



**Australian Government**

**Australian Transport Safety Bureau**

# Collision between out of gauge freight train 3WB3 and passenger train C181

Loftus, New South Wales, on 21 July 2020

**ATSB Transport Safety Report**

Rail Occurrence Investigation (Short)

RO-2020-012

Final – 20 July 2021

This investigation was conducted under the Transport Safety Investigation Act 2003 (Commonwealth) by the Office of Transport Safety Investigations (NSW) on behalf of the Australian Transport Safety Bureau in accordance with the Collaboration Agreement.

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#### Addendum

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# Safety summary

## What happened

On 21 July 2020, Pacific National freight train 3WB3 was travelling from Port Kembla, New South Wales to Brisbane, Queensland. The train consisted of three locomotives and 34 wagons.

At 1912, train 3WB3 stopped and remained stationary at a signal north of Loftus station. Passenger train C181 was travelling in the opposite direction on the adjacent line towards Kiama and began to pass the stationary freight train at 1918. On passing the third locomotive (NR68), the lead carriage of C181 struck an open air filter hatch on NR68. The driver of C181 heard a loud noise and as a result stopped the train at Loftus station.

Train 3WB3 then departed, with its crew unaware of the collision between the two trains before being directed to stop shortly afterwards. There were no injuries as a result of the collision but the guard's windscreen and passenger doors on the lead carriage of C181 were damaged. One passenger door was also partially dislodged and pulled outwards from the carriage.

## What the ATSB found

Passenger train C181 struck an out of gauge air filter hatch on NR68 that was likely not properly secured during recent maintenance. The checks associated with the maintenance inspections did not require a physical check that the air filter hatch was secured correctly. There were also no other mechanisms to prevent the hatch from opening if the hatch was not properly secured.

## What has been done as a result

A modification to fit a secondary latch to the air filter hatches on NR locomotives was released for implementation. The intent of this modification was to prevent hatches on NR locomotives from opening and exceeding the rolling stock outline (out of gauge) if the hatch was incorrectly secured or the lock was to fail.

## Safety message

Rail transport operators should review their rolling stock to ensure that appropriate risk controls are in place to prevent hatches from opening while in service and becoming out of gauge.

# The investigation

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope investigation was conducted in order to produce a short investigation report, and allow for greater industry awareness of findings that affect safety and potential learning opportunities.

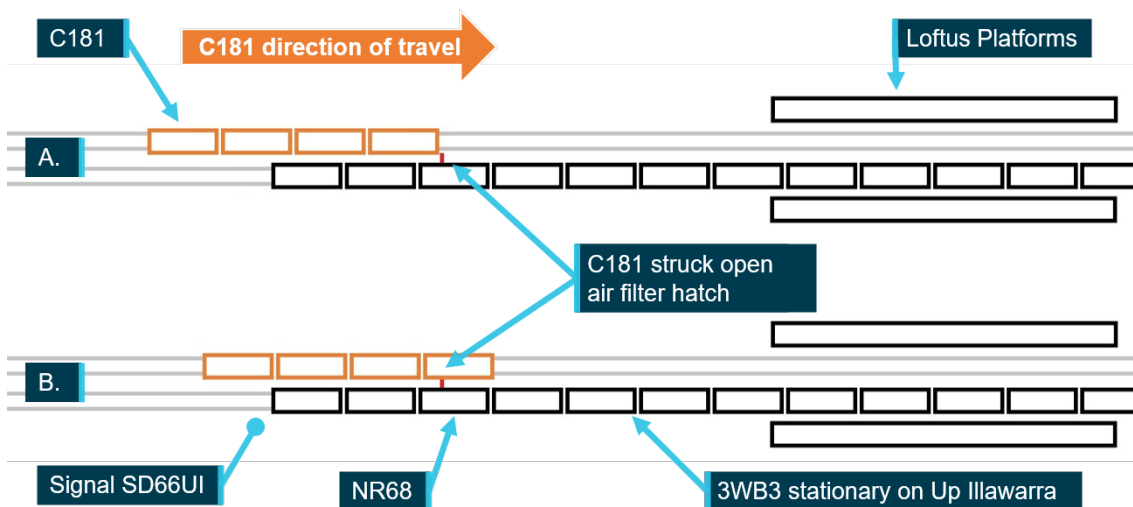
## The occurrence

On 21 July 2020, freight train 3WB3 operated by Pacific National was travelling from Port Kembla, New South Wales to Brisbane, Queensland. The train consisted of three locomotives (NR76, LDP004 and NR68) and 34 wagons.

Train 3WB3 departed Port Kembla at around 1727<sup>1</sup> with two drivers (driver 1 and driver 2). At 1831, the train stopped briefly at Waterfall and the drivers changed positions and continued until stopping at Loftus at 1912. Train 3WB3 stopped about 400 m north of Loftus station at signal SD66UI.

Passenger train C181 consisting of four carriages was travelling towards Kiama in the Down<sup>2</sup> direction and was not scheduled to stop at Loftus. At 1918, train C181 began to pass train 3WB3 near Loftus. The lead carriage 6984 of C181 struck an open air filter hatch on the third locomotive damaging the front and side of the carriage (Figure 1 and Figure 2). The driver of C181 stopped the train at Loftus station after hearing a loud noise and came to a stand at 1918:48.

**Figure 1: Location and collision details**



The image shows a simplified diagram for the track configuration at Loftus with the positioning of trains 3WB3 (shown in black) and C181 (shown in orange). The two diagrams A and B show the progression of C181 towards Loftus past the stationary air filter hatch (shown in red).  
Source: OTSI

Train 3WB3 proceeded towards Sydney at 1920:14 with its crew unaware of the collision with C181. The driver of C181 reported the collision to network control and C181 remained stationary at Loftus.

At 1926, the crew of 3WB3 were advised by network control to inspect their train at Jannali. Driver 2 inspected one side of the leading portion of the train from the platform at Jannali and did not identify a problem. The train was then authorised to proceed to Como station for an inspection of

<sup>1</sup> Times shown in 24-hour format as Australian Eastern Standard Time (AEST).

<sup>2</sup> The Down direction refers to the direction of travel for trains heading away from Sydney. The Up direction refers to trains heading towards Sydney.

the opposite side of the train. During this inspection, a large opening (missing air filter hatch) was found on the side of the third locomotive.

The collision with the air filter hatch broke the guard side windscreen and the passenger door glass on door 5, and partially dislodged passenger doors 1 and 3 (Figure 2) on carriage 6984 of C181. The air filter hatch broke free from NR68 and fell to the track after the collision with 6984. There were between 30 and 40 passengers on board C181 at the time with no reported injuries.

**Figure 2: Collision damage to carriage 6984**



The diagram and photos show the location of the damage on carriage 6984. The bottom of passenger doors 1 and 3 were pulled outwards by the air filter hatch.

Source: Sydney Trains, modified (front of train image brightness adjusted) and annotated by OTSI

## Context

### Air filter hatch

There was one air filter hatch on each side of the NR locomotive. Each hatch was hinged on the left side and the hinge allowed the hatch to rotate through 180 degrees and lay flat against the side of the locomotive when fully opened. Depending on the direction of travel of the locomotive, either the right-hand or left-hand side (in direction of travel) could open if unsecured.

In this case, NR68 was operating in a trailing direction (drivers cab at the rear) and the air filter hatch on the left-hand side opened as shown below (Figure 3). The air filter hatch when opened protruded 935 mm past the body of the locomotive and exceeded the kinematic outline.<sup>3</sup>

**Figure 3: NR locomotive air filter hatch configuration**



*The right-hand and left-hand sides of an NR locomotive are shown. The left-hand side of the locomotive is shown with the air filter hatch open and protruding past the body of the locomotive (rolling stock outline).  
Source: OTSI*

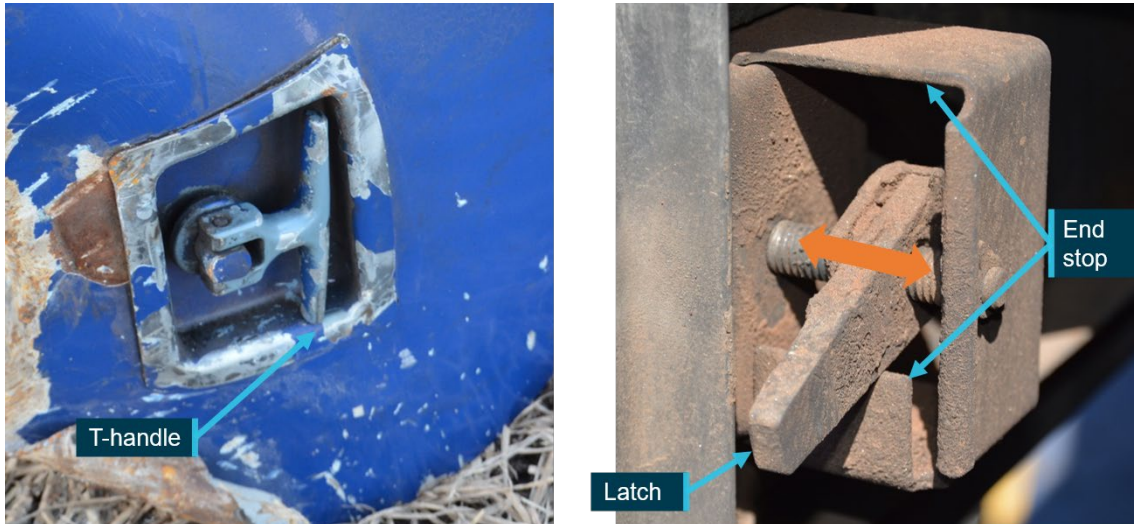
The air filter hatch was fitted with two T-handle screw latches to secure the hatch (Figure 4).

- The T-handle wound a screw that operated a latch that could rotate through about 95 degrees between two end stops. On contacting an end stop, the latch would slide forward or backwards in relation to the screw rotation.
- To secure (clockwise rotation) - the latch would rotate to a horizontal position and clamp (may require a number of revolutions) against a bracket on the locomotive.

<sup>3</sup> Kinematic outline - A two-dimensional cross-section of the shape of a vehicle that consists of the static outline plus the maximum permitted allowance for vertical bounce upwards plus lateral and roll movements in response to a steady-state cant deficiency force at maximum permitted cant deficiency (or the maximum permitted installed cant) and dynamic movements in response to track irregularity.

- To open (anti-clockwise rotation) - once the clamping force was lost against the bracket, the latch could rotate upwards to a vertical position allowing the hatch to open.
- The T-handle could be folded flat against the hatch when the latch was in the locked or unlocked position.

**Figure 4: Air filter hatch latch**



*The image on the left shows the T-handle with the handle folded flat. The image on the right shows the latch in the locked position. Clockwise rotation of the T-handle would cause the latch to slide forward on the lower end stop. In response to anti-clockwise rotation of the handle the latch would rotate vertically and slide backwards on the upper end stop.*  
Source: OTSI

### **Rolling stock outlines**

Trains are designed and assessed to ensure that the vehicle operates within the specified gauge. Australian Standard for Rolling Stock Outlines<sup>4</sup> contained requirements to maintain acceptable clearances between rolling stock, structures and passing trains. The following was specified in relation to hatches:

#### **4.8 Hatches**

External hatches should be designed such that when open they do not protrude from the kinematic envelope [outline]. If this cannot be achieved the hatch design should include one or more of these features:

- (a) Top hung (hinged at the top of the hatch).
- (b) Redundancy in fastening systems.
- (c) Secondary latch to open (latch shall be designed with two positions, one fully latched and a secondary latched position).
- (d) Swing stop (chain or strap).
- (e) Visible lock indicators.
- (f) Designed to be frangible or tear-away.

This standard was not mandatory for rail transport operators but provided industry recommended practices to prevent hatches exceeding the specified gauge or kinematic outline.

### **Maintenance activities**

Maintenance records indicated that the air filters on NR68 were replaced on 1 June 2020 requiring the air filter hatch to be opened and closed.

<sup>4</sup> Rail Industry Safety and Standards Board (2017). AS 7507:2017 - Rolling Stock Outlines

The following maintenance was completed on NR68 in close proximity to the air filters after they had been replaced (Table 1). United Group Limited (UGL) was the maintenance provider for Pacific National.

**Table 1: Maintenance history**

Date	Task	Comments
29/06/2020	Scheduled engine component change out (CCO)	Air filter hatch not required to be opened. Completed Bassendean, Western Australia.
17/07/2020	Scheduled re-torquing of engine components	Air filter hatch not required to be opened. Completed Spotswood, Victoria
17/07/2020	Rolling Stock Movement Checklist (Locomotive)	Air filter hatch not required to be opened, checklist noted all hatches closed. Completed Spotswood, Victoria

### ***Journey of NR68***

On 19 July 2020, NR68 operated as the lead locomotive on train 1MW2 from Melbourne, Victoria and arrived in Port Kembla on 20 July. While in Port Kembla yard on 21 July, the three locomotives were turned around and NR68 became the trailing locomotive for 3WB3. Closed-circuit television (CCTV) footage from Port Kembla yard showed the air filter hatch on NR68 in a closed position before the train departed as 3WB3.

Driver 1 reported inspecting the rear locomotive (NR68) prior to departure from Port Kembla and advised the air filter hatch was closed. A roll-by inspection<sup>5</sup> was also performed of both sides as 3WB3 departed Port Kembla at 1727 and no issues were reported.

Platform footage from Helensburgh showed NR68 pass through at 1820 with the air filter hatch fully open and laying flat against the body of the locomotive. On passing Loftus platform at 1912, the air filter hatch on NR68 appeared to be in a closed or partially closed position. The train then came to a stop north of the station and the position of the hatch could not be observed.

The crew of 3WB3 reported passing four trains travelling in the Down direction prior to Loftus without incident.

### **Safety analysis**

Post collision the air filter hatch was found to be missing one (lower) of the two latches, probably the result of the collision although the missing latch was not recovered. The remaining latch (upper) was inspected and functioned as expected. Both hinges failed during the collision sequence as the hatch detached from NR68.

The unsecured air filter hatch on NR68 probably opened after passing Loftus or was drawn outwards by the air pressure associated with the passing of C181 when it was struck.

It is likely that the air filter hatch on the left-hand side of NR68 was opened during one of the recent maintenance activities, although there was no specific requirement for the hatch to be opened. The most recent maintenance activity on NR68 was completed on 17 July 2020, NR68 then operated in a leading direction between Melbourne and Port Kembla on 19 July. If the hatch had been opened and not secured correctly on 17 July, the hatch would probably be less likely to open in transit as the hatch needed to open against the direction of travel.

The design of the air filter hatch and locks meant that the hatch could appear visibly closed and locked without it being secured correctly. The inspections following maintenance and the roll-by

<sup>5</sup> Roll-by inspections are a visual inspection of moving rail traffic to identify equipment, loading security or other defects or failure.



inspections prior to departure, would be unlikely to detect an unsecured hatch unless the hatch was obviously open.

The locking and hinge arrangement of the air filter hatch allowed the hatch to exceed the kinematic outline and presented a risk to people, structures and passing trains if the locks failed or the hatch was incorrectly secured. While the hatch was not required to be designed in accordance with AS 7507:2017, the inclusion of some of these features specified in the standard would likely have prevented this occurrence.

## Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include ‘contributing factors’ and ‘other factors that increased risk’ (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition ‘other findings’ may be included to provide important information about topics other than safety factors.

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

From the evidence available, the following findings are made with respect to the collision between out of gauge freight train 3WB3 and passenger train C181 on 21 July 2020.

### **Contributing factors**

- The air filter hatch was likely not properly secured on NR68 during one of the recent maintenance activities allowing the hatch to open during the journey of 3WB3 which was struck by C181.
- The maintenance inspections did not require a physical check that the air filter hatch was secured correctly. Additionally, there were no other mechanisms to prevent the air filter hatch opening if it was not properly secured.

## Safety actions

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

### **Safety action by Pacific National and United Group Limited**

Pacific National advised that the following safety actions were taken by Pacific National and its maintenance provider United Group Limited (UGL):

- Completed an inspection of the air filter hatches across the fleet of NR locomotives to check the integrity of the locks and hinges.
- Assessed the design of hatches that could open and exceed the rolling stock outline for NR locomotives if the hatch was incorrectly secured or the lock was to fail. This identified a separate hatch (CA10 communications cabinet located at platform level on the left-hand side behind the driver’s cab) that could exceed the rolling stock outline.
- Completed an inspection of the CA10 hatches across the fleet of NR locomotives to check the integrity of the locks and hinges.
- Issued a bulletin to maintenance staff in November 2020, detailing the correct procedure for securing hatches.
- Developed a design change to install a secondary latch to the air filter and CA10 hatches under Field Modification Instruction (FMI-1752 – Secondary Latch Install on NR Locos).

## Sources and submissions

### **Sources of information**

The sources of information during the investigation included the:

- NSW Trains
- Pacific National
- Sydney Trains.

### **References**

Rail Industry Safety and Standards Board (2017). *AS 7507:2017 - Rolling Stock Outlines*.

Rail Industry Safety and Standards Board (2021). *Glossary of Terms*. Accessed at: <https://www.rissb.com.au/glossary/>

### **Submissions**

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the following directly involved parties:

- NSW Trains
- Office of the National Rail Safety Regulator
- Pacific National
- Sydney Trains
- Transport for NSW.

Submissions were received from:

- Pacific National.

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

# General details

## Occurrence details

Date and time:	21 July 2020 – 1918 AEST	
Occurrence category:	Serious incident	
Primary occurrence type:	Collision	
Location:	Loftus, New South Wales	
	Latitude: 34° 2.667' S	Longitude: 151° 3.071' E

## Train details 1

Track operator:	Sydney Trains	
Train operator:	Pacific National	
Train number:	3WB3	
Type of operation:	Intermodal freight	
Consist:	Three locomotives and 34 wagons	
Departure:	Port Kembla, New South Wales	
Destination:	Brisbane, Queensland	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – nil	Passengers – Nil
Damage:	Minor	

## Train details 2

Track operator:	Sydney Trains	
Train operator:	NSW Trains	
Train number:	C181	
Type of operation:	Passenger	
Departure:	Sydney Terminal, New South Wales	
Destination:	Kiama, New South Wales	
Persons on board:	Crew – 2	Passengers – 30-40
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Minor	