



Report 96-109

Pilot fall from Locomotive

Westfield Depot, Auckland

7 June 1996

Abstract

At about 0945 hours on Friday 7 June 1996, a depot staff member, while piloting a DFT locomotive at Westfield, fell from the front cowcatcher step. He had given an unexpected "stop" hand signal to the driver, who responded with an immediate full brake application, and the resulting decelerative forces probably caused the pilot to overbalance and lose his grip. The pilot was run over by the locomotive's cowcatcher, sustaining serious injuries from which he died six days later.

Transport Accident Investigation Commission

Rail Accident Report 96-109

Locomotive:	DFT 7199
Date and time:	7 June 1996, 0945 hours
Location:	Westfield Depot, Auckland
Type of occurrence:	Pilot fall from locomotive
Injuries:	Crew: 1 fatal
Investigator in Charge:	A J Buckingham

1. Factual Information

- 1.1 At about 0945 hours on Friday 7 June 1996, locomotive DFT 7199 was being positioned within depot limits at Westfield by two depot staff, one driving and one piloting. The locomotive was travelling short hood leading, towards the depot after leaving the turntable, with the pilot¹ riding on the right front cowcatcher step. (Both staff members were Servicing Assistants, but are referred to throughout the report by their respective roles at the time - the term "Locomotive Engineer" is not applicable in this case.)
- 1.2 The driver stated that approaching the depot, the pilot extended his right arm in the "stop" hand signal, and the driver applied the independent brake². As the locomotive was decelerating, the driver saw the pilot disappear from his field of view with his right arm still extended, and shortly afterwards, heard shouting coming from the left side of the locomotive. The driver dismounted and found the pilot lying on the ground to the left of the locomotive, with his lower body between the cowcatcher and left front wheel.
- 1.3 It was evident to the driver that the pilot had sustained serious injuries, and he ran immediately to the Depot Manager's office to report the accident. Emergency services were alerted and attended promptly. The pilot was extricated by ambulance personnel and taken to Middlemore Hospital for emergency surgery. He had suffered a crushed pelvis, lacerations and internal injuries. He succumbed to his injuries six days after the accident.
- 1.4 The pilot was of solid build, 1.81 m tall and weighing approximately 128 kg. The cowcatcher had passed over his lower body, the clearance between the underside of the cowcatcher and the rail head being 110 mm³, which accounted for the severity of his injuries. The surrounding ballast, overlaid by finer gravel, was almost level with the rail head. The locomotive, which was braking as the pilot fell, had stopped before the leading wheels reached him.
- 1.5 There were no eyewitnesses to the accident, other than the driver who did not see the pilot's actual fall. During the site investigation, it was noted that there was a small amount of wet mud on the step where the pilot had been riding, the step had a thin film of water over its inner half, and that there were some small scuff marks on the centre portion of the cowcatcher. The step itself was of patterned steel plate, a type commonly used in this type of application. It had been painted, but the paint finish appeared to have been "sanded", i.e. sand grains had been incorporated in the finish for improved grip.
- 1.6 The mud on the cowcatcher step was located on the edge, (as if someone had cleaned a boot sole by scraping), and did not appear to have been the cause of the accident. There were no signs of slip marks on the step on the pilot's side, although there were some small scuff marks on the centre point of the cowcatcher. Their relevance was not established. The pilot's boots were checked after the accident, and were found to have clean soles, with good tread depth.
- 1.7 Once the locomotive was moved clear of the accident site, a light scrape mark was found on the ballast, originating some five metres short of the final stopping point, and having the appearance of having been made by a dragging boot. Mounded gravel and the presence of some crushed stones on the rail head indicated that the pilot had probably gone under the cowcatcher only in the final one to two metres of the locomotive's travel.

¹ Although Tranz Rail Rules define "Pilot" as "an employee who ensures the safety of a train or other movement by guiding the Locomotive Engineer", the term is compatible with the duties being performed here, in that the employee was required to pilot the locomotive on and off the turntable, and set points in the yard as required for the locomotive to reach its correct destination.

² The independent brake valve is proportional in operation, i.e. the brake cylinder pressure is directly related to the amount of brake handle travel.

³ This falls within the Mechanical Code range of 75 to 150 mm.

- 1.8 The locomotive event recorder was isolated before the locomotive was moved from the scene of the accident and the data extracted later. The printout showed that the locomotive accelerated over a period of 20 seconds to 19 km/h⁴ after leaving the turntable, the throttle was closed and a light brake application and release made. The locomotive coasted for 13 seconds, and was travelling at 17 km/h when a full brake application was made. The latter corresponded to the driver's reaction to the pilot's stop signal. Although the printout did not show distance, the stopping distance was calculated to be approximately 25 m.
- 1.9 The driver did not know why the pilot had signalled him to stop at that point, as the locomotive was to run past the depot and be positioned ready for departure on a northbound train. One possibility mentioned by the driver was that the pilot had decided to stop and pick up a mop from the depot, another staff member suggested that he decided he was no longer required on 7199, and was going to start work on some other locomotives awaiting servicing. The driver was not anticipating stopping before reaching the intended parking position, several hundred metres ahead. The pilot's "stop" hand signal was unexpected, not being preceded by a "reduce speed" signal, which would have alerted the driver to the possibility of an impending stop. The driver said that he thought he had made only a half application of the brake in response to the "stop" signal.
- 1.10 During the site investigation, some time was spent re-enacting the event (although with the locomotive stationary), in order to determine how the accident occurred. It was concluded that the most likely explanation was that the pilot lost his balance as the locomotive was decelerating; he had his right arm extended clear of the locomotive, and was maintaining a grip on the handrail with his extended left hand. As the locomotive decelerated, there would have been a tendency for the pilot to pivot forward about his left hand, and continuation of this pivoting movement and loss of grip by his left hand would have resulted in his falling into the path of the locomotive with his lower body over the left-hand rail. Additionally, one of his boots may have caught and dragged under the leading edge of the cowcatcher as he lost his balance, and prevented him from regaining a secure footing. There were no track irregularities which could have contributed to the pilot's fall.

Training and experience

- 1.11 Both the pilot and the driver involved had been working at Westfield Depot since January 1996. They were employed initially as Depot Handymen, but at the time of the accident, were not permanent Trans Rail staff. They and one other were being employed on a temporary basis through an external employment agency, as permanent positions could not be confirmed until rationalisation of locomotive servicing at Palmerston North Depot had been finalised and decisions made concerning the redeployment of the staff from that depot. (The positions of the driver and the third staff member have been subsequently confirmed as permanent.)
- 1.12 During the first month at Westfield Depot, they were assessed as to their suitability for long-term employment, and were found to show the desired qualities. It was intended that they be employed permanently in due course as the current equivalent of "adult apprentices". They were given a three-week Servicing Assistant training course in February/March, which combined theoretical with practical instruction in their duties. The course included training in the driving and piloting of locomotives and was conducted by an experienced Locomotive Engineer (Acting Supervisor Training and Operating Practices), this phase occupying three to four days.

⁴ The yard speed limit is 25 km/h.

- 1.13 At the end of the course, each employee was issued with an Operating Certificate appropriate to his duties. They had had full medical examinations (to the same standard required of a Locomotive Engineer) early in their employment.
- 1.14 Subsequent to the course, both employees were rostered on day shift, and worked a “buddy system” where each was assigned as an extra to a two-man team to gain experience under supervision. The day shift was considered to provide a more consistent standard of supervision. After a time on day shift, they moved onto the rotating roster system with the rest of the depot staff, always working with a more experienced Servicing Assistant. There was no laid-down period of supervision; once on the roster, the employees were deemed by their manager to be fully competent without the need for additional training or assessment. They would, however, be subject to random compliance checks from time to time.
- 1.15 On Monday 4 June, both found themselves working together on the day shift for the first time, as the pilot had arranged a shift swap for that week. The Depot Manager spoke to them in the morning, and they appeared enthusiastic and confident in their ability to work together as a team. The Depot Manager told them that they were not to feel pressured, and to take their time and do their job safely. He stated that the pair had achieved excellent results that week, up to the time of the accident. The work that week was no different from that performed during the 12 weeks since they were certified at the end of their training course.
- 1.16 The work, in the main, comprised the receiving of locomotives at the completion of a run, refuelling and replenishing, and turning the locomotive according to the direction of the next run. The locomotives were then either parked and shut down, or positioned in readiness for their allotted trains. It was a requirement when a locomotive was being moved in the direction of the long hood (i.e. the engine compartment), for the movement to be piloted.

Piloting and use of cowcatcher steps

- 1.17 The Tranz Rail Operating Code defines piloting as the guiding of any locomotive or vehicle movement. When piloting takes place over short distances such as in a yard or depot, it is common for the person piloting to ride on the leading cowcatcher step on the locomotive, particularly if the locomotive is travelling long hood leading. In the latter case, the principal function of the pilot is to compensate for the severely restricted view from the driving position, the pilot standing on the cowcatcher step on the driver’s side at the long hood end. In this case, where the locomotive was travelling short hood leading (the normal direction of travel), there was no mandatory requirement for a pilot to ride on the locomotive, although the pilot was required to pilot the locomotive on and off the turntable, and if necessary, set points.
- 1.18 All Tranz Rail mainline diesel locomotives are equipped with cowcatchers front and rear, the cowcatchers incorporating steps for use by pilots and shunters. The steps differ from those on shunt locomotives (e.g. DSG class), in that on the mainline classes, the steps are not full-span, whereas the shunt locomotive steps (known as “shunters footplates”) are full span, and are wider than those on mainline locomotives. Corresponding handgrips are provided in all cases. The step width, i.e. the distance between the leading edge of the step and the headstock, is typically 450 mm on shunt locomotives (e.g. DSG class) and ranges between 300 and 410 mm on mainline locomotives. The greater step width on shunt locomotives reflects that almost continuous use of these steps is necessary in shunting operations. Mainline locomotives are generally used to shunt only when attaching or detaching wagons at intermediate stations whilst en route between terminals. At the time of the accident, there were no specific Rule or Code requirements pertaining specifically to riding on mainline locomotive cowcatcher steps.

- 1.19 During this investigation, a comparison was made between a random sample of DF/DFT⁵ cowcatcher steps and those on DC and DX locomotives. The DF/DFT step was found to be 300 mm wide at its outer edge, increasing towards the locomotive centreline to a maximum of 360 mm. The corresponding DX step measurements were 330 mm and 360 mm, and on the DC, 350 and 410 mm. It was found that on the DF/DFT, greater care was required in riding on the steps than on the other classes. The presence of the brake hoses forced the rider to lean forward slightly, and also made it difficult to place the full length of one's boot on the step, resulting in a slight body instability. However, any instability could be overcome by taking a firm hold of the handgrips. Increasing the steps' width did not appear to be an option owing to the already minimal clearance between cowcatchers when two locomotives of this class were connected in multiple.
- 1.20 The step provides a convenient point on which to ride, and its use by pilots and shunters had been routine on both mainline and shunt locomotives prior to the accident, even when the option of riding in the locomotive cab was available. One reason for this was that there is a considerable difference in effort required between stepping on and off the cowcatcher step and climbing up to the cab, and when a large number of movements were made, repeated climbing to the cab could be fatiguing.

2. Analysis

- 2.1 The most likely explanation for the pilot's fall is that he overbalanced under his own momentum because of the unexpected deceleration as the locomotive braked, pivoting about his left hand before losing his grip and slipping off the step. His disappearance from the driver's view was not compatible with either an attempt to cross to the other side of the cowcatcher or of stepping onto the ground to cross in front of the locomotive. During training, he had been taught specifically not to take either of these actions. Additionally, if he were to step off to go to the depot, he would have departed to the right, clear of the path of the locomotive.
- 2.2 The driver was not expecting to stop until reaching the parking position several hundred metres ahead, and the pilot's "stop" signal came as a surprise. Although the driver thought he had made only a half brake application, the event recorder printout showed that he made a full application to stop the locomotive, which was the correct response in the circumstances. He was entitled to assume that an immediate stop was required. The pilot's "stop" hand signal was not preceded by a "reduce speed" signal, which would have given the driver some warning of an impending stop. Additionally, had the pilot been riding in the cab, he could have told the driver directly what his requirements were. It is likely that the pilot's requirement to stop was a spur-of-the-moment decision.
- 2.3 The pilot's presence on the locomotive was not mandatory in terms of the Operating Code, as the locomotive was travelling short hood leading on the way both to and from the turntable. However, the driver and pilot were working as a two-man team, and the pilot's assistance was necessary to expedite the turning of the locomotive, and also to set any points relevant to the intended route. Riding on the cowcatcher step was an accepted operating practice by Tranz Rail, and considered safe as long as certain elementary precautions were observed, the most fundamental being to maintain a secure grip while the locomotive was moving.
- 2.4 For a person riding on the DFT cowcatcher step on the right-hand side in the normal direction of travel, a two-handed grip is appropriate, with the left arm extended and the right hand gripping the handrail to the rear of the body. When using the right arm for signalling, the left hand is usually brought closer to the body for increased stability, restricting the body's

⁵ The cowcatcher configuration on the DF is identical to the DFT.

tendency to swing forward when the locomotive is braking. In this case, it could not be stated with certainty what type of grip the pilot was maintaining, but it is likely that he had his left arm extended when the locomotive was braked. The pilot was of heavy build, and this could have accentuated any tendency to swing forward under deceleration, particularly if he did not anticipate that the driver would make a full brake application in response to his signal.

- 2.5 The training and supervision of both the driver and pilot appeared to have been appropriate, and they were gaining experience in their roles (which were interchangeable). They had reportedly been working well together during their first week “solo”, i.e. not under direct supervision, but at this stage of their careers, they could not be classed as “experienced” staff members. It is probable that inexperience contributed to this accident. The pilot was probably not expecting the driver to make a full brake application, thus may not have anticipated the greater retarding force and consequent increased tendency for his body to lurch forward. A “reduce speed” hand signal by the pilot, prior to his “stop” signal, would have resulted in a lighter brake application throughout, rather than the equivalent of an emergency application. The latter, in effect, is what was achieved by a full application of the independent brake.

3. Findings

- 3.1 The locomotive was being operated normally prior to the accident.
- 3.2 Both staff members had received appropriate training for their respective roles and were certified Servicing Assistants.
- 3.3 The driver’s full brake application on receipt of an unexpected “stop” hand signal from the pilot was the correct action in the circumstances.
- 3.4 Although the pilot should have known that his stop signal would result in a full brake application, it is likely that he was anticipating a lesser application.
- 3.5 Preceding the “stop” hand signal with a “reduce speed” signal probably would have resulted in a gentler deceleration.
- 3.6 The pilot probably overbalanced, losing his grip with his left hand then his footing as the locomotive was braking.
- 3.7 It is unlikely that the pilot attempted to cross the cowcatcher or to cross in front of the locomotive while it was still moving.
- 3.8 Inexperience on the part of the pilot was probably a contributing factor.
- 3.9 The Commission does not consider the use of the cowcatcher steps on mainline locomotives to be unacceptable, provided that the pilot maintains a firm grip and communicates the appropriate signals.

