



Office of Transport Safety Investigations

BUS SAFETY INVESTIGATION REPORT

UNSECURED BUS FLOOR HATCH

CASTLE HILL

19 MARCH 2010



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Published by: The Office of Transport Safety Investigations
Postal address: PO Box A2616, Sydney South, NSW 1235
Office location: Level 17, 201 Elizabeth Street, Sydney NSW 2000
Telephone: 02 9322 9200
Accident and incident notification: 1800 677 766
Facsimile: 02 9322 9299
E-mail: info@otsi.nsw.gov.au
Internet: www.otsi.nsw.gov.au

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EXECUTIVE SUMMARY

At approximately 8:15am on Friday 19 March 2010, Hillsbus school service 3120 stopped at the bus stop on Highs Road, Castle Hill, and picked up two school children en route to Murray Farm Public School, Carlingford. A nine year old boy boarded the bus followed by a ten year old girl. While the girl was still gaining her seat as the bus moved off, she stepped on a floor hatch which then gave way tipping her partially through the floor opening. She was able to grab hold of the rail on a seat to prevent herself from falling completely through the opening onto the transmission or past the transmission onto the roadway below. The girl sustained scratches and bruising to her leg and was taken to the family doctor by her mother for treatment.

An inspection of the bus revealed that the hatch had not been secured, and no loose securing bolts could be found inside the bus. The hatch had dislodged from the hatch frame to the extent that it was unstable when trodden on at its edge.

The investigation found it is most likely the four bolts needed to secure the hatch were inadvertently not fitted when the hatch was placed back in position after having been removed as part of a transmission change. When the hatch was removed, the bolts were placed on one of the seats but were not prevented by any means from falling between the seat and back rest. It is likely that at some time before the maintenance work was completed, the bolts fell off the seat onto the floor and through the open hatch. Subsequently, the fact that they were missing went undetected or unactioned as the workshop did not have a protocol in place to check that bus floor hatches were secured after a maintenance event, even though they had a checklist to be completed following routine servicing. Hillsbus has now sought to rectify this by adding a safety warning to its Work Order form to remind garage staff to check the securing of all floor hatches.

During a test run of the bus, the hatch remained in its recessed mounting despite being unsecured while being driven round and over small roundabouts and at up to

100km/h on the M2 Motorway. It was concluded, therefore, that the hatch was dislodged as the result of a considerable vertical jolt. This had to occur between when the driver last saw the hatch in its proper position and the bus stop at which the two school children boarded the bus. However, the driver asserted that he had not experienced such a jolt and it was not possible to corroborate this as the CCTV unit on the bus was inoperative at the time of the incident.

This was an extremely serious bus safety incident which could have had tragic consequences. To prevent such a hazardous situation from arising again, it is recommended that ComfortDelGro Cabcharge Pty. Ltd., the owner of Hillsbus:

- review the workshop protocols of its other subsidiaries and rectify any omission of the same nature as that identified with Hillsbus;
- regularly spot check workshop procedures to verify they are being implemented satisfactorily;
- include the visual checking of floor hatches on all buses as part of the driver's daily check; and
- ensure CCTV units on its buses are functioning and any defects are rectified within 24 hours of being reported.

It is also recommended that the NSW Department of Transport and Infrastructure, using this incident as a case study, highlight to all bus operators throughout NSW the need to be diligent in regularly verifying the adequacy of workshop procedures and documentation, and in comprehensively checking the completion of all activities associated with servicing and mechanical repairs.

PART 1 CIRCUMSTANCES OF THE INCIDENT

Incident Summary

- 1.1. At approximately 8:15am on Friday 19 March 2010, Hillsbus¹ school service 3120 stopped at the bus stop on Highs Road near the corner of Kookaburra Place, Castle Hill, and picked up two school children en route to Murray Farm Public School, Carlingford.
- 1.2 A nine year old boy boarded the bus followed by a ten year old girl. While the girl was still gaining her seat as the bus moved off, she stepped on a floor hatch which then gave way tipping her partially through the floor opening. She was able to grab hold of the rail on a seat to prevent herself from falling completely through the opening onto the transmission, tail shaft and then the roadway.
- 1.3 The girl sustained scratches and bruising to her leg and was taken to the family doctor by her mother. The bus was immediately removed from service, driven back to the Hillsbus depot at Dural and quarantined pending arrival of the OTSI Investigator.

The Bus Driver

- 1.4 The bus driver had been the holder of a Motor Vehicle Driver license for 27 years and was in possession of a current Driver Authority. He had been driving buses for Hillsbus for the past 18 months and was familiar with the route having driven it many times including the previous two days in the same bus.

Pre-Incident Activity

- 1.5 According to the Driver Activity Report, the driver commenced his shift at 6:34am and drove the bus from the Dural depot to commence route 651 at Highs Road near Castle Hill Road. He commenced picking up passengers at 7:04am en route to Macquarie Shopping Centre via Aiken Road and Beecroft

¹ Hillsbus is a wholly owned subsidiary of ComfortDelGro Cabcharge Pty. Ltd.

Station, arriving at the Centre at 7:39am. A total of 14 passengers were carried on the bus during this first run.

- 1.6 Following this run, the driver stated that he swept out the bus, although it is not common practice to do so during the shift unless the bus becomes particularly dirty or untidy with rubbish being left by passengers. Drivers are allotted extra time at the completion of the whole day's operation to sweep the interior of the bus.
- 1.7 The driver then drove the bus as a 'Special' to the Richard Webb Reserve in Aiken Street, Castle Hill, where he waited until it was time to commence the school run. The route to the start point of school service 3120 at the corner of Aiken and Taylor Streets involved proceeding around a roundabout into Taylor Street, West Pennant Hills, then left at another roundabout into Highs Road. The first passengers were two Murray Farm Public School students who boarded at the bus stop on Highs Road near the corner with Kookaburra Place.

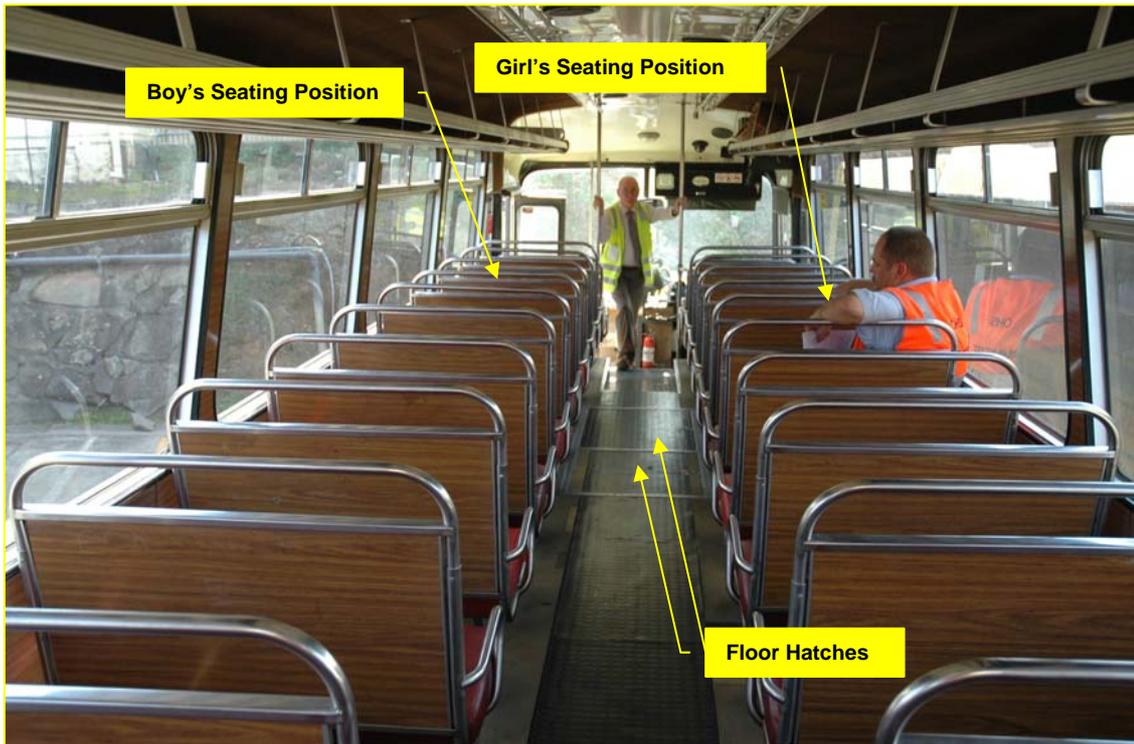
The Incident

- 1.8 The first of the children to board the bus was a nine year old boy who went to a seat at the sixth row from the front on the left (nearside) of the bus. He was followed by a ten year old girl who proceeded up the aisle with the intention of sitting in the seventh row on the right hand side of the bus (see *Photograph 1*). In the process, and as the bus moved off, she placed her foot on the rear edge of a floor hatch which immediately tilted downwards tipping her feet-first partially into the space below the floor. She instinctively reached out and was able to grab hold of the rail on a seat which prevented her from falling completely through the floor. She recalled seeing the road and a "*spinning thing*" (i.e., the bus tail shaft).²
- 1.9 On witnessing the girl's predicament, the boy called out to the driver. The driver stated that, as he commenced to drive off slowly after the two school children had boarded, he looked back in response to the call from the boy and saw the girl with her legs well below floor level. He immediately stopped the

² Both school children were interviewed at school with the permission of their parents and in the presence of the school Principal.

bus and went to assist. By the time he reached her, the girl had managed to extricate herself from the opening in the floor and get into a seat.

- 1.10 The floor hatch was inside the hatch opening, but the driver could not remember if it was resting on the transmission or just jammed skewed in the opening. The bus had travelled 20m from the bus stop.



Photograph 1: Floor hatches and seating positions

Mother's Response

- 1.11 On seeing the bus come to a stop such a short distance from where the children had boarded, both the childrens' mothers ran to the bus to see what had caused the bus to stop. The girl's mother comforted her daughter and then, after giving particulars to the driver, conveyed her daughter to her own family physician for treatment to her leg which had sustained grazes and bruising.³

³ The girl did not attend school on the day and was unable to participate in weekend sport and social activities. Immediately after the incident she was too frightened to travel by bus but, after a short period of time, resumed bus travel to school each day.

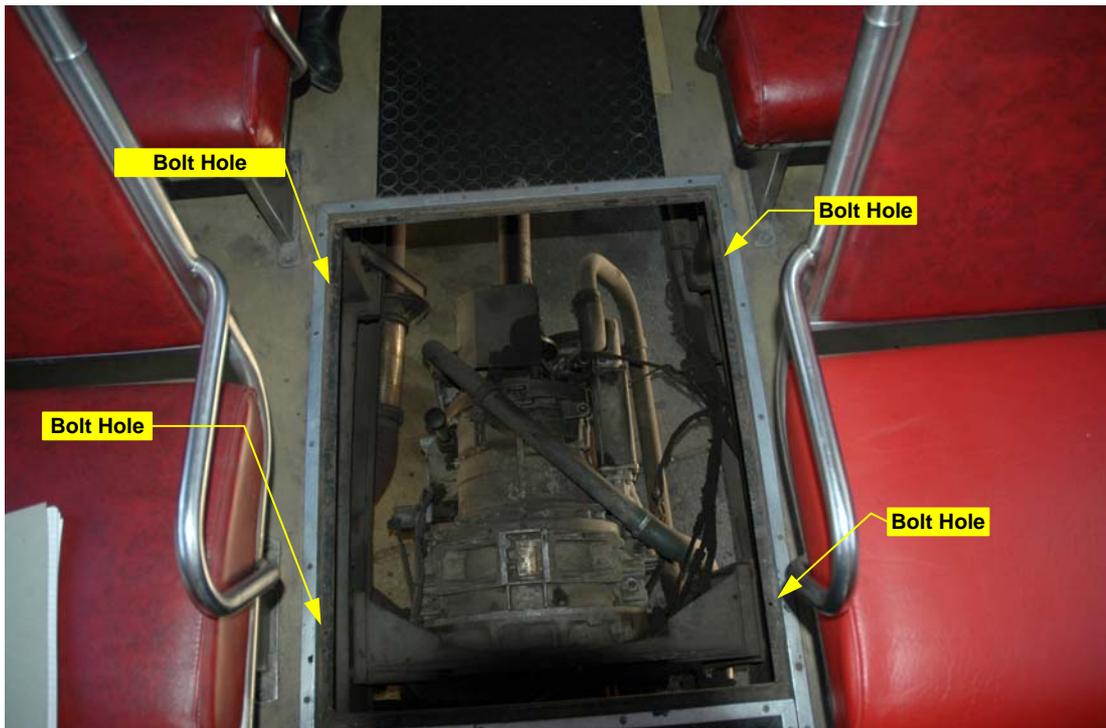
The Unsecured Hatch

1.12 The bus, a 1986 model Volvo, registration MO 7511, has two floor hatches in the centre aisle in the forward section of the bus: a forward hatch over the engine and a hatch to its rear over the transmission. The forward hatch was firmly secured in its mounting frame in the floor with four self-tapping dome head bolts 45mm long by 6mm diameter thread (see *Photograph 2*). The rear hatch was unsecured and no bolts were found inside the bus, indicating that they had been removed prior to commencement of the bus services on 19 March 2010.



Photograph 2: Self-tapping dome head bolt used to secure hatches

1.13 The hatch which measures 84cm by 66cm sits directly above the bus transmission. The gap between the floor level of the bus and the top of the transmission is 65cm at the forward end (see *Photograph 3*). The chassis runs parallel to the transmission and tail shaft on either side. Given the dimensions of the hatch (width, length and height above the transmission), in an open condition, it would allow a small adult or child to fall through onto the transmission and possibly then down either side of the transmission to the roadway. If the bus was moving when this occurred, it is highly likely that the person would be run over by the rear wheels of the bus.



Photograph 3: Transmission below floor hatch

Dislodgement

- 1.14 The driver's description of the morning run does not reveal anything that could explain how the hatch came to be unseated out of the recessed mounting on the floor (see *Photograph 4*). He claims not to have driven over any potholes or gutters prior to the incident. If the hatch was dislodged during its first morning run, it is reasonable to expect it would have been noticed to be out of position when the bus was being swept after its run from Highs Road to the Macquarie Shopping Centre.
- 1.15 Although not mentioned in his initial reports to either Hillsbus or the OTSI Investigator, the driver subsequently advised that he had visually inspected the floor while waiting at Richard Webb Reserve immediately before commencing the second run and believed the hatch to have been in position. He could not offer any explanation as to how it might have subsequently become dislodged.



Photograph 4: Floor hatch shown in a displaced position

- 1.16 The driver stated that other drivers had mentioned floor hatches coming loose and reported that a check of all buses by Hillsbus the day after the incident revealed many hatches were not properly secured due to missing bolts. This was verified by the mechanic and apprentice who had previously worked on MO 7511.
- 1.17 The schoolboy who entered the bus first did not notice the position of the hatch when he boarded. He stepped over the corner of the hatch as he hurried to sit because the bus moved off before he was properly seated. (The schoolgirl said that the drivers often did not allow them time to sit down before moving off.)

Testing for Dislodgement

- 1.18 Hillsbus drivers and management expressed an opinion that the unsecured hatch would lift when the bus was travelling at speed due to air pressure, or if the bus received a sudden jolt when going over a bump, pothole or running over the edge of a roundabout on the roadway. To test this theory, the bus was taken on a test run, with the hatch bolts removed, on the same route it had

travelled on the morning of the incident. The route involved travelling on the M2 Motorway at speed and then through streets where roundabouts were prevalent.

- 1.19 No movement of the hatch within its recessed mounting occurred while travelling on the M2 Motorway at 100km/h. The bus was also driven over small roundabouts with the rear wheels impinging on the roundabout and again no displacement of the hatch from the floor mounting occurred.
- 1.20 It was concluded by both the Hillsbus representatives and the OTSI Investigator that it would require a significant vertical movement of the bus while under way, either by going over a large speed bump or pothole, or riding up and over a gutter, to dislodge the hatch to the extent that it would no longer support a person stepping from the bus floor onto it. The driver asserted that he had not driven over any potholes or gutters.

Removal of Securing Bolts

Transmission Replacement

- 1.21 The transmission on the bus was removed on 9 February 2010 and replaced on 11 February 2010. The work was undertaken at the Hillsbus Dural Depot maintenance area by a qualified diesel mechanic who had been with Hillsbus for two years. He was assisted by an apprentice who had been with Hillsbus for six months and had three year's previous experience in the transport industry as a tyre fitter.
- 1.22 Removing the transmission involved lifting the bus clear of the ground on a hoist and removing the floor hatch bolts with a battery operated drill. The mechanic then worked from below to remove the bolts from the transmission while the apprentice removed the top transmission bolts from a position on the floor of the bus.
- 1.23 The transmission was replaced by the same team during an afternoon shift (1:30pm to 10:00pm) two days later under artificial lighting. They explained that it was normal procedure to test the bus after replacing the transmission. This included a test drive around the area with the bus driven by the mechanic and with the floor hatch removed to allow the apprentice to observe the

transmission. The bus would then be returned to the depot and placed in the wash bay.

- 1.24 The apprentice stated that the hatch bolts were placed on a seat near the hatch along with the battery operated drill. When asked if the bolts would fall off the seat when the bus was tested, the apprentice replied: “*no they would sit between the seat and the back rest*”. When shown a photograph of the seats on the bus, both the mechanic and the apprentice agreed the bolts would not remain on the seat but fall to the floor and then possibly through the open hatch, because of the large space between the seats and back rests (see the seat and back rest configuration in *Photographs 3 and 4*).
- 1.25 The apprentice believed that, on completion of the transmission change, he would have used the battery operated drill to replace the bolts, but could not specifically remember doing so. The mechanic and apprentice both agreed it was a possibility that the drill used to remove the hatch bolts could have been removed from the bus before the work was completed as there were only three battery drills available in the workshop.

Vandalism

- 1.26 The possibility that the bolts were removed as a deliberate act of vandalism is unlikely. In addition to needing tools, the position of the bolts on the floor makes them difficult to access. To work on the bolts, they must be accessed either from four different seat positions or by lying on the floor.

Sabotage

- 1.27 Injuries aside, the extent of material damage and/or consequences to a bus company from removing bolts from a hatch make it unlikely to have been an isolated act of sabotage, given the bus was one of many, and a comparatively old one, within a large depot.

Maintenance Documentation

- 1.28 Hillsbus workshop Work Orders for routine servicing on buses include a checklist which must be completed before the bus is released back into service. The checklist requires an inspection of the hatch bolts. However, for repair work, there was no checklist to accompany the repair Work Orders. This

anomaly was discussed with the Operations Manager and Head Mechanic and Hillsbus have advised that they have revised their Work Order forms by adding a safety warning to remind garage staff to check the securing of all floor hatches.

Onboard Recording

1.29 The bus is fitted with Closed Circuit Television (CCTV) but the unit was inoperative on the day of the incident. It was detected as being defective on 16 March 2010 during the cyclic fortnightly CCTV testing program and then programmed for repair on 22 March as a contractor attends the depot every Monday to handle CCTV repair and maintenance work. With the benefit of CCTV records, it may have been possible to determine how and when the hatch was dislodged.

Summary

1.30 This was an extremely serious bus safety incident which could have had tragic consequences. It highlights the necessity for all public transport operators to ensure that their vehicle drivers understand their safety responsibilities to the travelling public, and to ensure that their workshop procedures and documentation are comprehensive, applied consistently and diligently, and checked regularly.

PART 2 FINDINGS

Causation

2.1 The school girl fell through the floor of the bus immediately above the transmission because the hatch was not secured and had dislodged from the hatch frame to the extent that it was unstable when trodden on at its edge.

Contributory Factors

2.2 It is most likely the four bolts needed to secure the hatch were inadvertently not fitted when the hatch was placed back in position after having been removed as part of a transmission change. When the hatch was removed, the bolts were placed on one of the seats but were not prevented by any means from falling between the seat and back rest. At some time over the three days the maintenance work was ongoing, it is likely that the bolts fell onto the floor and through the open hatch.

2.3 Subsequently, the fact that the bolts were missing went undetected or unactioned as the workshop did not have a protocol in place to check that bus floor hatches were secured after a maintenance event even though it was the case following routine servicing. Hillsbus has now addressed this matter with a new addition to the job card which carries a safety warning that includes a reminder for garage staff to check the securing of all floor hatches.

2.4 During a test run of the bus, the hatch remained in its recessed mounting despite being unsecured while being driven round and over small roundabouts and at up to 100km/h on the M2 Motorway. It is concluded, therefore, that it was dislodged as the result of a considerable vertical jolt. This had to occur between Richard Webb Reserve, when the driver last saw the hatch in its proper position, and the bus stop at which the two school children boarded the bus. It was not possible to verify this as the CCTV unit on the bus was inoperative at the time of the incident.

PART 3 RECOMMENDATIONS

3.1 In order to prevent a recurrence of this type of incident, the following remedial safety actions are recommended for implementation by the specified responsible entities.

Comfort DelgroCabcharge Pty. Ltd.

3.2 Review the workshop protocols of its other subsidiaries and rectify any omission of the same nature as that identified with Hillsbus.

3.3 Regularly spot check workshop procedures to verify they are being implemented satisfactorily.

3.4 Include the visual checking of floor hatches on all buses as part of the driver's daily check.

3.5 Ensure all CCTV units on its buses are functioning and any defects are rectified within 24 hours of being reported.

NSW Department of Transport and Infrastructure

3.6 Using this incident as a case study, highlight to all bus operators throughout NSW the need to be diligent in regularly verifying the adequacy of workshop procedures and documentation, and in comprehensively checking the completion of all activities associated with servicing and mechanical repairs.

PART 4 APPENDIX

Appendix 1: Sources and Submissions

Sources of Information

- Staff of Hillsbus Dural Depot
- The school children who were passengers on the bus

Submissions

The Chief investigator forwarded a copy of the Draft Report to the Directly Involved Parties (DIPs) to provide them with the opportunity to contribute to the compilation of the Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and to submit recommendations for amendments to the Draft Report that they believed would enhance the accuracy, logic, integrity and resilience of the Investigation Report. The following DIPs were invited to make submissions on the Draft Report:

- ComfortDelgro Cabcharge Pty. Ltd.
- Independent Transport Safety and Reliability Regulator (ITSRR)
- NSW Transport and Infrastructure (NSWTI)

The findings and recommendations of the draft report were acknowledged by NSWTI and submissions were received from ITSRR and ComfortDelgro Cabcharge Pty. Ltd. The Chief Investigator considered all representations made by DIPs and responded to the author of each of the submissions advising which of their recommended amendments would be incorporated in the Final Report, and those that would not. Where any recommended amendment was excluded, the reasons for doing so were explained.