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Australian Transport Safety Bureau

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ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Rail Occurrence Investigation No. 2006/012
Final

Derailment of Train 3DA2K – Tarcoola, SA
1 November 2006

At about 2123 on 1 November 2006, freight train 3DA2K derailed near Tarcoola, SA. Eight multiple-unit freight wagons were derailed but there were no injuries.

Location

Tarcoola is a small town in central South Australia located about 700 track kilometres north-west of Adelaide. A junction at Tarcoola joins the rail line from Darwin with the main east-west rail line running between Adelaide and Perth. The derailment occurred about 5.5 kilometres east of the Tarcoola rail junction.

Train information

Freight train 3DA2K was owned by FreightLink Pty Ltd and operated by Genesee & Wyoming Australia Pty Ltd (GWA). It consisted of three locomotives (FQ03 leading CLF6 and GM37) hauling 31 wagons (26 of which were multiple-unit wagons). The train was 1536 metres long and weighed a total of 2219 tonnes.

The crew of train 3DA2K consisted of two sets of two drivers. The two crews worked rotating shifts with one crew driving and one crew resting. The resting crew were accommodated in a fully equipped crew van marshalled immediately behind the locomotives. The driver operating train 3DA2K at the time of the derailment had more than 30 years driving experience. Both drivers were appropriately qualified, assessed as competent and medically fit for duty.

Occurrence

At about 2116 on 1 November 2006, Train 3DA2K departed from Tarcoola for Adelaide and slowly accelerated towards its running speed of 100 km/h. About six kilometres east of Tarcoola yard, the drivers felt a slight tug and/or surge through the locomotives followed by a reduction of brake pipe air pressure and an increase in brake pipe air flow.

The drivers slowed train 3DA2K to a stop and one of the drivers walked back to inspect the train. He discovered that only 16 of the 31 wagons were coupled behind the locomotives. Walking further back along the track, the driver found the remainder of the wagons, some of which had derailed.

Damage and recovery

At about 0230 on 2 November 2007, the undamaged front portion of train 3DA2K continued its journey to Adelaide. Investigators and recovery crews arrived on site throughout the morning and examined the site throughout the remainder of the day. Heavy lift cranes arrived on site later that night and recovery of the derailed wagons started at about 0630 on 3 November 2007.

The undamaged rear portion of the train was pulled back to Tarcoola at about 1000 and the derailed wagons were removed from the track to allow restoration work to progress. The track was reopened for traffic at about 1430 on 4 November 2007 and the damaged rollingstock progressively recovered from the track side over the following weeks. Six wagons and their respective loads were significantly damaged along with approximately 400 m of track.

ANALYSIS

Examination of on-site evidence did not reveal any clear cause or factors contributing to the derailment. Consequently, the following analysis documents the sequence of events and examines the elements that may have contributed to the derailment of train 3DA2K.

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government.

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with section 25 of the
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Sequence of events

While approaching Tarcoola from the north, the drivers of train 3DA2K noted a significant amount of lightning in nearby thunderstorms. The train arrived at Tarcoola at about 2105 where one of the drivers left the locomotive to operate the point controls. At that time the thunderstorms were just starting to reach Tarcoola. Rain had started to fall and as the intensity increased was accompanied by strong winds and some hail.

Train 3DA2K departed from Tarcoola at about 2116. The locomotive data log shows that the driver accelerated to about 20 km/h and held this speed until the rear of the train had cleared the points at Tarcoola. The driver then increased speed gradually, intending to reach a running speed of about 100 km/h.

Soon after leaving Tarcoola, the drivers noted that the intensity of the thunderstorms had continued to increase. The rain became so heavy and the wind so strong that rain water was blowing under the sliding widows on the left-hand side of the locomotive cabin. While the drivers were attempting stop the water by placing towels in the left-hand side window channel, water suddenly began blowing in under the right-hand side window channel. The wind had suddenly changed direction and was now blowing water under the sliding widows on the right-hand side of the cabin.

At about the same time, the driver felt a slight tug and/or surge through the locomotives. He described the feeling as similar to a transition[1]. However, the driver noted that the train's speed was about 65 km/h whereas field diversion (or shunt) on an FQ class locomotive would normally be felt at speeds between 40 km/h and 45 km/h. The locomotive data log showed the train travelling at about 67 km/h.

The driver checked the locomotive gauges and observed both a reduction of brake pipe pressure and an increase in brake pipe air flow. These conditions indicated that the brake pipe air had been vented, either at a fracture in the brake-pipe, a damaged brake hose or as a result of the train separating (possibly due to derailment). In an endeavour to keep the train stretched, the driver bailed off[2] the locomotive independent brake and brought train 3DA2K to a controlled stop using the train brake.

At about 2123, the driver contacted train control to advise that train 3DA2K had stopped due to a loss of brake pipe pressure and that his colleague was leaving the locomotive to investigate the cause. The second driver left the locomotive and walked back to inspect the train. He found that the 16th wagon (FQAY-25U) had derailed and its rear bogie was missing along with the remaining wagons of train 3DA2K. A further 700 m back towards Tarcoola the driver discovered the remainder of the wagons, some derailed and lying on their side.

Rollingstock

Examination of the derailment site and the post derailment location of wagon components suggested that the 17th wagon (FQWY-23W) was the most likely wagon to have derailed first. This was the first in a series of FQWY class wagons coupled in sequence.

The FQWY class wagon is a '2-pack Well Wagon' which consists of two individual rail vehicles (platforms) coupled by a rigid drawbar. The low-floor 'well' design allows for double stacking of freight containers. The FQWY wagons were about six months old. The Chinese manufactured wagon bodies were fitted with wheels, bogies, brakes and coupling equipment manufactured in accordance with Australian specifications.

Examination of the rollingstock components found an amount of wear on a wagon centre plate which was not consistent with the age of the vehicle. However, there was no corresponding evidence of wear to the centre bowl of the bogie or other components that

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[1] Traction motor transition between series and parallel operation on some older locomotives resulted in a 'surge' being felt due to partial loss off power and then re-application of power. A field diversion (or shunt) in the traction motors of later locomotives is still detectable but to nowhere near the same extent.

[2] Bail off is a term used to describe the action of:
- preventing the locomotive(s) brake from applying automatically during a train brake application, or
- releasing the locomotive(s) independent brake during a train brake application.

would indicate poor bogie performance. The level of excessive wear was not evident on every wagon centre plate examined and it was concluded that the wear was likely to be the result of relatively soft centre plate material.

The trailing coupler on the 16th wagon (FQAY-25U) and the leading coupler on the 17th wagon (FQWY-23W) showed evidence of bruising which was consistent with the couplers rolling or twisting apart as opposed to pulling or lifting apart. No rollingstock related defect was found that could provide any explanation as to why one coupler (or wagon) had rolled with respect to the other coupler (or wagon).

The draw-gear on some of the other derailed wagons showed evidence of being pulled from their mounting position in the wagon bodies. However, examination of the failed components indicated that each pulled draw-gear failure occurred due to coupler (or drawbar) angles exceeded their horizontal limits. It was concluded that the pulled draw-gear failures probably occurred as the wagons jack-knifed during the derailment.

In general, the rollingstock was found to be in good condition. There was no evidence to suggest that a rollingstock defect contributed either directly or indirectly to the derailment of train 3DA2K.

Train loading

When considering double stacked containers on 'well' wagons, a critical issue relating to vehicle stability is the combined centre of mass (rail vehicle and load) above rail level. The Code of Practice for the Defined Interstate Rail Network (CoP), Freight Loading Manual states that for interstate routes, the combined centre of mass shall not exceed 2500 mm.

Freight loads on the Darwin rail corridor generally run heavy towards Darwin and light from Darwin. Many of the containers on train 3DA2K were empty or lightly loaded.

The most likely wagon to first derail (FQWY 23W) was loaded with four double stacked containers, two on each of the individual platforms. In each case, the containers were empty or lightly loaded with the heavier containers loaded on top of the lighter ones. While not the most desirable load configuration, the combined centre of mass did not exceed 2500 mm (as per the CoP).

The issue of train loading is discussed further in the section titled 'Derailment scenario'.

Track structure

The track at Tarcoola is predominantly continuously welded rail secured to concrete sleepers by resilient fasteners and supported on ballast. The Australian Rail Track Corporation (ARTC) was responsible for access to and maintenance of this section of the Defined Interstate Rail Network (DIRN) and maintenance had been contracted out to Transfield Services.

The track runs straight (almost due east) after departing Tarcoola yard. The derailment occurred about 5.5 kilometres into this straight section of track. The track structure was found to be in good condition with a full ballast profile for both shoulder and crib[3]. There was no evidence to suggest that a track defect may have contributed either directly or indirectly to the derailment of train 3DA2K.

Train handling

The locomotive data log showed that train 3DA2K had accelerated to about 20 km/h as it departed from Tarcoola. This speed was held for a period of time before the throttle was progressively increased to notch eight and train 3DA2K slowly accelerated. This data is consistent with the driver's account that he held the train at the required speed limit until it had cleared the points in Tarcoola yard before gradually increasing speed towards Adelaide.

About 5.5 kilometres from Tarcoola, the locomotive data log showed the train travelling at about 67 km/h. The log then indicated a decrease in train speed along with a reduction in brake pipe pressure and an increase in brake pipe air flow. The independent brake was shown to be bailed off and the throttle gradually

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[3] A full shoulder and crib is indicated when ballast's surface is level with the top surface of each adjacent sleeper and has the required amount of ballast at the ends of each sleeper.

notched back as the train slowed to a halt. Again, this data is consistent with the driver's account of events.

It was concluded that train 3DA2K was handled in a manner consistent with normal driving practices. There was no evidence to suggest that train handling contributed either directly or indirectly to the derailment of train 3DA2K.

Environmental conditions

Information on the weather conditions were obtained from the Bureau of Meteorology (BoM) data recorded at an automatic weather station located at the Tarcoola airfield, approximately four kilometres west of the derailment site. Table 1 shows the automatic weather station data recorded on 1 November 2006.

Table 1: Recorded data – Tarcoola airfield

Time	Temp	Wind Gust		Rain
	^{o}C	km/h	from	mm
2101	28.2	39	SSW	0.0
2113	24.5	63	WSW	0.8
2115	19.0	67	WSW	5.4
2118	17.1	61	SSE	11.2
2130	18.6	35	SE	12.6

The BoM also recorded a maximum wind gust at Tarcoola of 74 km/h. The time of this event was recorded as 2019. However, this record had not been adjusted for daylight saving time and was a record for 2119.

It is evident from the data that a significant meteorological change occurred during this time period. Average wind speed almost doubled with a directional change over about 115 degrees. The temperature fell 5.5 degrees Celsius over a two minute period, and more than 10 mm of rain fell in five minutes. The same weather system recorded 91 km/h wind gusts at Coober Pedy (185 km north) and 80 km/h wind gusts at Woomera (215 km east).

Severe winds in thunderstorms are usually caused by a 'downburst' of cold air. When a downburst impacts with the ground, it spreads radially and horizontally, creating very rapid increases in wind speed. The forward speed of the storm then adds to the downburst speed, creating an elongated 'footprint'. Very severe downbursts (or microbursts) can produce wind speeds of more than 200 km/h while only affecting areas up to 1 km wide[4].

It is possible that a downburst (or microburst) of cold air in the vicinity of the derailment site created wind speeds significantly higher than those recorded at the Tarcoola airfield.

Site observations

Figure 1: Derailment site

Examination of the derailment site focused on the two wagons (two 2-pack wagons) considered to have derailed first, FQWY-23W and FQWY-22N. The remaining wagons were considered to have derailed as a consequence of damage caused by the wagons in front.

The key observations were:

- The distance between the earliest evidence of derailment and the front of wagon FQWY-23W was about 120 m.
- The initial derailment evidence was ballast displacement along the ballast shoulder.

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[4] Australian Geological Survey Organisation & Bureau of Meteorology - *Natural hazards and the risks they pose to South-East Queensland* - 2001

- The first evidence of wheel flange climb was on the northern rail about 30 m beyond the initial evidence of displaced ballast.
- The first evidence of wheel induced damage to the concrete sleepers was about 30 m beyond the initial evidence of displaced ballast.
- Wagons FQWY-23W and FQWY-22N and their double stacked loads had come to rest lying on their left side.
- Wagons FQWY-23W and FQWY-22N were effectively lying in their coupled state.

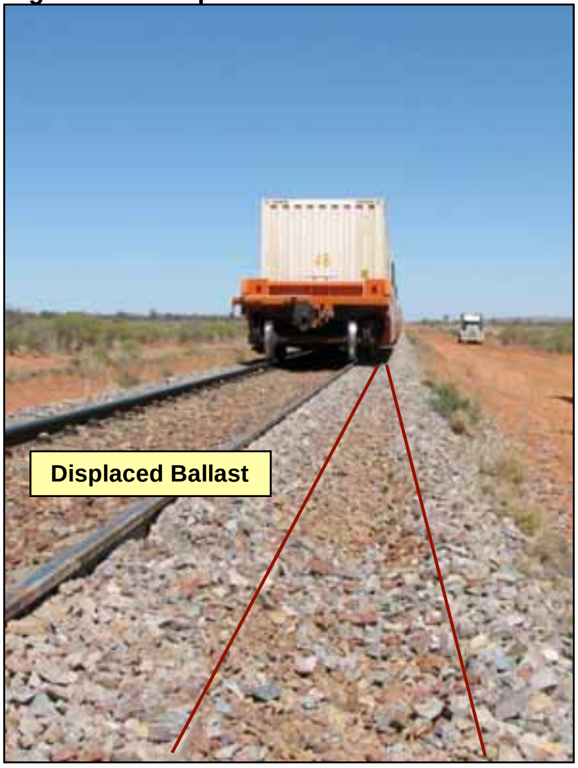
Derailment scenario

A wagon's lateral stability largely depends on the relationship between lateral and vertical forces. A common derailment scenario is for a track defect, rollingstock defect or inappropriate train handling to cause undesirable lateral force and contribute to a flange climb derailment. For this type of derailment scenario, it would be normal to find wheel flange marks crossing the head of the rail. This would be closely followed by sleeper/ballast damage, both between the two rails and to the side of one rail, due to wheels running on the top of the sleepers and ballast. In this case, the investigation found no defect in the track or rollingstock, no inappropriate train handling and no ballast damaged wheel treads. There was no evidence of flange marks crossing the head of the rail or wheel induced sleeper damage, until about 30m after the initial evidence of ballast displacement along the ballast shoulder.

An alternative but less common scenario is for a lateral force to cause sufficient body roll that the wagon tips over. The wagons considered to have derailed first (FQWY-23W and FQWY-22N) had both come to rest lying on their left-hand side, supporting a roll-over scenario. However, it was recognised that the other derailed wagons had remained upright and showed no evidence of roll-over.

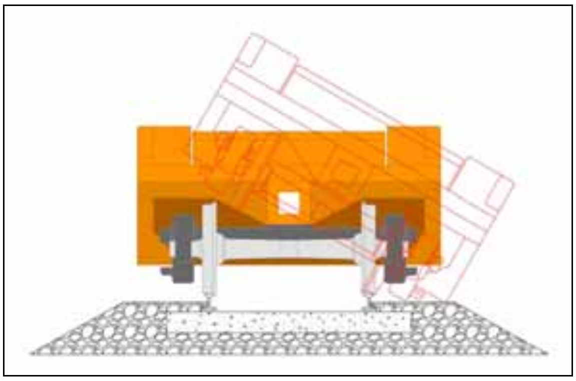
The earliest evidence of derailment was displaced ballast along the northern side of the track leading into the derailment site (Figure 2). The displaced ballast was found to begin outside the line of sleepers, generally running parallel to the track and gradually deepening as it entered the main derailment site. That is, there was no evidence that a derailed wheel had tracked from the rail towards the ballast shoulder, nor was there any evidence of disturbed ballast between the two rails.

Figure 2: Displaced ballast



When considering a roll-over scenario, it is possible that the observed profile of the displaced ballast was caused by the FQWY wagon's side frame as the wagon gradually tipped sideways (Figure 3). It is also possible that the bruises found on the couplers between the 16th (FQAY-25U) and 17th wagon (FQWY-23W) were caused by the FQWY wagon rolling to the left.

Figure 3: Overlay of rolled FQWY wagon



Wind induced lateral force, especially that acting on the side of a wagon, is considered to contribute significantly to body roll and potential wagon roll-over. In the absence of any evidence to the contrary, the ATSB closely examined the possibility that the severe environmental conditions at the time of the derailment may have led to a wagon roll-over scenario. Similarly, the factors that serve to resist roll-over were also examined.

Wind force calculations

The side of a double stacked container wagon will act like a sail when considering wind induced lateral forces acting on a wagon. As the combined side area of a loaded wagon increases, so too will the resultant wind force acting on the wagon.

It is also important to consider the shape of the side area exposed to wind when considering wagon roll-over due to wind force. For example, loading a smaller container on top of a larger container is likely to result in a lower roll-over effect (turning moment) than if a larger container was loaded on top, even though the combined side area may be the same. To illustrate this, consider a tall mast with a small sail. If you place the sail at the top of the mast, the turning moment will be greater than if you place the sail at the bottom of the mast. In both cases, the size of the sail is the same. It is the distance from the pivot point (centre of area) that should also be considered.

Both platforms of wagon FQWY-23W were loaded with the larger upper tier container. This load configuration is not uncommon since some freight containers are too long to be placed on the lower tier of a FQWY well wagon. Consequently, other factors such as a wagon's total mass and the distribution of this mass should also be examined when considering wind induced wagon roll-over.

There are no criteria documented in the current CoP to take into account the effects of wind loading on rail vehicles. However, the Australian Rolling Stock Standard under development by the Rail Industry Safety and Standards Board (RISSB) does include this consideration in a draft document titled *Dynamic Behaviour – Freight Rolling Stock*. A formula for calculating static wheel unloading due to wind load is included in Section 11, *Wind Load Considerations* of the RISSB standard.

The RISSB standard is intended as generic acceptance criteria for the design of freight rollingstock. Consequently, there are a number of assumptions made that simplify the calculations, one being that the wagon is stationary and the wind is acting perpendicular to the wagon[5]. If the wagon is moving, there are other factors not considered in the RISSB standard[6]. In both instances, calculations are simplified by considering individual wagons in isolation and by not considering the effects of adjacent wagons in the train consist.

Static wind force calculations

For train 3DA2K, the load configuration on the second platform of FQWY-23W exhibited the poorer profile with respect to wind load (ie. light weight, large side area and high centre of area). Based on the RISSB standard, 100% static wheel unloading is calculated to occur for this platform at a wind speed of about 125 km/h.

However, there are a few assumptions made in relation to this calculation, one being the value of a co-efficient used to calculate wind force. The RISSB standard assumes a figure of 1.0 for this co-efficient. FreightLink engaged RMIT University to conduct a wind tunnel study[7] on two double stacked well wagon configurations (1/15 scale models). The study returned peak co-efficient figures of about 1.15 and 1.4 for the wagon models tested. Based on these co-efficients, 100% static wheel unloading is calculated to occur at wind speeds of about 117 km/h and 106 km/h respectively.

Dynamic wind force calculations

A critical element of wind force on a moving train is the combined effects of atmospheric wind (due to weather) and induced wind (due to train movement). Atmospheric wind is simply the speed and direction of wind relative to a

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[5] This report refers to the wind force acting on a stationary wagon as 'Static Wind Force'.

[6] This report refers to the wind force acting on a moving wagon as 'Dynamic Wind Force'.

[7] Conducted by the School of Aerospace, Mechanical and Manufacturing Engineering at RMIT University.

stationary object. Wind speed due to train movement is equal to train speed, but acts in a direction opposing the direction of train movement. The effective wind (speed and direction) is the combined effects of atmospheric and induced wind. The effective wind speed may be significantly higher in magnitude, but will act at an angle less than 90 degrees to the wagon if it is moving.

The RMIT University wind tunnel study measured the relationship between wind angles and the co-efficient used to calculate wind force. Using the load configuration on the second platform of FQWY-23W and a train speed of 67 km/h, 100% wheel unloading is calculated to occur when atmospheric wind speed is about 100 km/h at an angle between 60 degrees and 70 degrees to the direction of train travel.

Calculations indicate that most of the other double stacked platforms in the train required at least 20% higher wind speeds before 100% wheel unloading was calculated to occur. These results provide some explanation as to why wagons FQWY-23W and FQWY-22N may have rolled while other derailed wagons remained upright.

Combined mass and mass distribution

A wagon's total mass and the distribution of this mass serves to resist tipping. The further the centre of mass acts (horizontally) from the point of rotation (wheel/rail contact point), the more resistant the wagon will be to tipping.

Both static and dynamic wind force calculations assume that the wagon's combined centre of mass acts continuously at the centre point between the two rails (ie. there is continuous wheel/rail contact and no allowance for body roll). In reality, a rail wagon (bogies, wagon body and load) is not a rigid structure. Bogie suspension and a wagon's natural oscillation and/or an external force such as wind loading will allow a wagon body to roll slightly from side to side. The consequence of this movement is that the wagon's combined centre of mass will also shift from side to side. The magnitude of this shift for the same roll angle will increase as the height of the centre of mass increases above rail level. It should also be noted that the contents of a container may not always be evenly distributed or may have shifted during transit thereby offsetting the wagon's combined centre of mass.

Based on the documented container loads for train 3DA2K, the centre of mass for all wagons that derailed was calculated at less than 2000 mm above rail level. This conforms to the CoP Freight Loading Manual which states that the combined centre of mass shall not exceed 2500 mm above rail level.

Wagons FQWY-23W and FQWY-22N were considered the most likely to have derailed due to wind induced roll-over. The platform considered at most risk of wind induced roll-over (second platform of FQWY-23W) was loaded with two empty containers. Derailment site observations indicated that these two containers remained locked together providing no opportunity for the load to shift.

The only loaded container on FQWY-23W was the top container on the first platform. It is estimated a load of only three to four tonnes was inside this container. In the unlikely event that the entire load mass was concentrated on one side of the container, the calculated risk of wheel unloading is still less than the second platform which was carrying two empty containers.

Further calculations indicated that double stacked wagons are at most risk of wind induced roll-over when they are loaded with two large empty containers. This configuration provides the largest side area and the lightest weight. Adding a load to one of the containers will improve the wagon's resistance to roll-over, irrespective of the load being in the upper or lower container.

These findings imply that ensuring a lower centre of mass may not be as important as reducing the total side area or increasing the total wagon weight when considering the risk of wind-induced roll-over. However, as discussed previously, these calculations assume a rigid wagon structure with no allowance for the wagon body to roll on its suspension. It is still desirable to keep a wagon's combined centre of mass as low as practical (height above rail).

Summary

Static wind force calculations using the RISSB standard indicate that wind speeds of between 106 km/h and 125 km/h could have resulted in 100% wheel unloading of wagon FQWY-23W.

If wagon FQWY-23W was travelling at 67 km/h, dynamic wind force calculations using data from the RMIT University wind tunnel study indicate that a wind speed of about 100 km/h could have resulted in 100% wheel unloading.

Calculations indicate that other derailed wagons may have required at least 20% higher wind speeds before 100% wheel unloading would occur.

The static and dynamic calculations do not take into account any tilting of the wagon body on the bogie suspension, nor do they consider the transmission of forces from adjacent wagons. Both factors could increase the risk of 100% wheel unloading at wind speeds lower than those calculated.

It is possible that a downburst of cold air in the vicinity of the derailment site produced wind speeds greater than the 74 km/h speed recorded at the Tarcoola airfield.

It is unlikely that uneven load distribution or a load shift during transit would have contributed to the derailment.

It is possible that the combined effects of wind load and the wagon's natural oscillations while travelling could have been sufficient to initiate the overturning of a wagon lightly loaded with double stacked containers, such as the FQWY wagons on train 3DA2K. The profile of the displaced shoulder ballast and the absence of any evidence indicating an alternative derailment mechanism indicate that this scenario is the most likely initiator for the derailment of train 3DA2K.

A number of factors can combine to reduce a wagon's risk of wind induced roll-over:

- Reduce the combined side area of a loaded double stacked container wagon.
- Keep a wagon's combined centre of area as low as practical.
- Avoid double stacking two large but empty containers onto any one wagon or platform.
- Keep a wagon's combined centre of mass as low as practical and evenly distributed across the width of the vehicle.

Similar derailments

Despite the extensive use of double stacked well wagons in Australia, the ATSB could find no records of any wind induced derailments of double stacked well wagons in Australia.

However, in Manitoba (Canada) on 1 November 1999, two well wagons loaded with empty double stacked containers derailed and came to rest leaning towards an adjacent track. A train travelling on the adjacent track collided with the leaning containers causing significant damage to the locomotives. The investigation[8] found that high cross-winds exaggerated the natural oscillation of the well wagons and contributed to the derailment. The recorded wind speed, 23 km from the derailment site, was between 67 km/h and 83 km/h with gusts up to 107 km/h.

In North Dakota (US) on 9 August 2006, a number of double stacked well wagons were blown into the Sheyenne River. It was reported that thunderstorm downburst winds had impacted on the high side profile container cars as they crossed the Luverne Trestle Bridge, 48 m above the Sheyenne River Valley floor.

In western Montana (US), high winds and previous derailments have prompted the installation of wind fences on a rail bridge to reduce the derailment risk to double stacked rail wagons.

FINDINGS

Context

At about 2123 on 1 November 2006, FreightLink train 3DA2K derailed about 5.5 kilometres east of Tarcoola, SA.

Based on available evidence, the following findings are made with respect to the derailment but should not be read as

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[8] Transportation Safety Board of Canada (TSB) railway investigation report number R99W0231.

apportioning blame or liability to any particular individual or organisation.

Contributing Safety Factors

Considering the profile of the displaced shoulder ballast and the absence of any evidence to the contrary, it is possible that the combined effects of wind load, due to the prevailing thunderstorm conditions, and the wagons' natural oscillations while travelling, could have been sufficient to initiate the overturning of the lightly loaded, double stacked, FQWY wagons in the train. [*Safety Issue*]

Other key findings

There was no evidence to suggest that any track or rollingstock defect contributed either directly or indirectly to the derailment of train 3DA2K.

There was no evidence to suggest that inappropriate train handling contributed either directly or indirectly to the derailment of train 3DA2K.

A number of factors can combine to reduce a wagons risk of wind induced roll-over:

- Reduce the combined side area of a loaded double stacked container wagon.
- Keep a wagon's combined centre of area as low as practical.
- Avoid double stacking two large but empty containers onto any one wagon or platform.
- Keep a wagon's combined centre of mass as low as practical and evenly distributed across the width of the vehicle.

SAFETY ACTIONS

Safety actions are taken and/or recommended with the intention of improving railway operational safety. Rather than provide prescriptive solutions, recommendations are designed to guide interested parties on the issues that need to be considered.

Both actions already taken by an agency and recommendations directed to an agency are not necessarily reflective of deficiencies within those agencies. They are taken by, or directed to, those agencies that should be best placed to action the safety enhancements.

FreightLink Pty Ltd

Effects of wind load on rail wagons

Safety Issue

Considering the profile of the displaced shoulder ballast and the absence of any evidence to the contrary, it is possible that the combined effects of wind load, due to the prevailing thunderstorm conditions, and the wagons' natural oscillations while travelling, could have been sufficient to initiate the overturning of the lightly loaded, double stacked, FQWY wagons in the train.

Action taken by FreightLink Pty Ltd

FreightLink has implemented procedures to reduce the risk of wind induced derailments by ensuring the combined centre of mass of double stacked wagons is as low as possible. The gross mass of the top tier container(s) must be equal to or less than the gross mass of the bottom tier container(s).

ATSB assessment

Considering the extensive use of double stacked well wagons in Australia and the very low incidence of wind induced derailments, it is likely that FreightLink's action will reduce the risk of wind induced wagon roll-over. However, there are actions other than reducing centre of mass that may require consideration, especially avoiding double stacking two large but empty containers on any one wagon or platform.

ATSB recommendation RR20080020

The Australian Transport Safety Bureau recommends that FreightLink consider further action to address this safety issue.

SUBMISSIONS

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003*, the Executive Director may provide a draft report, on a confidential basis, to any person whom the Executive Director considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the Executive Director about the draft report.

A draft of this report was provided to:

- FreightLink Pty Ltd
- Genesee & Wyoming Australia Pty Ltd
- Australian Rail Track Corporation
- South Australian Railway Safety Regulator
- a small number of individuals.

Submissions were received from:

- FreightLink Pty Ltd
- Australian Rail Track Corporation
- South Australian Railway Safety Regulator

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

MEDIA RELEASE

Thunderstorm possible cause for train derailment

The ATSB has found that strong winds during a thunderstorm could have caused a train derailment in central South Australia.

The Australian Transport Safety Bureau has today released its final report into the investigation of a freight train derailment near Tarcoola in South Australia on 1 November 2006.

The FreightLink train, travelling from Darwin to Adelaide, derailed during a thunderstorm about five kilometres east of Tarcoola. Freight wagons in the middle of the train appeared to have ‘tipped over’ while the train was travelling at about 67km/h in a severe thunderstorm and there was no evidence of any track or train defect that could have caused the derailment.

The investigation established that it was possible that the combined effects of strong winds at the time and the wagons’ natural oscillations while travelling could have been sufficient to initiate overturning of the wagons lightly loaded with double stacked freight containers.

In the interests of enhancing future rail safety, FreightLink has been proactive in adopting a number of measures to address the safety issues identified by the ATSB and the ATSB has recommended that further action be considered.