Legislative Council Panel on Transport
Subcommittee on matters relating to railways

Airport Railway Service Disruption on 27 July 2003

Introduction

Service of the Airport Railway (AR) including the MTR Tung Chung Line (TCL) and the Airport Express Line (AEL) was suspended for about two hours in the morning of 27 July 2003. On 1 August 2003, the Panel on Transport was briefed on the incident, immediate actions taken by the MTR Corporation Limited (MTRCL) and the Transport Department (TD), preliminary investigation findings and areas identified for improvement (vide information papers nos. CB(1)2335/02-03(05) and CB(1)2335/02-03(04) issued respectively by MTRCL and the Administration on 1 August 2003).

2. This paper provides further information on the investigation outcome of the incident and responds to Members' questions raised at the Panel meeting on 1 August 2003.

Investigation Outcome and Follow-up Actions

3. MTRCL has recently completed its investigation into the AR incident on 27 July 2003. The final report is attached at **Annex A**. It has been found that the service disruption was caused by data overflow in the transmission network at a switch of the data transmission equipment module at Nam Cheong Station. Although the incident caused a service suspension, it did not have any safety implications. Appropriate measures have been identified to prevent recurrence of similar incidents. The Hong Kong Railway Inspectorate (HKRI) will follow up with MTRCL on the implementation of these measures.

4. In addition, MTRCL has reviewed its incident handling and will continue to examine and implement further improvements in consultation with TD. Measures agreed to be taken include :-

(a) strengthening communication and coordination between MTRCL and TD when railway incidents occur. MTRCL would make better use of the existing alert system with a view to providing precise information to TD in a timelier manner;

(b) improving dissemination of information to passengers during incidents. MTRCL is reviewing its station announcements and information displays for emergency situations with an aim to providing timely and precise information for passengers to plan their journeys; and

(c) enhancing the provision of emergency transport services. The routings and stopping points of MTRCL's emergency buses for AR have been reviewed to improve their efficiency. When the situation requires, some existing franchised bus routes will be diverted to AEL and TCL stations to serve stranded rail passengers. The temporary pick-up/set down arrangements for MTRCL's emergency buses, diverted franchised buses and taxis at AEL and TCL stations have also been reviewed and made known to the relevant service providers and trades.

Review of AR Incidents, Performance and Maintenance

5. An account of major AR service disruptions since its commissioning in 1998 is at **Annex B**. For all these incidents, MTRCL has carried out investigation and submitted reports to HKRI and TD as appropriate. HKRI has reviewed thoroughly all major incidents and the remedial measures proposed or taken by MTRCL. The conclusion is that MTRCL has correctly identified the different causes of the incidents and the corresponding remedial/improvement measures.

6. In fact, after taking some time for the system to run in, AR's performance has gradually improved as seen from the decreasing number of major incidents. MTRCL has been able to meet all Performance Requirements for AEL and TCL stipulated in the Operating Agreement since the agreement took effect in June 2000. In 2003, up to July, MTRCL achieved a performance level of over 99% for "train service delivery", "train punctuality" and "passengers journey on time" for both

AEL and TCL.

7. At the Panel meeting on 1 August 2003, some Members expressed concerns on whether the maintenance standards of AR have been affected as a result of outsourcing by MTRCL.

8. Outsourcing is beneficial when contractors have appropriate expertises and when they perform the same or similar processes for multiple customers. Since the Mass Transit Railway commenced operation in the 1970's, some maintenance work has been outsourced to suitable contractors. Examples of outsourcing include maintenance of escalators, station lifts, concrete repairs, structure repainting, depot plant equipment, signaling control panels, trackside cable replacements, station CCTV, etc. Whether the maintenance is carried out by MTRCL staff or contractors, the requirements and standards are the same to ensure delivery of safe and high quality services to passengers.

9. The Government is satisfied that MTRCL has put in place comprehensive maintenance and management systems, which are subject to regular external audits and reviews.

Compensation for Passengers affected by AR Incidents

10. Members have asked whether MTRCL would consider offering fare discounts on AR as a gesture of goodwill due to inconvenience caused to the traveling public; and the procedures adopted by the Corporation in handling claims from passengers who missed their flights as a result of AR service suspension.

11. During any major incidents, MTRCL will not charge passengers for the affected MTR/AEL journeys. Those who have paid their fares could claim for refund at MTR Customer Service Centres within four days of the incident. Moreover, free emergency bus service will be offered during rail service disruptions. Passengers affected by any incident may consider filing a claim for compensation. Each and every claim will be carefully considered by MTRCL on its own merit.

Conclusion

12. MTRCL and the Government have jointly reviewed the AR incident on 27 July 2003. HKRI and TD will monitor MTRCL's progress of implementing remedial and improvement measures to ensure that AR continues to provide safe and reliable service, and railway incidents will be handled appropriately and efficiently.

13. Members are invited to note the contents of this paper.

Environment, Transport and Works Bureau
September 2003

Annex A

Final Report of the Investigation into the incident that occurred on the Airport Railway on 27 July 2003

Introduction

The investigation into the incident that occurred on Airport Railway (Tung Chung Line and Airport Express Line) on 27 July 2003 was conducted by the Management Investigation Panel (the Panel) with a view to achieving the following objectives:

(a) to identify the cause of failures of equipment which subsequently interrupted passenger service on both the Tung Chung Line and the Airport Express Line;

(b) to address the effectiveness of command and control throughout the incident in dealing with information dissemination, contingency arrangement and the recovery of train service;

(c) to identify areas for improvement with a view to providing effective and appropriate contingency arrangement and communication with the traveling public during similar service disruptions; and

(d) to identify areas for improvement with a view to preventing similar occurrence.

The Incident

2. On Sunday 27 July 2003, at 0801 hours, the train indication of Nam Cheong signaling control area failed on the Airport Railway Train Management Workstation in the Operations Control Centre. The Train Management Workstation is a computer system designed to provide indication and control for train movements. This workstation became unstable affecting the train indication and control of other signaling control areas of the Airport Railway with intermittent failure.

3. At 0809 hours, the Train Management Workstation in Operations Control Centre completely failed with all indication and control functions lost. To maintain train service on the Airport Railway, the Traffic Controller at Operations Control Centre immediately initiated

contingency procedures by switching train control from the Operations Control Centre to local control areas of individual stations.

4. All stations, except Nam Cheong Station, achieved local control at 0810 hours. Subsequently, all trains on the Airport Railway kept moving, allowing passengers to alight and board trains at respective platforms, except for one train in the defective Nam Cheong signaling area.

5. At 0813 hours, information on train service delay was delivered to all stations through teleprinter. Local public announcement and notices were prepared accordingly. Updated version was sent at 0817 hours. Public announcements were subsequently made.

6. In anticipation of service delay to the Airport Express Line, Airport Express Line shuttle buses were deployed as emergency buses shuttling passengers directly to the Airport. At 0820 and 0821 hours, the first Airport Express Line shuttle buses arrived at Hong Kong Station and Kowloon Station stations respectively for such purpose.

7. At 0822 hours, Public Omni-Bus Operations Association was requested to provide emergency bus service.

8. At 0824 hours, the Emergency Transport Coordination Centre of the Transport Department was informed that train service on the Airport Railway would experience a 20-minutes delay.

9. The problem at Nam Cheong Station persisted. At 0825 hours, the Train Management Workstations at Tung Chung Station and Tsing Yi Station then showed slow response which culminated in a failure.

10. Local train control was subsequently lost in Tung Chung Station, Tsing Yi Station and Nam Cheong Station again and the Chief Controller decided to suspend train services on the Airport Railway at 0830 hours. Major Incident was therefore declared, with a Red Alert immediately issued at 0833 hours to the Transport Department and other transport operators requesting assistance.

11. Nam Cheong Station regained partial control at 0831 hours. After configuring the correct positioning of the points, the isolated train was moved from Nam Cheong control area at 0842 hours to Olympic Station and subsequently to Kowloon Station.

12. Updated information was disseminated to stations, trains. Electronic media was informed accordingly.

13. Restoration of train services was carried out through computer systems in the local Train Management Workstations at Nam Cheong Station, Lai King Station, Tsing Yi Station and Tung Chung Station which were de-linked from the trunk network and Operations Control Centre. By 0928 hours, de-linking was fully completed.

14. Subsequently, the computer systems at Tsing Yi Station and Tung Chung Station were rebooted to enable the local workstations to regain indication and control. By 0955 hours, rebooting was successfully completed.

15. At 0958 hours, the Train Management Workstation in Operations Control Centre was able to regain indication and control of Hong Kong Station, Kowloon Station and Olympic Station signaling control areas, whilst Nam Cheong Station, Lai King Station, Tsing Yi Station, Tung Chung Station and Airport Station resumed local indication and control. At 1000 hours, the Major Incident was stepped down, with train service on the Tung Chung Line resuming at 1000 hours and on the Airport Express Line at 1010 hours respectively.

Impact on Train Service and Remedial Actions

16. During the incident, train service on the Tung Chung Line and Airport Express Line was disrupted for approximately two hours between 0810 hours to 1010 hours.

17. In accordance with standard arrangements, the Operations Control Centre started to call out for emergency buses for operation on six routes to serve passengers on both the Airport Express Line and Tung Chung Line at 0822 hours. The first Public Omni-Bus Operations

Association bus arrived at Hong Kong Station and Kowloon Station at 0833 hours and 0845 hours respectively.

18. Airport Express Line shuttle buses were deployed to carry passengers to the Airport as soon as it became apparent that there would be disruption to Airport Express Line service. The first Airport Express Line shuttle buses arrived at Kowloon Station and Hong Kong Station at 0820 hours and 0821 hours respectively.

19. Public announcements about the incident and train service information were made at stations and on trains, which were supplemented by notices at stations during the course of the incident. At 0830 hours, electronic media was notified of the incident and information on train service.

Technical Investigation

20. The malfunctioned equipment involved a data transmission equipment module at Nam Cheong station. A Technical Investigation Team was commissioned to address the root causes and to recommend any technical improvement.

21. The Technical Investigation Team identified that the problem was caused by data overflow in the transmission network at a switch which links the Nam Cheong Train Management workstation with the trunk Train Management System network and Operations Control Centre computer systems.

22. This network switch of the data transmission equipment module is a newly installed device at Nam Cheong station.

23. It was confirmed that whilst local indications and control from the Train Management Workstations in Nam Cheong Station, Tung Chung Station and Tsing Yi Station were lost, signaling interlocking remained intact, i.e. safety was at no time compromised during the course of the incident.

Conclusion from Technical Investigation

24. To avoid further network data overflow at Nam Cheong Station, the concerned network switch in the Nam Cheong Station data transmission network was immediately isolated and subsequently replaced.

25. To provide an early warning for precautionary actions before future data overflow in the network, a 24-hour real time network monitoring terminal for Train Management System with a built-in audible alarm system should be provided in the Operations Control Centre and be manned by an Operations Control Centre staff member.

26. To minimize service interruption in the future, the procedures of switching control of trains from central control at Operations Control Centre to local control at station areas should be reviewed for improvement. A one-touch device, i.e. “de-link button”, shall be provided in the Station Control Room to enable station staff to promptly de-link the train control from the trunk network when there is data congestion.

27. To improve reliability, a dedicated data transmission network for Train Management System should be considered as a longer term improvement.

Recovery Actions

28. The Panel reviewed the handling of the incident and concluded that recovery actions by both operations and maintenance staff were taken in accordance with procedures and were carried out in a speedy and efficient manner.

29. During the incident, about 5,000 passengers were affected. There were no passenger injuries in the whole MTR network. All response and recovery actions were undertaken in a safe manner and in accordance with the established contingency plans.

Provision of Emergency Bus Service

30. The Panel considered that during any train service disruption, it was very difficult, if not impossible, to rely on emergency buses alone to substitute train service.

31. Findings of the investigation confirmed that during the initial period of any train service suspension, it was difficult to mobilize a large number of emergency buses within a short period of time. Despite this, 87 emergency bus trips were operated, carrying a total of 3,032 passengers on 6 routes during the incident.

32. As soon as substantial service delay was anticipated, the Operations Control Centre had immediately triggered emergency bus service by using the Airport Express Line shuttle buses as well as those provided by Public Omni-Bus Operations Association.

33. During the incident, some passengers at Lai King Station refused to go to Cheung Sha Wan to take the emergency buses and complained that emergency bus service was not provided at Lai King Station.

Dissemination of Information

34. Throughout the period of train service suspension, public announcements were made at all MTR stations and trains, to inform passengers of the incident.

35. The Panel noted that during the initial period of the incident, it was difficult to gather adequate information for communication to passengers as operation staff had to ascertain the cause of the incident and to identify the extent of service disruption. During this particular incident, there were also concerns raised by Mainland visitors for lacking Putonghua announcements.

Local Traffic Control

36. Traffic congestion was observed on the access roads leading to Hong Kong Station. At Hong Kong Station, Public Omni-Bus

Operations Association buses experienced traffic jam upon their arrival. It was noticed that there were many empty taxis trying to enter the station. Local traffic control was therefore exercised at the transport interchange areas of the respective stations, i.e. Hong Kong Station, Kowloon Station and Tsing Yi Station, to facilitate smooth traffic flow.

37. It was noted that Airport Express Line stations had sufficient taxis to pick up passengers throughout the incident.

Recommendations

38. In addition to the technical recommendations as mentioned in paragraph 24 to 27, the Panel has identified the following five areas for continuous improvement:

(a) The emergency bus working should be reviewed for improvement in providing more emergency buses during the initial period though it is understood that there is difficulty in providing a large number of emergency buses within a short span of time.

(b) A review should be conducted, in conjunction with Transport Department, on the appropriateness of Cheung Sha Wan Station as the pick up point for emergency bus connection for Tung Chung Line stations. It is worth exploring the possibility of having Lai King Station, which is the interchange station between Tung Chung Line and Tsuen Wan Line as an alternative pick up point for emergency buses.

(c) The feasibility of providing Putonghua public announcements at all stations during an emergency should be explored with the increasing number of Mainland visitors using MTR service.

(d) The Panel opined that the amount of public announcements at Airport Railway stations during the initial period of a service disruption could be enhanced. A review is to be carried out.

(e) The local traffic control scheme was effective in reducing traffic congestion at respective Airport Railway stations, thus allowing emergency buses to be operated smoothly. However, it is recommended that the traffic control scheme should be made more visible to road users including taxi drivers to alleviate misunderstanding.

MTR Corporation Limited
September 2003

Annex B

Service Disruptions of the Airport Railway since 1998

Date and Location	Summary of Incident	Cause / Recovery / Remedial Measures
27 July 2003 at 0801 hrs, at Nam Cheong Station	Train services on both Airport Express Line and Tung Chung Line were interrupted for approximately 2 hours. During the incident, emergency buses were operated direct from Hong Kong, Kowloon, Tsing Yi Stations to the airport at 9 to 24 minutes intervals, between Cheung Sha Wan/Tsing Yi and Tung Chung stations at 5 to 14 minute intervals and between Cheung Sha Wan and Tsing Yi stations at 1 to 13 minutes.	A newly installed data transmission equipment module for the upcoming Nam Cheong Station experienced data overflow and subsequently affected the centralized signaling control function in the Operations Control Centre. The concerned network switch in the Nam Cheong Station data transmission network was immediately isolated and subsequently replaced. The investigation conducted by the Corporation recommended to review the procedures of switching train control from central control room to station control, and set up a 24-hour real time network monitoring terminal for Train Management System with a built-in audible alarm system to provide an early warning for data overflow.
24 June 2002 at 1118 hrs, between Tsing Yi and Airport/Tung Chung in both directions	Whilst Tung Chung Line service between Hong Kong and Tsing Yi Stations was maintained at the normal 10-minute headway, service between Tsing Yi and Tung Chung stations was subject to an increase in journey time of about 20 minutes. Airport Express Line service was maintained, but the train movement over the affected section was kept at a slow speed. Airport Express Line and Tung Chung Line service were affected for about 2 hours. During the period, emergency buses were operated direct from Hong Kong, Kowloon, and Tsing Yi Stations to the airport at 5 to 8 minutes intervals, and between Tsing Yi and Tung Chung stations at 2 to 3 minute intervals.	Signaling control for a 5-km section from west of Tsing Yi Station to East Lantau Tunnel Portal on both tracks failed, causing slow train movement on both tracks. Normal train services resumed once the problem was rectified. A subsequent investigation found that the failure was caused during the replacement of a piece of equipment. The relevant Work Instructions were subsequently enhanced to avoid a recurrence.
6 Nov 2001 at 0528 hrs, near Tsing Yi Station, inside the	Airport Express Line and Tung Chung Line train services to the west of Tsing Yi was suspended for 3 hours.	The event occurred prior to the start of the morning service. Some strands of tunnel repair material had detached from the tunnel roof and dropped onto the pantograph of an Engineer's Works Train and the overhead line, leading to flashover of the overhead line and tripping of the power supply circuit breakers. This power cable was broken

Date and Location	Summary of Incident	Cause / Recovery / Remedial Measures
tunnel leading up to the direction of Lantau	During the incident, emergency bus services were operated direct from Hong Kong, Kowloon and Tsing Yi stations to the airport at 10 to 12 minutes intervals and between Tung Chung and Tsing Yi at 4 to 6 minutes intervals.	during the flashover. The repair work commenced at 0624 hrs. The detached materials were removed and the broken wires were temporarily repaired and completed at 0719 hrs. The spreading of dropped repair material by the running of the Engineer's Works Train caused subsequent tripping of trains used for checking prior to the restoration of service. After removal of all repair material from the overhead line, train service to Tung Chung and Airport stations resumed. Results of the technical investigations showed that the repair material applied a few hours earlier, had not been properly 'bedded' into the epoxy resin as the surface of the tunnel was particularly rough and the relatively low temperatures that night affected the curing time. As a precautionary measure, all of these repair materials have been removed from tunnels.
25 June 2001 at 1644 hrs, in the open section on the track towards Hong Kong near Tai Ho Wan junction	Airport Express Line service and Tung Chung Line service to the west of Tsing Yi were suspended for 4 hours. During the period, emergency bus services were operated from Hong Kong, Kowloon and Tsing Yi stations to the airport at 10 minutes intervals and between Tung Chung and Tsing Yi at 5 minutes intervals.	A copper jumper cable which connected the power supply feeder wires to the messenger wire dropped when the nylon cable ties which hold the jumper cable up to the feeder wires broke. The pantographs of a passing Airport Express train hit the 'loop' of the jumper wire and tore it down. The train's pantographs were deformed, which then caused damage to the overhead line equipment at a number of locations over a distance of 6.5 km. Train service resumed upon the completion of emergency repairs. Detailed investigation showed these standard nylon cable ties used to secure the cable had become brittle as a result of weathering. All nylon cable ties have now been changed to metal ties.

Date and Location	Summary of Incident	Cause / Recovery / Remedial Measures
12 Nov 1999 at 1337 hrs, near Airport Station Servicing Platform	The Airport Express Line service was suspended for 2 hours and the Tung Chung Line service was not affected. During the incident emergency buses were operated direct from Hong Kong, Kowloon and Tsing Yi stations to the airport at 4 to 10 minutes intervals.	A copper alloy ferrule connecting a power supply cable to an insulator became detached and the overhead line cable dropped. Normal train service resumed after the repair. After detailed technical investigation, all connectors were changed to stainless steel.
5 Nov 1999 at 1220 hrs, between Olympic and Lai King Stations in both directions	Train service between Hong Kong and Tsing Yi Stations of both Airport Express Line & Tung Chung Line were suspended for 2 hours. Train services between Airport and Tsing Yi and Tsing Yi to Tung Chung stations on both lines were maintained at 15 minutes intervals. During the incident, emergency bus services for Airport Express Line were operated direct from Hong Kong and Kowloon Stations to the airport at 2 to 5 minutes intervals and for Tung Chung Line between Tsing Yi and Cheung Sha Wan Stations at 5 to 10 minutes intervals.	There was a loss of centralised signalling control function in the Operations Control Centre, control was transferred to local Station Control except for Lai King and Olympic Stations, causing a disruption to service. A defective telecom network switch was identified. To prevent recurrence, the system was upgraded to enhance its performance.
22 Aug 1999 at 1948 hrs, near Airport Station in the direction towards Hong Kong	Airport Express Line service was suspended from Tsing Yi to Airport by 2¾ hours while Tung Chung Line was not affected. During the incident, emergency bus services were operated from Hong Kong, Kowloon and Tsing Yi Stations to the airport at 10 minutes intervals.	A clamp holding the traction supply feeder cable became detached during typhoon. The feeder cable dropped, causing a dead short to the overhead line mast and power supply for the section near Airport and Tung Chung Station was discharged and could not be restored. The recovery works were completed and train service resumed. At the time of the incident, Tropical Cyclone Signal No. 8 was hoisted. The feeder wire clamp of the overhead line insulator was detached by severe vibration resulting from the strong wind. A system wide check of all similar clamps was conducted after the incident to ensure all were secure and this has been emphasised in the maintenance procedures.

Date and Location	Summary of Incident	Cause / Recovery / Remedial Measures
16 Mar 1999 at 1602 hrs, near Airport Station Servicing Platform in the direction towards Hong Kong	Airport Express Line service between Tsing Yi and Airport Station was suspended for 7 hours, whereas the Tung Chung Line service was not affected. During the incident emergency bus services were operated direct from Hong Kong, Kowloon and Tsing Yi stations to the airport at 5 to 10 minutes intervals.	An empty train running from the Departure Platform experienced an emergency stop before entering the Arrival Platform. Its rear pantograph happened to rest beneath a section insulator. Because of the voltage difference between the two traction supply sections, excessive arcing developed over the pantograph and the contact wire of the overhead line was broken. When the following train passed through the location, its pantographs were deformed and the overhead line wires were torn down. Remedial measures were taken to adjust the setting of insulators to avoid possible excessive arching. Improved train operating procedures were developed to prevent reoccurrence of similar incidents.
3 Feb 1999 at 1747 hrs, near Tung Chung	Tung Chung Line was suspended between Tsing Yi and Tung Chung for 2½ hours, whereas the Airport Express Line was not affected. During the incident emergency bus services were operated between Tsing Yi and Tung Chung at 8 to 10 minutes intervals.	Excessive arcing developed at the overhead line section insulator over pantograph of a train while it stopped in the section to reset a fault. The overhead line contact wire was damaged. Upon completion of the contact wire reconnection, normal train service resumed. A technical Investigation was conducted to identify the cause of the excessive arcing. As a remedial measure, improved operational procedures were adopted.
23 July 1998 at 0945 hrs, near Tsing Yi in the direction towards Tung Chung	While service of Airport Express Line was maintained throughout the period, Tung Chung Line service was suspended between Tung Chung and Tsing Yi for 2½ hours. During the period, emergency bus services were operated from Hong Kong, Kowloon and Tsing Yi to Tung Chung at 10 to 18 minutes intervals.	An Airport Express train passed through a set of points as the train operator failed to observe the signal indicated and caused damage to the track. Repair works took 2½ hours to complete and train service was then resumed. Although this was an isolated case soon after opening, the incident has been included in internal training studies.

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