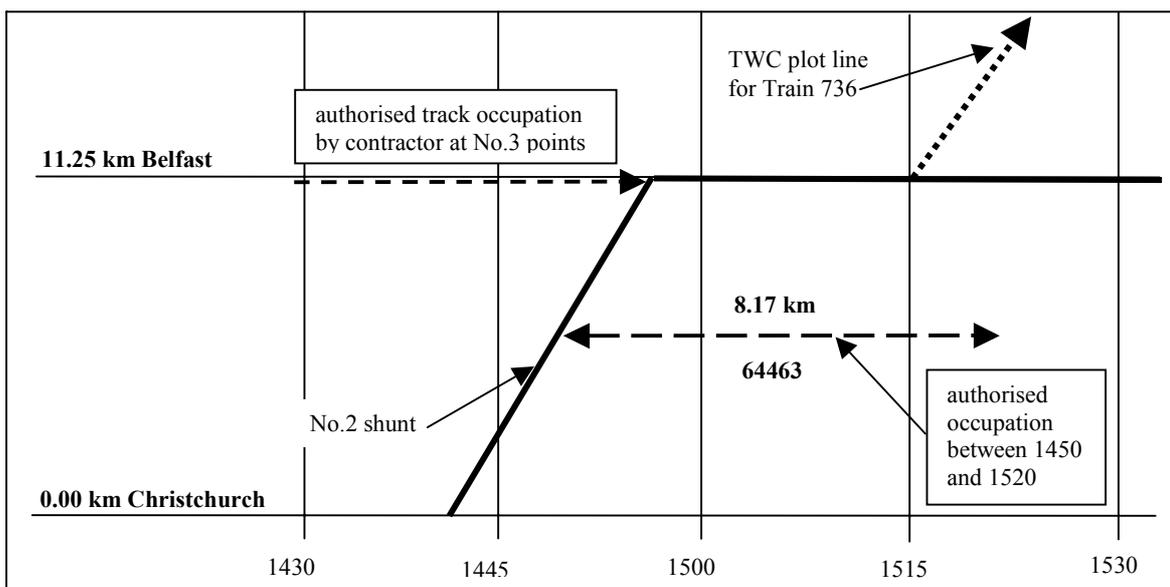


Figure 3
Information on train control diagram when Train 736 departed Christchurch (not to scale)

1.3.4 At about 1455, train controller 1 completed his shift after the handover to train controller 2 and departed the office.

Train controller 2

1.3.5 Train controller 2 had gained extensive experience in train control duties since his certification in 1988. In September 2002, he transferred to a locomotive engineer multiple unit training programme but in February 2004 he returned to full-time train control duties.

1.3.6 On 17 December 2003, together with other train controllers, train controller 2 received training in the enhanced track occupation procedures. The course did not include training on control tag removal, to allow a train to be signalled from a protected section.

1.3.7 On 2 February 2004 he commenced a period of on-the-job training and regained his train control certification for the MNL desk on 10 March 2004.

1.3.8 On the day of the incident, train controller 2 started work at 1450. At the completion of the 2-minute handover, he confirmed an understanding of the active train movements and track occupations on the MNL.

1.3.9 Immediately after responding to a request to berth No.2 shunt into the loop at Belfast, train controller 2 undertook TWC tasks relating to the preparation, issue and cancellation of track warrants to 4 locomotive engineers involved with train crossings at both Taimate and Oaro.

1.3.10 At 1458, train controller 2 issued track warrant No.66 to the locomotive engineer of Train 736 giving him authority to travel north from Belfast to Waipara. He correctly plotted the track warrant authority line in blue pen on the train control diagram. He could not recall if he drew a pencilled plot line from Christchurch for the anticipated train path to link with a 1515 departure from Belfast, and no such line appeared on the train control diagram.

1.3.11 At 1501, train controller 2 received a request from the signalman at Addington to release Signal 2R at Christchurch for Train 736 to proceed from Christchurch to Belfast. He could not recall if he referred to the train control diagram before placing Signal 2R to proceed at 1503.

Person in charge

1.3.12 The PIC held current certification for his role. His most recent bi-annual refresher training was carried out on 17 December 2003.

1.3.13 The PIC had completed the Mis.71 Track Occupancy Cross Check form from the information given by train controller 1 (see Figure 4). He did not fill out the control block details on the form, nor did he query the train controller on this matter.

1.3.14 The work at 8.17 km involved the repair of a damaged insulated joint. In order to facilitate the work, the maintenance gang had used an ignited diesel-soaked rope to heat and therefore lengthen the rails.

TRANZ RAIL 64463

Track Occupancy Cross Check

Line 8.175 M N B Date 14/1/04

*~~Work~~ Work between Belfast and Paparangi
(*Km/location) (*Km/location)

Commence 1445 hours Clear By 1520 hours

Next Train 736 - 1530

Blocking applied between _____ and _____
(Not applicable SLAS)

CLEARING OF LIMITS

| Call Clear of | Clear at (hours) | Blocking applied between locations |
|---------------|------------------|------------------------------------|
| | | and |
| | | and |
| | | and |

Other Information

*Delete words not required

Figure 4

Mis.71 Track Occupancy Cross Check form completed by person in charge at 8.17 km

Locomotive engineer

- 1.3.15 The locomotive engineer of Train 736 gained certification on 17 March 2004. He had accumulated several years' operating experience as a shunter and remote control operator⁸ in the Christchurch area before undertaking locomotive engineer training.
- 1.3.16 The locomotive engineer saw the smoke from the burning rope when he was about 150 metres from the worksite and sounded the locomotive whistle. He noticed one of the track maintenance staff kick a drum of diesel clear of the track. After passing through the worksite, he looked back and saw that all the track maintenance staff were clear of the track before contacting train control.
- 1.3.17 Train 736 continued its journey through Belfast to its first scheduled crossing at Waipara, and on to its final destination of Picton.

1.4 Relief of personnel following operating incidents

- 1.4.1 Tranz Rail's emergency procedures provided for the mandatory relief of a locomotive engineer when involved in:
 - passing a signal at Stop
 - overrunning of track warrant limits
 - a trespasser collision
 - a level crossing accident
 - instances of fatigue/illness.

⁸ Remote Control Operator was a person who was certified to operate a remote controlled locomotive.

In addition, a locomotive engineer was to be relieved if his train was involved in an occurrence that was likely to cause him any stress.

- 1.4.2 Tranz Rail Operating Code, Section 2 Emergency Procedures, Clause 1.2 stated in part:

Other Occurrences

Following occurrences of a less serious nature the Network Control Manager **must** be consulted should there be any doubt as to the fitness of the train crew to continue.

1.5 Locomotive event recorder

- 1.5.1 The event recorder data was not downloaded following the incident.

1.6 Features and functions of train control

Forward planning

- 1.6.1 Tranz Rail's operating procedures stated that train controllers were to anticipate all train movements and train crossings some hours ahead, and to plot these on the train control diagram. This forward planning was vital to good train controlling. Particular emphasis was to be placed on the accuracy and plotting of train movements as the safe operation of motor trolleys, Hi-rail vehicles and track maintenance work could be vitally affected.

Planning of train movements

- 1.6.2 Following a series of incidents investigated by the Commission between 1999 and 2000, Tranz Rail issued Train Control Safety Briefing No.5 dated 15 September 2000 which stated in part:

The diagram, the primary tool of the Train Controller, is where movements are plotted and recorded. Before signalling a train past a signal, you must ensure the section the train is entering is clear and safe, and that can only be guaranteed by referring to the diagram. When you have plotted the intending movement, and there is no conflict, then signals can be cleared accordingly.

So remember: plot first then signal, if it is safe to do so.

This briefing reinforced the importance of the train control diagram.

- 1.6.3 The 2 separate track occupations at Belfast and at 8.17 km had been recorded on the train control diagram in accordance with operating procedures.

Inquiries from maintenance workers, Hi-rail vehicles and trolley users

- 1.6.4 Tranz Rail's operating procedures identified the need for total accuracy when dealing with inquiries from maintenance staff working on or near the track.
- 1.6.5 Safety measures taken by train controllers when authorising a track occupation included the application of the control block on the VDU, and confirming with the PIC that the section was blocked. The PIC was required to request this confirmation if omitted by the train controller before completing the authorisation process.
- 1.6.6 The track occupation at 8.17 km was authorised under Rule 915. This rule stated in part:

Clearance when blocking applied for Track Occupancy

The Person in Charge must advise Train Control when they are clear of the line to enable blocking to be released.

Train control desk handover

- 1.6.7 Tranz Rail's train control desk handover procedures required the outgoing train controller to ensure that the train control diagram was up to date, with all movements and track occupations recorded. Incoming train controllers were to satisfy themselves that they had gained a full and detailed understanding of events at the time of the handover.

1.7 Previous track occupation incidents investigated by the Commission

Rail occurrence report 02-129, Train control incidents, trains authorised to enter sections of track already occupied by Hi-rail vehicles and work groups, various locations, 29 August 2002 – 4 December 2002

- 1.7.1 On 29 August 2002, an incident occurred at Maimai when a locomotive engineer was authorised by a train controller to enter a section of track already occupied by a rail contractor. The locomotive engineer saw the contractor and stopped the train short of the worksite.
- 1.7.2 On 21 November 2002, a train controller cleared a signal at Ashburton that authorised a train to enter a section of track that was already occupied by a Hi-rail vehicle. A possible collision was averted only because the driver of the Hi-rail vehicle overheard the conversation between the train controller and the locomotive engineer, and interrupted to advise that he was still in the section. The train did not enter the occupied section.
- 1.7.3 On 4 December 2002, an incident occurred near Lepperton when a locomotive engineer was issued with a track warrant by a train controller and given a signal to proceed into a section already occupied by a track gang replacing a broken rail. A collision was only averted because the track gang had cleared the track minutes before the train arrived.
- 1.7.4 The following safety issues were identified in these incidents:
- the train controllers not following correct procedures for handling track user enquiries
 - the lack of forward planning on the train control diagrams
 - the train controller's lack of attention in ensuring the train control diagram was accurate and complete.

Rail occurrence 03-103, Hi-rail vehicle and express freight Train 142, track occupancy irregularity, Amokura, 10 February 2003

- 1.7.5 On 10 February 2003, a train controller authorised northbound express freight Train 142 to depart Te Kauwhata and enter a single line section of track, into which an opposing Hi-rail vehicle movement had been authorised about 30 minutes earlier, thereby creating the potential for a head-on collision.
- 1.7.6 Among the safety issues identified was the train controller not placing the appropriate importance on the train control diagram when planning, plotting and authorising train and Hi-rail vehicle movements.

2 Analysis

- 2.1 Train controller 1 had correctly applied the control block, but had not confirmed this with the PIC at 8.17 km. The control block provided a safeguard to prevent a conflicting occupation and train controller 1 was therefore not required to inform the PIC of the next train movement through the Christchurch-Belfast section. However, there was no doubt that both train controller 1 and the PIC had a clear understanding that the occupation was authorised and omissions made during the authorisation process did not contribute to the incident.

- 2.2 Train controller 1 provided a clear dialogue of the train and occupation activity on the MNL and used the train control diagram as the contributor during the handover to train controller 2. Although the handover was accomplished in only 2 minutes, it was reasonable given the relatively low level of activity that was occurring on the MNL at the time.
- 2.3 The control block protecting the worksite at 8.17 km prevented command access to No.3 points because of the overlap of the 2 control block parameters. Train controller 2 was not sufficiently conversant with the full capability of the process, and therefore improvised by adopting a work-round practice whereby the control block protecting the worksite at 8.17 km was removed to allow No.2 shunt to enter the loop at Belfast.
- 2.4 Once No.2 shunt had entered the loop and No.3 points had been restored to normal, train controller 2 overlooked the reinstatement of the control block to protect the worksite at 8.17 km, probably because his attention was diverted to ongoing TWC tasks. Had he reinstated the control block, Train 736 could not have been signalled past Signal 2R at Christchurch and the incident would have been prevented.
- 2.5 Train controller 2 had 2 separate opportunities to plot Train 736's expected 15-minute path from Christchurch to Belfast: the first when he issued the track warrant to the locomotive engineer and the second when the signaller at Addington applied for a release on Signal 2R.
- 2.6 Had train controller 2 referred to the train control diagram on either of these occasions and plotted the train journey, he would have been alerted to the conflicting occupations. A safety recommendation emphasising that the train control diagram is the primary tool of a train controller has been made to the Chief Executive of ONTRACK.
- 2.7 Without the proper plot line on the train control diagram or the control block protecting the track occupation at 8.17 km, train controller 2 was probably led into an assumption that it was safe for Train 736 to run from Christchurch to Belfast when he issued the track warrant to the locomotive engineer. So when the signaller at Addington applied for a release on Signal 2R, train controller 2 responded to the prompt on the VDU without referring to the train control diagram.
- 2.8 Although the use of control blocks had become mandatory during the time train controller 2 was working as a locomotive engineer multiple unit with Tranz Metro Wellington, he had received classroom training in the enhanced track occupation procedures. Had train controller 2 been trained in the use of control tag removal, the near collision may not have occurred. Following this incident, Tranz Rail issued Train Control Instruction No.A017 dated 19 May 2004 to inform all train controllers that they needed to remove an individual control tag only, to permit the routing and signalling of a movement out of the control blocked area. As a result of the action taken by Tranz Rail, no safety recommendation addressing this issue has been made.
- 2.9 It was fortunate that Train 736 arrived at the worksite when the track maintenance gang had almost completed their work. Had the train arrived earlier than it did, or had the maintenance work taken longer to complete, an accident could have resulted.
- 2.10 Although the data from the event recorder was not downloaded, there was nothing to suggest that train handling or speed contributed to the near collision.
- 2.11 Had the train controller conveyed to the Network Control Manager that the locomotive engineer reported the near collision as a "nasty" incident, the Network Control Manager may have contacted the locomotive engineer directly, to satisfy himself that the locomotive engineer was fit to continue his driving duties. However, the train controller was probably feeling stressed after the occurrence and overlooked passing on the locomotive engineer's response.
- 2.12 The locomotive engineer of Train 736 could have stopped his train after the near collision and requested relief had he felt that the safe running of the train was at risk.

3 Findings

Findings are listed in order of development and not in order of priority.

- 3.1 The train control diagram had little effect in preventing this occurrence because it had not been used as a tool for forward planning. The anticipated path of Train 736 from Christchurch to Belfast had not been plotted on the diagram. Had it been plotted, the track occupancy irregularity would probably not have occurred.
- 3.2 A clear proceed signal was given to the locomotive engineer of Train 736, authorising him to enter the section of track that was occupied by a track maintenance gang carrying out routine maintenance.
- 3.3 Although neither train controller 1 nor the PIC confirmed that the control block had been applied during the cross check process, this did not contribute to the incident.
- 3.4 The authorised occupation at 8.17 km was correctly recorded on the train control diagram.
- 3.5 Train controller 1 correctly applied the control block to protect the track occupation at 8.17 km.
- 3.6 Train Controller 2 had not been trained in the use of control tag removal to enable a train to be signalled from a control blocked section.
- 3.7 Train controller 2 had not reinstated the control block to protect the continuing track occupation at 8.17 km, after No.2 shunt entered the loop at Belfast.
- 3.8 The actions of the PIC at 8.17 km and the locomotive engineer of Train 736 did not contribute to the near collision.
- 3.9 A collision was averted only because of the vigilance of the locomotive engineer and the prompt actions taken by the track maintenance gang to clear the track.
- 3.10 The actions of the locomotive engineer did not contribute to the incident.
- 3.11 The Rail Operating Code was not clear whether an occurrence such as this near collision fell within the requirements for mandatory relief of the locomotive engineer, or the extraction of the event recorder.

4 Safety Actions

- 4.1 On 19 May 2004, Tranz Rail issued Train Control Instruction A017, which detailed the procedure for removing and reapplying individual control tags without affecting the integrity of a control blocked section of track (see Appendix 1).

5 Safety Recommendations

Safety recommendations are listed in order of development, not in order of priority.

- 5.1 On 22 April 2005 the Commission recommended to the Chief Executive of ONTRACK that he:
 - 5.1.1 incorporate an instruction in the Rail Operating Code confirming that the train control diagram is the primary tool for planning the movement of rail service vehicles and track occupations. (005/05)
 - 5.1.2 review the Rail Operating Code with a view to clarifying those instances where staff are to be relieved from duties when involved in an operating occurrence. (040/05)
- 5.2 On 5 May 2005 the Chief Executive of ONTRACK replied in part:
 - 5.2.1 005/05 ONTRACK accept the recommendation.
 - 5.2.2 040/05 ONTRACK does not intend to implement this recommendation. ONTRACK together with Toll Rail have reviewed the instruction in the Rail Operating Code and found it fit for purpose in its current format.



Train Control Instruction A017

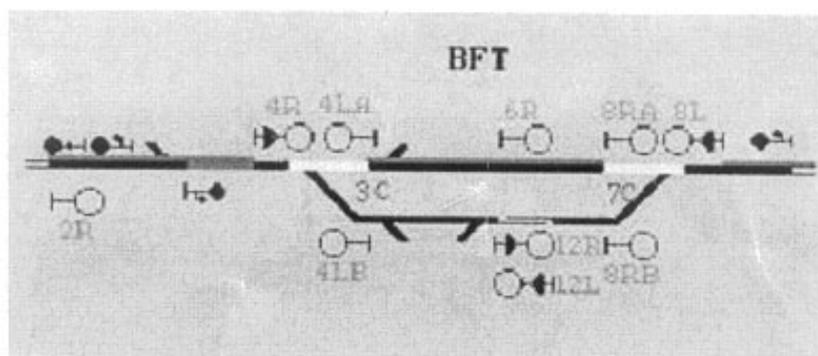
REMOVAL OF CONTROL TAG MAIN LINE POINTS WHILE BLOCKING APPLIED

19 May 2004

Following a track occupancy irregularity, which involved lifting “blocking” to operate main line points while the section was occupied, resulted in a near miss. Preliminary investigations have revealed that the lifting of a single “control tag” could have removed the potential for the near miss. This instruction is to be applied forthwith: -

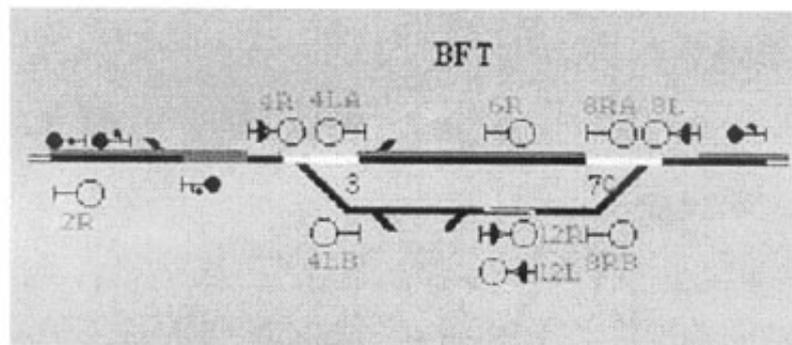
Removing a control tag from a set of points in an area where blocking had been applied previously.

Below is a picture of BFT with blocking applied. This will be used as a reference to explain what can be done in case a set of points needs to be moved for shunting under blocking conditions.

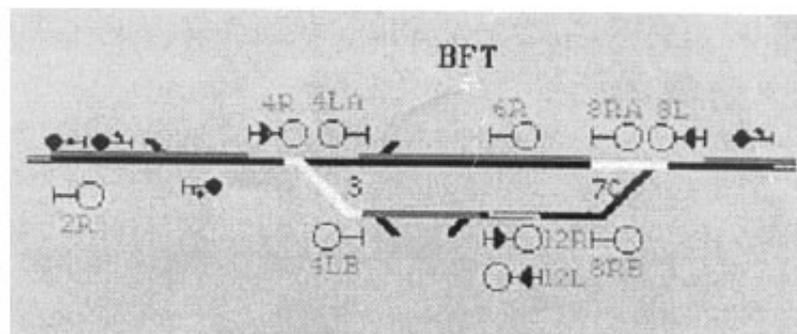


In this instance blocking has been applied on the main line. If, for operational reasons, a train needs to get to the loop, and there is still a gang active on the main line, the following can be done:

- Right click on 3 points.
- From the menu that appears, select the option called "Control Tag".
- A window will open with a button called "Clear" at the top.
- Left click "Clear", and this will remove the control tag from 3 points.



- 3 points can now be moved to reverse as per regular operation.
- Note that the blocking on 4R signal in this case, is now removed. 4R can be called to clear as per normal.



Once the train is in the loop and clear of the point's track, the points can be put back in the normal position and re-tagged manually.

If the points are put back to normal, the signal (4R) will re-tag within 5 seconds. ***Be careful not to clear the signal in that time!***

The 5-second delay is purely due to the time the servers in the equipment room take to process the blocking program.

Suggestion: Before applying blocking on a track, specifically the main between the points or the loop, set the points to the "clear road" (where there are no track gang or hi railer). This would avoid having to take off any blocking off once applied for the track gang/ hi railer.

Network Control Manager

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