



Australian Government

Australian Transport Safety Bureau



ATSB TRANSPORT SAFETY REPORT
Rail Occurrence Investigation RO-2009-002
Final

Safeworking irregularity involving the *Indian Pacific* (4SA8) and the XPT (WT28) Tarana, NSW

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at Tarana, NSW
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Abstract

At about 1858 on 14 January 2009, a safeworking irregularity occurred involving two passenger trains, 4SA8, the *Indian Pacific*, and WT28, an *XPT*, at Tarana in NSW. Both trains had been authorised to occupy the single line within the Tarana interlocked area at the same time. Fortunately, each driver saw the opposing movement and brought their trains to a stand about 524 m apart. After a short wait, the trains were authorised to continue their respective journeys. The investigation determined that the West Board network controller located at Broadmeadow train control centre, did not adequately plan the intended train movements through the sections Wallerawang to Tarana and Bathurst to Tarana or determine a specific limit of authority on the Special Proceed Authority (SPA) number 37 issued to the driver of the *XPT*, WT28. The West Board network controller also issued SPA number 38 to the driver of train 4SA8, even though it overlapped the authority of SPA number 37.

The investigation report identified three safety issues relating to the risks of using a manual train management system, inadequate auditing of safeworking systems, and ambiguous authority limits.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory Agency. The Bureau is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. However, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

When safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation, the person, organisation or agency must provide a written response within 90 days. That response must indicate whether the person, organisation or agency accepts the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au

TERMINOLOGY USED IN THIS REPORT

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, risk controls and organisational influences.

Contributing safety factor: a safety factor that, if it had not occurred or existed at the relevant time, then either: (a) the occurrence would probably not have occurred; or (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or (c) another contributing safety factor would probably not have occurred or existed.

Other safety factor: a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report.

Other key finding: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which 'saved the day' or played an important role in reducing the risk associated with an occurrence.

Safety issue: a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

Safety issues can broadly be classified in terms of their level of risk as follows:

- Critical safety issue: associated with an intolerable level of risk.
- Significant safety issue: associated with a risk level regarded as acceptable only if it is kept as low as reasonably practicable.
- Minor safety issue: associated with a broadly acceptable level of risk.

EXECUTIVE SUMMARY

At about 1858¹ on 14 January 2009, a safeworking irregularity occurred involving two passenger trains; 4SA8, the *Indian Pacific*, and WT28, the *XPT*, at Tarana in NSW. Both trains had been authorised to occupy the single line within the Tarana interlocked area at the same time. Fortunately, each driver saw the opposing movement and brought their trains to a stop about 524 m apart. After a short wait, the trains were authorised to continue their journeys.

On the day of the occurrence, planned track maintenance commenced between Tarana and Blayney, allowing for timetabled trains only. A Track Occupancy Authority (TOA) was issued at 0823 for the Up Main line to ensure procedural protection of the track workers. As a result of the TOA, all Up train movements were required to travel on the Down Main line. At 1710, the Up Main line between Bathurst and Tarana was cleared of track work, the TOA was fulfilled², and the track was re-opened for rail traffic. However, shortly after at 1720, a request was made for a new TOA on the same Up Main line, to be in place until 2000.

At 1815 the network controller issued the train driver of the *XPT* with SPA³ 37 to travel from Bathurst to Tarana, via the Down Main line, an unsignalled move⁴ and in the wrong-running-direction.

At 1846, work associated with TOA 37 was fulfilled. The Up Main line was re-opened for traffic, however, the time was incorrectly recorded on the train control graph as 1946. At 1851, another SPA was issued authorising the *Indian Pacific* to travel to Bathurst on the Up Main line in the wrong-running-direction. The investigation determined that the West Board network controller located at Broadmeadow train control centre did not adequately plan the intended train movements through the section between Wallerawang to Tarana and Bathurst to Tarana or determine a specific limit of authority on the Special Proceed Authority (SPA) number 37 issued to the driver of the *XPT*. The West Board network controller also issued SPA number 38 to the driver of train 4SA8, even though it overlapped the authority of SPA number 37.

The investigation identified the following safety issues:

- Manual systems of train management, such as Special Proceed Authority working, are used when interlocked/engineered systems are not available. However, manual systems are subject to human error and increase the risk of

¹ The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight Time (AEDT), as particular events occurred. Eastern Daylight Time was Coordinated Universal Time (UTC) + 11 hours.

² To complete the instructions on, and associated activities for, a Proceed Authority, a work on track authority or Pilot Staff Working form. (Written authorities have the word FULFILLED written diagonally across them, between two parallel lines). (ARA Glossary for National Code of Practice and Dictionary of Railway Terminology)

³ SPA – Special Proceed Authority, a method of special working in NSW which may be used when the normal system of Safeworking is not available. (ARA Glossary for National Code of Practice and Dictionary of Railway Terminology)

⁴ An unsignalled move is a vehicle movement that occurs without the use of fixed signals.

safeworking irregularities/incidents when compared to interlocked/engineered systems of safeworking.

- The ARTC's system of auditing safeworking processes did not detect errors existing between train control graphs and safeworking forms. These errors were not identified until a serious occurrence highlighted the deficiency.
- An examination of available evidence showed that from 31 December 2008 until 14 January 2009, 37 per cent of Special Proceed Authorities issued at ARTC's Network Control Centre at Broadmeadow for the Bathurst to Tarana section were issued with inadequate or ambiguous limits of authority specified on the form, increasing the risk of a train overrunning an intended limit of authority.

1 FACTUAL INFORMATION

1.1 Overview

At about 1858⁵ on 14 January 2009, a safeworking irregularity occurred involving two passenger trains travelling in opposing directions; 4SA8, the *Indian Pacific*, and WT28, the *XPT*, at Tarana in NSW. Both trains had been authorised to occupy the single line within the Tarana interlocked area at the same time. Fortunately, each driver saw the opposing movement and stopped their trains which came to a stand about 524 m apart. After a short wait, the trains were authorised to continue their respective journeys.

1.2 Location

Tarana is located on the Defined Interstate Rail Network (DIRN) between Lithgow and Bathurst, about 198 track kilometres from Sydney Central Station (Figure 1). Tarana is the junction point between the single line from Wallerawang and the double line to Bathurst (Figure 2).

Figure 1: Location of Tarana, NSW



Map – Geoscience Australia. Crown Copyright©

1.3 Management of the rail corridor

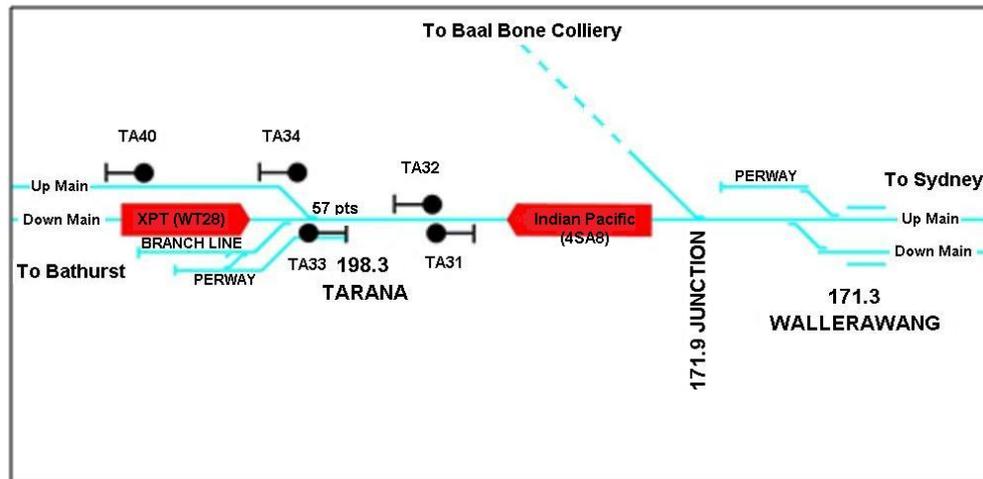
The rail corridor between Bowenfels (near Lithgow) and Orange, is managed by the Australian Rail Track Corporation (ARTC). Operational control is maintained from the ARTC Network Control Centre at Broadmeadow. The passage of trains through Tarana is controlled by a network controller operating on the West Board of the

⁵ The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight Time (AEDT), as particular events occurred. Eastern Daylight Time was Coordinated Universal Time (UTC) + 11 hours.

Phoenix Train Control System. The single line section of track between Wallerawang and Tarana (Figure 2) is normally controlled by fixed-colour light signals using Rail Vehicle Detection (RVD)⁶. From Tarana to Bathurst, there are two unidirectional lines, an Up Main and Down Main. Rail movements through this corridor are also controlled by fixed-colour light signals using RVD.

All train movements from Wallerang through to Bathurst are controlled by one network controller operating on the West Board.

Figure 2: Track schematic Bathurst/Wallerawang area



Note: Not to scale. Under normal operations, train travel on the Down Main line is away from Sydney and towards Sydney on the Up Main line.

1.3.1 Network Controller – West Board

The primary responsibility of network controllers is to manage train paths for the safe and efficient transit of rail traffic through the ARTC Network. The network controllers must plan, set priorities for, and manage train services, work on track authorities, Proceed Authorities, liaise with relevant operators and maintenance representatives and external services during incident management, and manage available facilities to restore train services safely and promptly. Network controllers must compile and maintain relevant records and reports about conditions⁷ affecting rail traffic and movements in the ARTC network. The primary record is a train control graph (Figure 3).

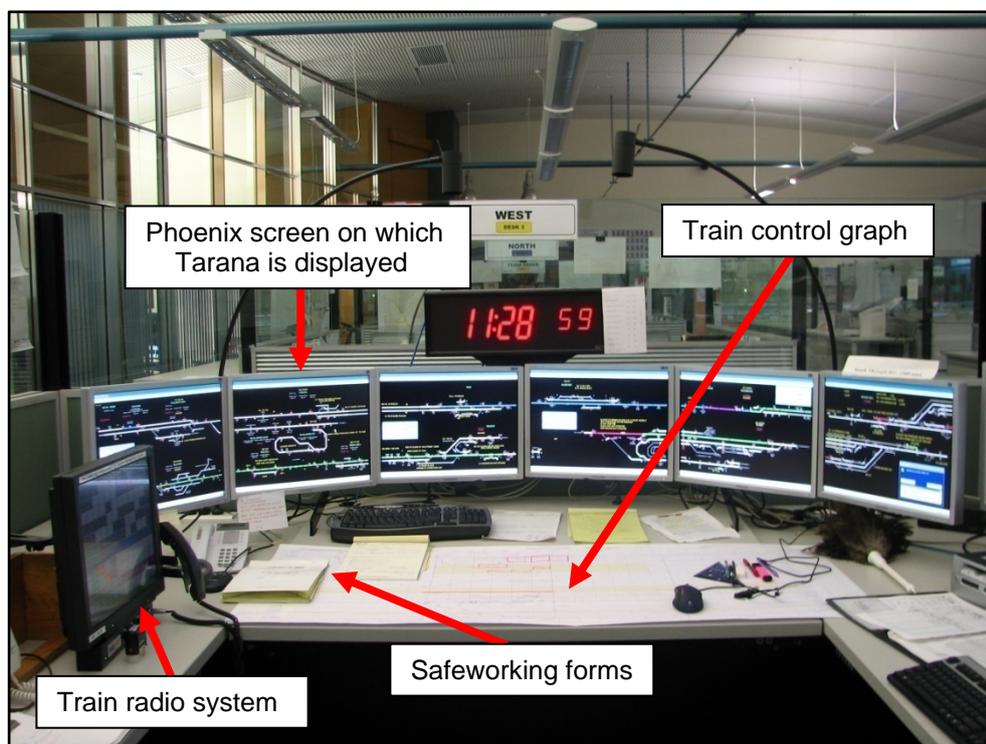
The network controller was assessed as competent for the role after undergoing initial training in the use of Special Proceed Authority (SPA) forms, augmented by an ongoing training regime. The network controller had 2 years experience in the role and had been a signaller for several years beforehand. On the day of the incident, the West Board network controller was working the final of eight consecutive shifts. He had consecutively worked two afternoons, two mornings, one

⁶ The portions of line where the system of Safeworking relies on track-circuiting or axle counters. (ARA Glossary for National Code of Practice and Dictionary of Railway Terminology)

⁷ Condition Affecting the Network (CAN) A situation or condition that affects or has the potential to affect the safety of the Network. ARA (Glossary for National Code of Practice and Dictionary of Railway Terminology)

afternoon, two mornings, and the afternoon shift on the day of the incident. The 8-day roster included two reduced time (8 hour) breaks between shifts.

Figure 3: West Board network control workstation



1.4 Train details

1.4.1 The *XPT* (WT28)

Train WT28, the *XPT*, is operated by RailCorp CountryLink. It is the return intrastate passenger service from Dubbo to Sydney.

At the time of the incident, the train comprised a leading locomotive (XP2012), four passenger cars, and a trailing locomotive (XP2003). The train had an overall length of 131.5 m and a gross weight of 316.9 t with a maximum operating speed of 160 km/h. The train had one driver, four hospitality staff for the passenger cars, and 87 passengers on-board. The driver was qualified, had extensive (almost 30 years) route knowledge, was medically fit, and had signed-on as fit for duty.

1.4.2 The *Indian Pacific* (4SA8)

Train 4SA8, the *Indian Pacific*, is operated by Great Southern Rail (GSR) as a regular passenger service twice a week between Sydney and Adelaide. It is re-marshalled in Adelaide and then continues on its journey as train 5AP8 to Perth. Great Southern Rail provides all rollingstock (excluding locomotives) and hospitality staff for these services. The locomotives and train drivers are provided by Pacific National.

At the time of the incident, the train comprised one locomotive (NR24) hauling a motorail wagon, power van, crew van, 11 passenger cars and a luggage van marshalled at the rear. The train had an overall length of 379 m and a gross weight of 716 t. The train had a driver, co-driver, driver supervisor, 13 hospitality staff, and 187 passengers on board at the time of the incident. The driver supervisor was conducting driver assessments on the journey. The driver and driver supervisor had extensive route knowledge; the other driver was being assessed on route knowledge. All drivers were qualified, medically fit, and signed-on fit for duty.

1.5 The occurrence

At 0600 on the day of the occurrence, planned track maintenance commenced in accordance with Train Alteration Advice No. 0007-2009 Western Program Area Tarana-to-Blayney (issued 1 December 2008), allowing for timetabled trains only in the area. A Track Occupancy Authority (TOA) was issued at 0823 for the Up Main line to ensure procedural protection of the track workers. As a result of the TOA, all Up train movements were required to travel on the Down Main line.

At 1209, the *XPT* service from Sydney to Dubbo (WT27) was terminated at Orange due to staffing issues. Passengers were transferred by bus to their final destinations. At some time before 1200, the driver for the return *XPT* service (WT28) received a call from the CountryLink operations office to sign-on earlier and travel to Orange to collect his train. The driver signed on at Dubbo at 1320 (regular sign-on time) and travelled via passenger coach to Orange to take charge of train WT28. The return *XPT* (WT28) departed Orange at 1650, 53 minutes late, bound for Sydney.

Earlier on the same day (1300), a driver supervisor and two drivers of the *Indian Pacific* (4SA8) signed on for duty for an on-time departure from the Sydney Central Station at 1455, bound for Parkes where the crew would changeover. The train would then continue to Perth via Broken Hill and Adelaide. The drivers involved in the incident swapped driver/co-driver roles at Lithgow before continuing on towards Tarana.

At 1710, the Up Main line between Bathurst and Tarana was cleared of track work, the TOA was fulfilled⁸, and the track was re-opened for rail traffic. However, shortly after at 1720, a request was made for a new TOA on the same Up Main line, to be in place until 2000. TOA 37 was duly authorised and issued by the West Board network controller.

At 1804, the *XPT* (WT28) arrived at Bathurst, 52 minutes late. At 1815, the network controller issued the train driver with SPA⁹ 37 to travel from Bathurst to Tarana, via the Down Main line without defining a limit of authority, an unsignalled move and in the wrong-running-direction. The *XPT* departed Bathurst at 1818 (64 minutes late).

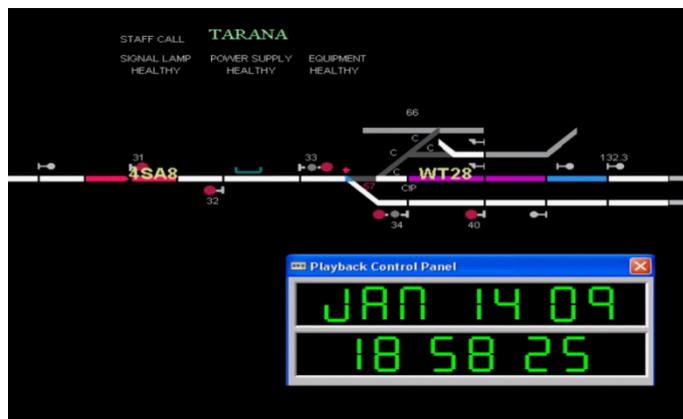
⁸ To complete the instructions on, and associated activities for, a Proceed Authority, a work on track authority or Pilot Staff Working form. (Written authorities have the word FULFILLED written diagonally across them, between two parallel lines). (ARA Glossary for National Code of Practice and Dictionary of Railway Terminology)

⁹ SPA – Special Proceed Authority, a method of special working in NSW which may be used when the normal system of Safeworking is not available. (ARA Glossary for National Code of Practice and Dictionary of Railway Terminology)

At 1846 work associated with TOA 37 was fulfilled. The Up Main line was re-opened for traffic, however, the time was incorrectly recorded on the train control graph as 1946.

At about 1850, the network controller set number 57 points at Tarana to the reverse position in anticipation of routing train 4SA8, the *Indian Pacific*, to Bathurst via the Up Main line, also an unsignalled move and in the wrong-running-direction. Being an unsignalled movement, this required a SPA for the train to proceed. SPA 38 was issued at 1851 authorising the *Indian Pacific* to pass signals TA31 and TA33 at 'Stop', over 57 points set reverse, then along the Up Main line in the wrong-running-direction to the first controlled signal, 105 at Kelso (near Bathurst). The *Indian Pacific* passed signal TA31 at 1858:25 (Figure 4) clearing it at 1859:33 at an average speed of 18.9 km/h.

Figure 4: Phoenix replay at 1858:25 (enhanced)

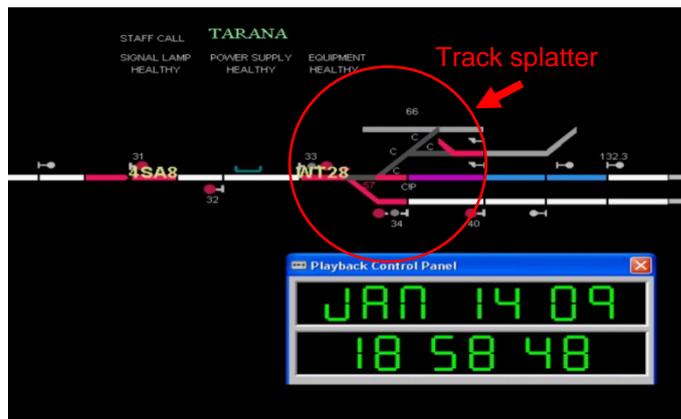


Graphic – Australian Rail Track Corporation. Copyright©

At 1858:48, the *XPT* was recorded as occupying 57 points track circuit, represented by 'track splatter'¹⁰, see Figure 5. Shortly after the train driver noticed 57 points in the reverse position. The driver immediately stopped the train, bringing it to stand adjacent to the 198.500 km post near signal TA34. Had he continued, the train would have traversed and damaged 57 points, as they were set in the wrong position for his movement. The *XPT* would then have been in direct conflict with the *Indian Pacific*.

¹⁰ A colloquial term used to describe the indication of all track circuits occupied on and around points.

Figure 5: Phoenix replay at 1858:48 (enhanced)

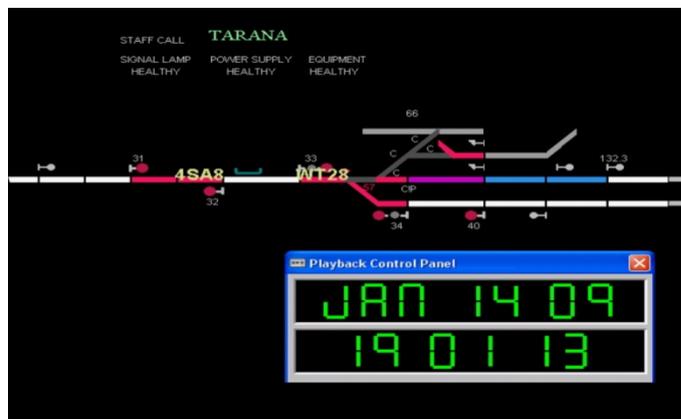


Graphic – Australian Rail Track Corporation. Copyright©

At 1859:24, the network controller, seeing the ‘track splatter’ associated with 57 points, called the driver of the *XPT* and said ‘red light, red light, I have 4SA8 heading towards you at Tarana’. At the same time, the driver of the *XPT* noticed the *Indian Pacific* approaching Tarana and said ‘stop, stop, stop’ over the open channel radio to attract the attention of the driver of the *Indian Pacific*. The network controller, still connected on the CountryNet radio (discrete channel, point to point), tried to confirm the exact position of the *XPT* from the driver and determine if his train was clear of 57 points.

The driver of the *Indian Pacific*, on seeing the *XPT* standing near 57 points, brought his train to a stand at 1901:13, see figure 6, at that time about 524 m from the *XPT*.

Figure 6: Phoenix replay at 1901:13 (enhanced)



Graphic – Australian Rail Track Corporation. Copyright©

After the driver of the *Indian Pacific* contacted the driver of the *XPT* and received an assurance that his train was stationary and not fouling the Up Main line (clear of 57 points) and would not be moved, the *Indian Pacific* continued towards the Tarana platform (1902:56). The *Indian Pacific* passed signal TA32 at 1903:08 and stopped adjacent the Tarana platform (1905:22) close to signal TA33 and about 146 m from the *XPT*.

At 1907:26, the *Indian Pacific* departed Tarana traversing 57 points set reverse and onto the Up Main line (Figure 7). The rear of the train cleared signal TA32 at 1907:36.

Figure 7: Phoenix replay at 1907:26 (enhanced)



Graphic – Australian Rail Track Corporation. Copyright©

At 1907:53, the *Indian Pacific* passed adjacent signal TA34 travelling in the down direction on the Up Main line bound for Bathurst then onto Adelaide and Perth.

At 1938, after having pushed back to allow 57 points to be set normal, the *XPT* departed Tarana with the driver under observation by the Passenger Services Supervisor (PSS). On arrival in Lithgow, the driver changed over with a new incoming driver.

2 ANALYSIS

On 14 January 2009, an investigation team from the Australian Transport Safety Bureau (ATSB) commenced an investigation into the incident. The investigators examined and photographed the incident scene and the Broadmeadow train control centre.

Evidence was sourced from RailCorp, Great Southern Rail, Pacific National, the Australian Rail Track Corporation and NSW Government agencies. In addition, the locomotive data recorders, the train drivers' and network controller's employment histories, relevant standards, and recorded train control data (including voice and signalling commands) were examined.

Times between the locomotive data logs and other recorded data have been synchronised. All times within the report are standardised to Eastern Standard Daylight Time.

2.1 Sequence of events analysis

Analysis of the locomotive data logs from the *XPT* and the *Indian Pacific* established that both trains were managed and driven in an appropriate manner. The actions of the train drivers in the handling of their respective trains did not contribute to the incident. All train crews were appropriately trained, qualified and fit-for-duty at the time of the incident.

2.1.1 Train driver actions

The drivers of the two trains, the *XPT* and the *Indian Pacific*, were unaware of the opposing movement until the incident occurred.

The driver of the *XPT* initially noticed that 57 points were set in the reverse position and stopped adjacent to signal TA34 to avoid trailing¹¹ and damaging the points. He then saw the *Indian Pacific* and, believing it was to be pathed onto the Down Main line, the track on which his train was standing, immediately contacted the *Indian Pacific* saying 'stop, stop, stop'. The driver of the *Indian Pacific* noticed the *XPT* at about the same time he heard the 'stop, stop, stop' message from the driver of the *XPT*; he also brought his train to a stand.

Had the driver of the *XPT* not detected number 57 points set in the reverse position, and brought his train to a stand, the risk of collision would have been significant.

The driver of the *Indian Pacific* was initially unaware of the intended movement of the *XPT*. When he first saw the *XPT* standing near the Tarana platform, he believed that it was on the Up Main line, the track his train was authorised to use.

The driver of the *XPT* subsequently spoke to the driver of the *Indian Pacific* regarding the content of their respective SPAs and routing details contained therein. After clarifying the intended routing, the *Indian Pacific* moved into the Tarana

¹¹ A term used when a rail vehicle traverses through a set of points, from one of the two lines that converge onto the one common line, with the switch blades set against the movement.

platform, waited for a clearance from the network controller, and departed onto the Up Main line towards Bathurst.

The *XPT* departed about 31 minutes later with a PSS accompanying the driver to Lithgow where the driver changed over with a new incoming driver.

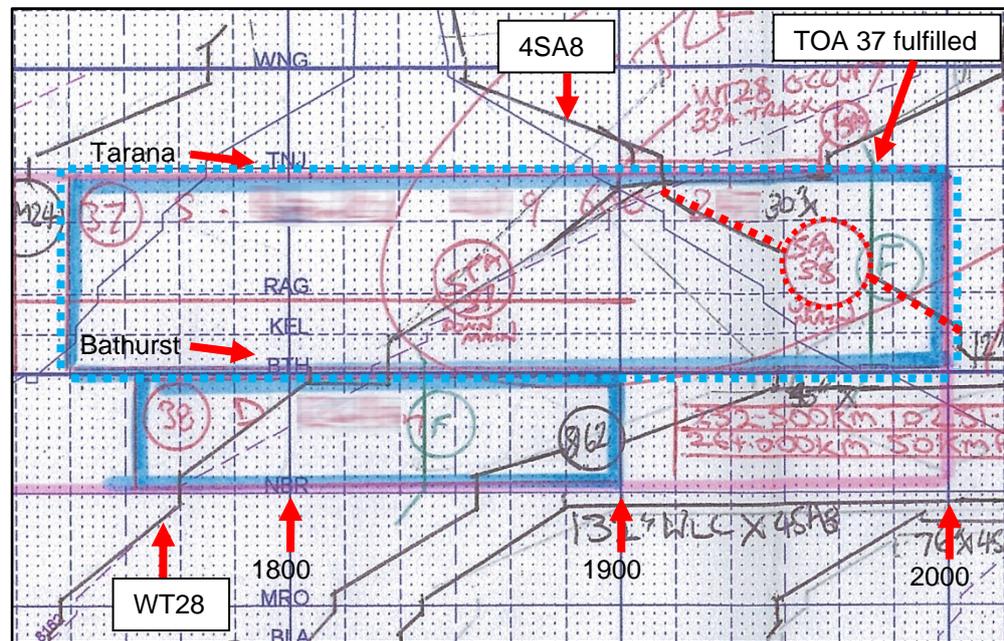
2.1.2 Network controller actions

The network controller was appropriately qualified and fit-for-duty. Immediately following the incident, he was tested for drug and alcohol impairment. Results returned zero readings. Interviews and an analysis of the network controller's roster established that, based on the previous 8 days of rostered duty, he had ample rest opportunities and fatigue was unlikely to have been an issue at the time of the incident.

An examination of events leading up to the incident, showed that the network controller did not adequately plan the intended routing of the train movements through the section between Wallerawang to Tarana and Bathurst to Tarana.

At 1720, Track Occupancy Authority (TOA) number 37 was issued for the Up Main line between Bathurst and Tarana. At 1846, the TOA was fulfilled but the network controller incorrectly recorded 1946 on the train control graph. However, the same network controller issued SPA number 38 at 1851 to the driver of train 4SA8 to travel over the Up Main line.

Figure 8: Extract from train control graph (West Board)



..... TOA 37 authority, SPA 38 Authority.

Note: Personal information on train control graph has been intentionally blurred.

The network controller, who should have been using the train control graph to manage and plan train movements, issued an authority that allowed the *Indian Pacific* to enter a section that was technically occupied (represented on the train graph in Figure 8) by TOA 37 and SPA 37.

At 1804, the *XPT* arrived at Bathurst. The network controller issued SPA 37 to the driver at 1815. During this process the network controller specified the limit of authority as Tarana. The train driver verified this during the read-back process, after some initial confusion with the network controller about what line he was going to use. At 1822:29, the network controller realised that by routing the *Indian Pacific* on the Down Main line through the Tarana to Bathurst section, it would conflict with the *XPT*. He then made a decision to run the *Indian Pacific* via the Up Main line to Bathurst, instead of crossing both trains at Wallerawang as timetabled, even though the train control graph indicated the Up Main line was occupied by TOA 37.

In the process of issuing SPA number 38 to the driver of the *Indian Pacific*, the network controller reversed 57 points at Tarana to allow the *Indian Pacific* to diverge from the single line to the Up Main line. The network controller, by placing 57 points in the reverse position, inadvertently reduced the risk of a collision between the *XPT* and the *Indian Pacific*. The action by the network controller caused the driver of the *XPT* to notice the lay of 57 points, which were set in the reverse position against his movement, and stop his train before entering the single line section.

Following the incident, the network controller was required to undertake additional training in the use of SPA forms and was re-assessed as competent.

2.2 Special Proceed Authorities

2.2.1 Introduction

Special Proceed Authorities (SPA) are a form of ‘Special Working’¹² used to manage train movements ‘not otherwise permitted under the system of safeworking normally in operation’¹³. A SPA form is used to manage train movements between specified locations, and is issued and authorised by the network controller in charge of that area. SPAs generally replace more robust safeworking systems of train management on an ad-hoc, short term basis.

2.2.2 Application of SPAs

In this instance, SPA forms were used to manage wrong-running-direction train movements between Bathurst and Tarana due to planned track work and subsequent speed restrictions. The use of SPAs to manage train movements and reduce delays, was actively promoted by the ARTC to all network controllers only ‘if safe to do so’. From 31 December 2008 until 14 January 2009, 27 SPAs were issued in relation to the planned track work, eight for the down direction via the Up Main line, and 19 for the up direction via the Down Main line. Of the 27 SPAs, 10 were issued without the limit of authority¹⁴ correctly specified; three for the down

¹² Working rail traffic using a Special Proceed Authority, pilot staff working or manual block working. (ARA Glossary for National Code of Practice and Dictionary of Railway Terminology)

¹³ As defined by ARTC rule ANSY514.

¹⁴ A location to which rail traffic may travel under a Proceed Authority. It may be defined by a sign, a signal capable of displaying a STOP indication, or a specific kilometrage point on a line. (ARA Glossary for National Code of Practice and Dictionary of Railway Terminology)

direction via the Up Main line and seven for the up direction via the Down Main line. Overall, 37 per cent of the SPAs were issued with inadequate or ambiguous limits of authority specified on the form, increasing the risk of a train overrunning its limit of authority.

The majority (63 per cent) of the SPAs issued to travel in the up direction via the Down Main line between Bathurst and Tarana did not have conflicting timetable movements, were mostly on-time, and authority was given to enter the single line section up to a specific limit of authority indicated on each SPA, signal TA32, (Figure 2). In this instance, the *XPT* was running about 64 minutes late, meaning that the timetabled crossing with the *Indian Pacific* occurred at Tarana instead of Wallerawang. In this instance, the SPAs issued to the *XPT* and the *Indian Pacific* overlapped their limit of authorities at Tarana.

The track work between Bathurst and Tarana had been planned and advertised in advance of the commencement date. The Train Alteration Advice (TAA) clearly defined the limits of the track possession, including which track would be occupied between timetabled trains. This meant that trains would operate as normal on the designated line in the right-running-direction on the authority of the interlocked fixed signals. The track work planning process did not specify a more robust system of alternative safeworking because the existing system of fixed signals was used to manage train movements. In this instance, due to the time pressures of the track work and train on-time running, the planned operations were altered or optimised to accommodate the time pressures. As a result, the track work continued unaffected by train operations. In the meantime, trains were diverted to run on the adjacent line to avoid further delays. Optimising this pre-arrangement, to reduce train delays and accelerate the track work, in itself appeared to be a viable option. Running trains on the adjacent track using SPA working would incur a lesser delay than running them on the normal track in between track work, but increased the risk of a safeworking irregularity.

Manual systems of train management, such as Special Proceed Authority working, are used when interlocked/engineered systems are not available. However, manual systems are subject to human error and increase the risk of safeworking irregularities/incidents when compared to interlocked/engineered systems of safeworking.

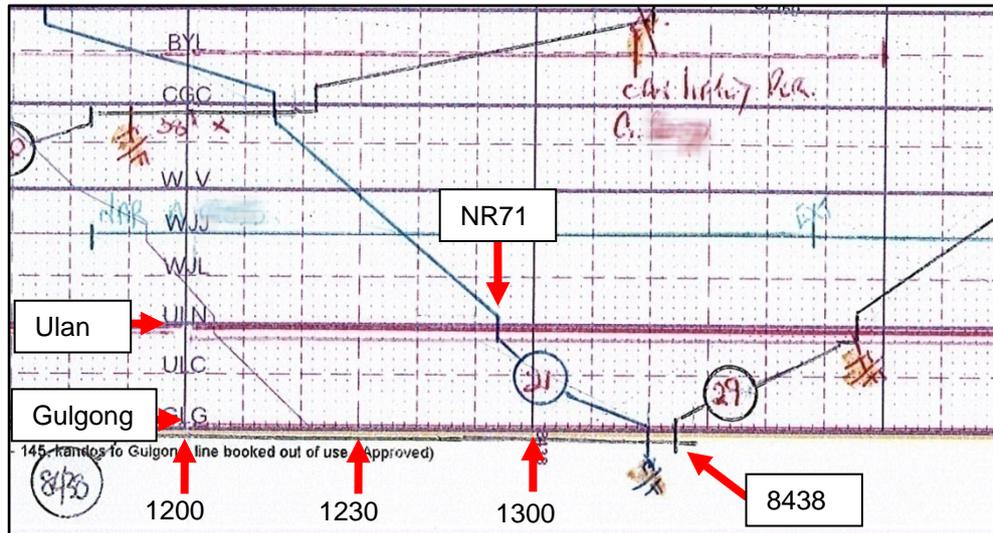
2.2.3 History of SPA irregularities/ambiguities

During the investigation, it came to light that another safeworking irregularity had occurred on 22 November 2008. The incident involved two trains having authority to enter the same section of track between Gulgong and Ulan from opposite directions at the same time. This section of track is on the boundary of two different train control areas of responsibility (West Board and Upper Hunter 2), both within the Broadmeadow train control centre.

An investigation into the incident established that on 22 November 2008, SPA working was in operation between Ulan and Gulgong, NSW, due to a staff instrument/signalling system failure (see train control graph Figure 9). At about 1225, the crew of train 8438, standing at Gulgong, contacted Broadmeadow train control for an authority to enter the section. Another train, NR71, was programmed to enter the section at Ulan and travel to Gulgong before train 8438. However, a SPA form (number 29) was pre-filled for train movement 8438. The form was dated 22 November 2008 and time stamped 1225, making it a valid authority to enter the

section before NR71 had entered and completed its movement through the Ulan to Gulgong section. Fortunately, the train crew of 8438 were aware of the intended movement and waited for NR71 to exit the section before entering and fulfilling it at 1355. The crew of train NR71 were issued SPA number 21 at 1248, fulfilling it at 1320.

Figure 9: Extract from train control graph (Upper Hunter 2)



Note: Personal information on train control graph has been intentionally blurred.

In this instance, the network controller from one area (West Board) pre-issued a SPA and unwittingly authorised it, before another network controller (Upper Hunter 2) had authorised and issued a SPA for the same section. This created a 32 minute overlap of authorities.

This incident further demonstrates the increased risk associated with the use of manual systems of train management, particularly SPA working, which is primarily intended to facilitate unplanned works, compared to interlocked/engineered systems of safeworking.

There is clear evidence to show that SPA forms had been regularly completed incorrectly; increasing the risk of incidents, and accidents.

2.3 Auditing

Train control graphs are normally audited once a week for compliance with the ARTC rules, policies and procedures. In this instance, train working information was not recorded or was incorrectly recorded on the train control graph. The audit process did not detect this error or correlate it correctly against issued SPA forms. It was noted however, that the ARTC audit process did not require a correlation of information between safeworking forms and information recorded on the train control graph.

In summary, the audit system used by the ARTC did not detect errors in the safeworking processes relating to inconsistencies between train control graphs and safeworking forms. These errors were not identified until a serious occurrence had highlighted the deficiency.

The ARTC have since enhanced the auditing of SPA forms to minimise the risk of similar occurrences.

3 FINDINGS

3.1 Context

At about 1858 on 14 January 2009, a safeworking irregularity occurred involving two passenger trains; 4SA8, the *Indian Pacific*, and WT28, the *XPT*, at Tarana in NSW. Both trains had been authorised to occupy the single line within the Tarana interlocked area at the same time. Fortunately, the driver of the *XPT* noticed that number 57 points were incorrectly set and brought the train to a stand before entering the single line in a conflicting move with the *Indian Pacific*.

From the evidence available, the following findings are made with respect to the safeworking irregularity between trains 4SA8 and WT28 at Tarana on 14 January 2009 and should not be read as apportioning blame or liability to any particular organisation or individual.

3.2 Contributing safety factors

- The West Board network controller did not adequately plan the intended routing of the train movements through the section between Wallerawang to Tarana and Bathurst to Tarana sections on 14 January 2009.
- At about 1815 on 14 January 2009, the West Board network controller issued Special Proceed Authority number 37 to the driver of the *XPT* without a specific limit of authority shown on the form.
- At about 1851 on 14 January 2009 the West Board network controller issued Special Proceed Authority number 38 to the driver of the *Indian Pacific*, even though it overlapped the authority of Special Proceed Authority issued to the driver of the *XPT*.
- Manual systems of train management, such as Special Proceed Authority working, are used when interlocked/engineered systems are not available. However, manual systems are subject to human error and increase the risk of safeworking irregularities/incidents when compared to interlocked/engineered systems of safeworking. *[Safety issue]*
- The ARTC's system of auditing safeworking processes did not detect errors existing between train control graphs and safeworking forms. These errors were not identified until a serious occurrence highlighted the deficiency. *[Safety issue]*

3.3 Other safety factors

- An examination of available evidence showed that from 31 December 2008 until 14 January 2009, 37 per cent of Special Proceed Authorities issued at ARTC's Network Control Centre at Broadmeadow for the Bathurst-to-Tarana section were issued with inadequate or ambiguous limits of authority specified on the form, increasing the risk of a train overrunning an intended limit of authority. *[Safety issue]*

- At about 1851 on 14 January 2009, the West Board network controller issued Special Proceed Authority number 38 to the driver of train 4SA8 even though the intended route (Up Main line) was technically occupied by a track vehicle in accordance with Track Occupancy Authority 37, as shown on the train control graph.

3.4 Other key findings

- Interviews and an analysis of the network controller's roster established that, based on the previous 8 days of rostered duty, he had ample rest opportunities and fatigue was unlikely to have been a factor at the time of the incident.
- Analysis of the locomotive data logs from the *XPT* and *Indian Pacific* established that both trains were managed and driven in an appropriate manner. The actions of the train drivers in the handling of their respective trains did not contribute to the incident.
- The network controller was appropriately qualified and fit-for-duty. Tests for drug and alcohol impairment returning zero readings.
- All train crews were appropriately trained/qualified and fit-for-duty at the time of the incident.
- The network controller, by placing number 57 points in the reverse position, inadvertently reduced the risk of a collision.
- Had the driver of the *XPT* not detected number 57 points in the reverse position, or the drivers of the two trains not seen each other, the risk of collision would have been higher.

4 SAFETY ACTION

The safety issues identified during this investigation are listed in the Findings and Safety Actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

All of the responsible organisations for the safety issues identified during this investigation were given a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

4.1 Australian Rail Track Corporation

4.1.1 Manual systems of train management

Safety issue

Manual systems of train management, such as Special Proceed Authority working, are used when interlocked/engineered systems are not available. However, manual systems are subject to human error and increase the risk of safeworking irregularities/incidents when compared to interlocked/engineered systems of safeworking.

Response from the ARTC

Special Proceed Authorities (SPAs) are a paper-based safe working system, not unlike Train Orders. Paper-based systems such as Train Orders are used to authorise train movements over a significant part of Australia's national rail network. The incident at Tarana occurred in the execution of the SPA, not as a result of a problem with the safe working system.

ATSB assessment of response

The Australian Transport Safety Bureau notes ARTC's response, however the risk of safeworking irregularities is greater with manual systems of safeworking. The ATSB urges the ARTC to explore further opportunities to mitigate the risks of human error when using a paper-based system in addition to considering alternative risk controls that may reduce or eliminate human error.

ATSB Safety recommendation R0-2009-002-SR-011

The Australian Transport Safety Bureau recommends that the ARTC take action to address this safety issue.

4.1.2 Issue of SPAs

Safety issue

An examination of available evidence showed that from 31 December 2008 until 14 January 2009, 37 per cent of Special Proceed Authorities issued at ARTC's Network Control Centre at Broadmeadow for the Bathurst to Tarana section were issued with inadequate or ambiguous limits of authority specified on the form, increasing the risk of a train overrunning an intended limit of authority.

Action taken by the ARTC

The NSW Independent Transport Safety and Reliability Regulator issued an Improvement Notice on ARTC in January 2009 specifying the need to define limits of authority within SPA notices, which in part states:

The practice of stating only location names in the specified limits boxes in section 3 of the Special Proceed Authority is not adequate. You must clearly identify on the form the specific limits of the authority or kilometrages in the case of failed trains or when clearing sections due to failures.

The ARTC has issued a Safety Alert Notice 1/2009 in response to this requirement.

ATSB assessment of action taken by the ARTC

The ATSB is satisfied that the action taken by the ARTC adequately addresses the safety issue.

4.1.3 Train control auditing

Safety issue

The ARTC's system of auditing safeworking processes did not detect errors existing between train control graphs and safeworking forms. These errors were not identified until a serious occurrence highlighted the deficiency.

Action taken by the ARTC

ARTC have advised that all Special Proceed Authorities (SPAs) and Train Occupancy Authorities (TOAs) are now audited against the train graphs on a daily basis by the Train Transit Manager (TTM) at all ARTC NSW Train Control Centres. A similar audit process is in place at ARTC's Train Control Centre at Mile End in SA.

ATSB assessment of action taken by the ARTC

The ATSB is satisfied that the action taken by the ARTC adequately addresses the safety issue.

APPENDIX A : SOURCES AND SUBMISSIONS

Sources of Information

Crew of the *Indian Pacific*

Crew of the *XPT*

Great Southern Rail

Pacific National

RailCorp

The Australian Rail Track Corporation

The Independent Transport Safety and Reliability Regulator of New South Wales

Submissions

Submissions were received from:

The Australian Rail Track Corporation, RailCorp, Great Southern Rail and the Independent Transport Safety and Reliability Regulator of New South Wales have made a number of comments and observations on the draft report issued to directly involved parties.

The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Safeworking irregularity involving the Indian Pacific (4SA8) and the XPT (WT2, Tarana, NSW)