Legislative Council Panel on Transport
Railway Incidents and Performance of the Railway Systems in Hong Kong

Purpose

This paper informs Members about the railway incidents which occurred in the past three months, the results of the investigations into these incidents and remedial actions taken to prevent the recurrence of similar incidents in future.

Background

2. KCRC has conducted reviews of the incidents and its services. The incidents have been investigated thoroughly. Existing maintenance and safety provisions have also been reviewed.

Measures for ensuring safety and reliability of services

3. KCRC has a comprehensive safety management system in line with international practices. The system has proved to be effective in ensuring the safe and reliable operation of the railway systems.

4. The Corporation adopts a quality management system to effectively monitor and control its maintenance and environmental activities. The quality management system is subject to an annual audit by an independent auditor to ensure that maintenance activities are properly managed. A hazard management system is also in place to proactively and systematically manage the safety of assets, systems, people and the environment.

5. KCRC continuously improves and upgrades all railway systems in order to provide a more reliable and efficient service. Assets are upgraded as and when necessary to ensure the highest level of safety and

to prevent aging. Between 1997 and 1999, the Corporation spent HK$1.3 billion on the Train Refurbishment Programme to upgrade the interior and equipment of East Rail's 348-train car fleet and increase its passenger carrying capacity by 15%. Between 2001 and 2003, KCRC purchased a total of 444 train compartments for East Rail and West Rail services.

6. Between 1998 and 2002, KCRC also introduced advanced train control systems, namely the Automatic Train Protection and Automatic Train Operation systems, to boost line carrying capacity and reliability.

7. New Light Rail vehicles were purchased in 1992 and 1997 to cope with the ever-growing passenger demand. KCRC is preparing for the coming mid-life refurbishment work of Light Rail vehicles (LRVs).

8. KCRC also adopts proactive measures in continuously improving the safety and performance of LRVs. These measures include on-train door control enhancements, modifications of the air-conditioning systems and hopper windows, and installation of detrainment ladders which have resulted in greater LRV stability and reliability.

Performance of railway services

9. The quality of KCRC's railway services has been consistently high. They compare favourably with other similar railway systems in the world. Over the years, the service delivery and punctuality rates of KCRC's railway services have been well above KCRC's service pledges and the terms of the operating agreements with the Government.

East Rail

10. In the most recent Nova[1] and Comet[2] benchmarking results

[1] Nova is an association of 12 medium-size metro railways carrying less than 2 million passengers a day. Members include railways serving Buenos Aires, Dublin, Glasgow, Lisbon, Montreal, Naples, Newcastle, Oslo, Singapore, Taiwan, Toronto and Hong Kong (KCR East Rail).

[2] CoMet is an affiliation of 11 large-scale metro railways serving over 2 million passengers daily. Members include railways serving Berlin, London, Madrid, Mexico City, Moscow, New York, Paris Metro, Paris RER, Sao Paulo, Tokyo and Hong Kong (MTRC).

conducted in 2002, East Rail's 99.96% record for passenger journey punctuality ranked "First". Its percentage of trains on time also grew from 99.17% in 1998 to 99.65% in 2002.

11. In terms of train reliability, East Rail's car kilometres between incidents increased from 622,646 in 2002 to 953,565 in 2003, an improvement of 53%.

West Rail

12. Despite some teething problems, West Rail has been operating smoothly since its opening in December 2003. Its service delivery and punctuality are also well above KCRC's service pledges and the terms of its operating agreement with the Government. The system now runs 409 trips a day and provides safe and reliable services and consistently achieves a service delivery rate of 99.5% and a punctuality rate of 99.4%. In comparison with other new railway systems around the world, West Rail has performed with a very high reliability in terms of safety and operation.

Light Rail

13. Light Rail's train reliability has also improved significantly over the years. Its km run per failure improved to 192,802 this year, an 88% improvement over 102,420 in 2001. Most Light Rail systems in the world define an incident as a case of "above-5-minutes delay", while KCRC defines an incident as a case of "above-3-minutes delay". The standard set by KCRC is therefore much more stringent than the industry norm.

14. Light Rail's service delivery and punctuality reached 99.9% and 99% respectively last year. Light Rail's safety performance also improved significantly in the past 10 years. In 1994, the figure for passengers and public injured per million passengers carried was 0.76, while the figure in 2003 had improved to 0.25.

15. For the figures on train service delivery and train punctuality for the railway systems, please see ***Annex 1***.

Inspection and maintenance procedures

16. KCRC has established comprehensive inspection and maintenance procedures to ensure smooth, safe and reliable operations of all the railway systems.

17. KCRC continuously improves its maintenance regime including its context and frequency to enhance the safety and reliability of the railway systems. The maintenance regime is based on standard industry practice and covers areas including design, repair and maintenance intended to achieve the best performances in terms of safety, reliability, availability, maintainability and productivity.

18. KCRC renews equipment parts and life expiry components through regular replacement programmes, including regular examinations and overhauls in order to maintain the best overall performance of all systems. These programmes ensure that all equipment is replaced before it ages or wears out and impacts system performance.

19. KCRC does not outsource safety critical maintenance tasks. All-first line and routine maintenance of trains and infrastructure are conducted by qualified and experienced in-house staff. Only non-safety critical and general engineering tasks such as lift and escalator maintenance, lighting and building maintenance are outsourced.

20. Manpower for maintenance is planned according to the workloads required to achieve the maintenance requirements. No maintenance task is ever compromised for the sake of manpower savings.

21. KCRC provides a comprehensive training programme for its staff to ensure they are qualified to perform their duties in the safest manner possible. They are required to be equipped with knowledge in handling emergency situations, and passenger and railway safety are the priority tasks. KCRC has also put in place an Examination and Qualification system for its staff.

22. Training on safety awareness, rules and procedures, and basic knowledge on railway operating systems such as signalling systems for trains, is provided before staff are posted to their positions.

Investigation results of recent incidents and follow up actions

23. In line with normal Corporation procedures, KCRC conducts thorough investigations into the causes of every incident and seeks measures to minimise the chances of the recurrence of similar incidents. Apart from replacing any faulty equipment, it carries out comprehensive checks on related equipment and facilities and finds ways to accelerate the recovery of services and minimise the impact on train services. A list of incidents occurred in the past three months is provided in ***Annex 2***. The more significant incidents and remedial actions taken are explained in paragraphs 24 to 31.

West Rail

24. The recent signalling incidents over the past few months were mainly peripheral hardware problems and at no point during any of the incidents was safety compromised.

25. KCRC has undertaken a series of measures to improve the signalling system and to enhance its stability. Immediately after the incidents in May this year, KCRC commenced a comprehensive check on critical equipment. An improvement programme has commenced, and the main improvement and modification works will be completed before the end of 2004.

26. To enable a more accurate assessment of an accident's impact on service, monitoring points have been set up at West Rail Tuen Mun, Kam Sheung Road and Nam Cheong stations to monitor train services and record journey times. The Corporation is also improving the computer software so that the Control Centre will have more information to make a more accurate assessment of the impact on journey times.

27. External experts conducted an independent review of the West

Rail signalling system in August 2004. The audit concluded that West Rail's signalling system is safe and reliable for passenger operations. In comparison with other new railway systems around the world, West Rail has performed with a high reliability level in terms of safety and operation. The experts also considered the improvement strategies adopted by the Corporation were appropriate.

Light Rail

28. The investigation into the Light Rail broken wheel incident that occurred on 10 September has been completed. An investigation conducted by an independent laboratory showed that the supplier's processing factory had carried out welding repairs on the tyre to cover up defects that appeared in the machining process. Cracks appeared inside the welded tyre and grew larger as the mileage built up and the tyre finally fractured when the crack had grown to an extent that it was no longer able to withstand the loading. The supplier has admitted responsibility for this violation of procedures.

29. To prevent similar incidents from happening in the future, KCRC will strengthen the procedures to ensure that Light Rail tyres are always in good condition. In addition to the original procedures, which included a routine inspection once every three weeks, and ultrasonic flaw inspections during the 24th and 40th month of operation, the Corporation will carry out ultrasonic flaw inspections before installing all new wheel tyres, will conduct hammering tests once every week, and ultrasonic flaw inspections once every six weeks.

30. KCRC will also accelerate the existing wheel replacement programme in phases in order to enhance public confidence in the Light Rail system. All wheel tyres will be replaced by end of 2005.

31. KCRC has also commissioned a group of professionals and academics led by Mr Edmund Leung, former President of The Hong Kong Institute of Engineers to review the results of the investigation and to provide independent professional advice. The new measures have already incorporated their views. The panel considers the additional measures sufficient for early detection of cracks in wheel tyres. The

Corporation will review the measures in six months.

Conclusion

32. KCRC's safety management system and maintenance regime have proved to be effective in ensuring the safety and reliability of the railway systems. In addition to the regular quality audit and risk assessment, a safety audit is conducted by external experts on all railway systems, East Rail, West Rail and Light Rail, every three years. A pre-audit was completed in September. The entire audit exercise will be completed by early 2005.

33. The Corporation also works closely with the Hong Kong Railway Inspectorate on all aspects relating to the design and safe operation of the railway. It continuously reviews its safety management system and adopts appropriate improvement measures whenever necessary to ensure the safe and reliable operation of the railway systems.

Kowloon-Canton Railway Corporation
October 2004

Annex 1

KCRC Service Performance

July – September 2004

East Rail

Month	Service Delivery[1]	Punctuality[2]
July	99.85%	99.66%
August	99.87%	99.59%
September	99.95%	99.75%

West Rail

Month	Service Delivery[1]	Punctuality[2]
July	99.9%	99.9%
August	99.6%	98.2%
September	99.5%	99.4%

Light Rail

Month	Service Delivery[1]	Punctuality[2]
July	100%	99.87%
August	100%	99.92%
September	100%	99.77%

2001 – 2003

East Rail

Year	Service Delivery[1]	Punctuality[2]
2001	99.90%	99.70%
2002	99.70%	99.40%
2003	99.91%	99.70%

Light Rail

Year	Service Delivery[1]	Punctuality[2]
2001	99.94%	99.03%
2002	99.91%	99.03%
2003	99.86%	98.79%

[1] The service delivery rate refers to the percentage of the number of trips run versus the number of trips scheduled.
[2] The punctuality rate refers to the percentage of trains arriving at their destination within three minutes of the scheduled running time.

Annex 2

List of railway incidents from July to October 2004

East Rail

	Date	Incident Time	Incident description	Cause of Incident/Findings of investigation	Remedial action taken
1.	02/07/04	12:26 pm	A southbound train was default at Fo Tan station due to a damaged motor alternator motor coil. The blockage was cleared after 9 minutes. There was an extended journey time of 9 minutes.	Motor Alternator motor coil damaged.	The defective motor was replaced.
2.	20/07/04	00:30 am	Driver of an empty train got out the train for inspection at south of Kowloon Tong station and could not get back to the driving cab. The last northbound train was blocked and delayed. The blockage cleared after 9 minutes later. There was an extended journey time of 9 minutes.	The driver did not follow the procedures.	All drivers were briefed on the correct procedures.
3.	22/07/04	6:02 am	Track circuit at southern exit of Lowu Marshalling yard failed. The fault was cleared after 9 minutes later. 2 minutes extended journey time.	Short circuited by iron dust on insulating joint.	Cleared by signal staff.
4.	02/08/04	9.10 am	Train failure at Mong Kok Station after the train driver wrongly pressed the emergency stop button and did not reset it afterwards. The incident was cleared 18 minutes later. There was an extended journey time of 10 minutes.	The train could not obtain traction power.	All train drivers were briefed on the correct procedures.
5.	10/08/04	10:58 pm	Point failure at north of Hunghom station. The fault was cleared after 11 minutes. There was an extended journey time of 9 minutes.	Failure of circuit controller	Replaced by signalling staff.
6.	25/08/04	5:20 am	Point failure at south of Lowu station. The fault was cleared after 102 minutes later. 1-2 minutes extended journey time was incurred during the incident.	Data link problem	Reset diagnostic processor.
7.	30/08/04	11:00 am & 12:33 pm	Track circuit failure at south of Lowu station. The fault cleared after 175 minutes later. A total of 6 trains incurred 3-17 minutes extended journey time. Northbound Lo Wu train headway was changed from 5 minutes to 6-10 minutes.	Short circuited by screws of fishplate on insulating joint.	Replaced the screws with smaller size.
8.	10/09/04	5:59 am	Owing to a track circuit failure, northbound service from Tai Po to Lo Wu was delayed for 8 mins. The fault was cleared after 16 minutes. 8 minutes extended journey time.	The incident was caused by a point failure at south of Tai Po Market station.	The point was adjusted.
9.	01/10/04	3:40 pm	A northbound Beijing-Kowloon through train stalled at north of Tai Po Market. The incident was cleared 39 minutes later. There was an extended journey time of 15 minutes.	The incident was caused by failure of the locomotive of the Mainland Through Train	The incident is being followed up by Mainland railway authorities.
10.	02/10/04	7:46 pm	A northbound train failed after departing Hunghom station. The blockage cleared after 9 minutes later. There was an extended journey time of 8 minutes.	The Driver safety device isolating cock air leakage	The fault was cleared.
11.	09/10/04	7:48 am	A train failed at Tai Wo station due to door defect. The blockage was cleared after 8 minutes. There was an extended journey time of 10 minutes.	A lock nut of bracket on the door was found dislocated.	The lock nut was replaced and adjusted.

West Rail

	Date	Incident Time	Incident description	Cause of Incident/Findings of investigation	Remedial action taken
1.	9/7/04	7:32 pm	A Nam Cheong bound train failed at Tuen Mun Station. Service was delayed for 8 minutes.	Train-borne signalling equipment fault	The train operator reset the computers on the train in accordance with procedures.
2.	10/7/04	10:35 am	Due to signalling failure, a train from Kam Sheung Road Station to Tsuen Wan West Station was delayed for 5 minutes. The incident was cleared at 10:37 am.	Train-borne signalling equipment fault	The train operator reset the computers on the train in accordance with procedures.
3.	23/7/04	06:38 am	Due to signalling failure at Nam Cheong Station, a Yuen Long bound train was delayed for 7 minutes.	Train-borne signalling equipment fault	The train operator reset the computers on the train in accordance with procedures.
4.	23/7/04	5:56 pm	Some of the platform screen doors at platform no. 2 of Tuen Mun Station were out of order. Service was delayed for 2-3 minutes.	Tripping of platform screen door miniature control breakers	Reset miniature control breakers concerned to resume the doors to normal working.
5.	27/7/04	4.36 pm	Train lost communication with the central computer. The incident was cleared after 8 minutes. There was an extended journey time of 5 minutes.	Intermittent fault on the train borne computer.	The train operator reset the computers on the train in accordance with procedures.
6.	4/8/04	10:03 pm	A fault was found on a Mei Foo bound train when approaching Tsuen Wan West Station. Passengers were required to change the next train. Train service was delayed for 8 minutes. Service resumed at 10:16 pm.	Train-borne rolling stock equipment fault.	Replaced the faulty equipment in depot.
7.	16/8/04	4:44 pm	Due to axle counter box failure near Tin Shiu Wai Station (Tuen Mun bound), train service at Tin Shui Wai Station was affected for 5 minutes. The incident was cleared at 4:48 pm.	Axle counter head was inspected by Signalling staff in non traffic hours.	No fault was found. Monitoring was undertaken.
8.	20/08/04	3.22 p.m.	Signalling failure between Siu Hong and Tuen Mun. The incident duration was 8 hrs. 58 minutes. The journey time between Siu Hong and Tuen Mun was extended by 3-6 minutes. The service headway between Nam Cheong and Siu Hong was extended 0.5 min during pm peak and was resumed normal there afterwards until until end of the incident. The service headway between Siu Hong and Tuen Mun was extended by 3.5 mins and Tuen Mun during pm peak and there afterwards 1-2 mins until end of the incident.	The incident was the result of a communication problem at one of the signal inductive loops (環 形 天 線).	The concerned component has been replaced. A system check programme has commenced and is scheduled for completion by the end of November 2004.
9.	22/08/04	4.23 pm	Signalling failure between Siu Hong and Tuen Mun. The incident was cleared at 7:35 pm and through service resumed. The journey time between Siu Hong and Tuen Mun was extended for 2-4 minutes. Normal headway between Nam Cheong and Siu Hong was maintained throughout the incident. The service headway between Siu Hong and Tuen Mun was extended by 1.5 – 2.5 minutes.	The incident was the result of a communication problem at one of the signal inductive loops (環 形 天 線).	The concerned component has been replaced. A system check programme has commenced and is scheduled for completion by the end of November 2004.

	Date	Incident Time	Incident description	Cause of Incident/Findings of investigation	Remedial action taken
10.	24/8/04	6:15 am	Due to signalling failure from Siu Hong to Tuen Mun, 3 trains were delayed for 5 minutes. One platform at Tuen Mun Station was closed. The incident was cleared at 6:35 am.	Poor cable joint for signalling loop.	Re-fixed the cable joint and checked the rest during non-traffic hours.
11.	25/8/04	8.38 pm	Train brake failure and detrainment inside Tai Lam Tunnel. The incident was cleared 10:45pm. Train service maintained throughout the incident by introducing bi-directional working along the northbound track between Tsuen Wan and Mei Foo. The service headway was extended by 5-10 mins.	The incident was caused by a brake loop cable short-circuited to earth, resulting in the application of emergency brake and the failure of releasing the brake for the train to resume normal operations.	A fleet check was carried out. Insulation tests were also carried out to ensure the insulation integrity of the critical wires and to improve the protection of the wires. The works were completed by mid September 2004.
12.	04/09/04	7.25 am	Station control system failure at Tin Shui Wai and Tuen Mun. The incident was cleared after 27 mins. The journey time was extended for 3 to 10 minutes. Service headway between Nam Cheong and Tin Shui Wai was extended by 0.5 –1.5 minutes and 6.5 mins between the section of Tin Shui Wai and Tuen Mun	The incident was a result of poor earthing.	A system-wide check on all earthing connections to signalling equipment has been conducted.
13.	08/09/04	11.07 am	Axle Counter (車 輪 計 軸 器) problem inside Tai Lam Tunnel. The incident was cleared at 1:23pm. The journey time was extended by 10 – 15 minutes. The service headway was extended by 4 mins.	A controller card inside an Axle Counter trackside equipment failed.	The defective controller card was replaced.
14	21/9/04	7:42 pm	Due to signaling problem at Yuen Long Station, northbound service between Kam Sheung Road and Yuen Long were delayed for 5 mins. Service resumed at 7:47 pm.	Faulty electronic card at trackside signalling equipment was found.	The faulty card was replaced.
15.	04/10/04	7.22 pm	Point Failure at Tuen Mun Station. The incident was cleared after 23 minutes. The journey time extended by 3 to 15 minutes. The service headway was extended by 3-4 mins.	The point failure was caused by hardware fault.	The faulty component in the point system was replaced.
16.	5/10/04	9:10 am	Due to signaling failure, the journey time from Kam Sheung Road to Tsuen Wan West Station was extended by 3 to 5 mins. The incident was cleared at 9:15 am.	Intermittent fault on Axle Counter Head.	Remote reset of the equipment from control room to resume the equipment to normal working.
17.	16/10/04	7:42 am	Due to a train failure, a Tuen Mun bound train had to detrain passengers at Tsuen Wan West Station. 6 trains were affected with service delay for about 3-4 minutes. The incident was cleared at 7:48 am.	Train-borne signalling equipment fault.	Investigation is still underway.
18.	16/10/04	5:39 pm	One Emergency Escape Door detection device fault was found at Kam Sheung Road platform 1. 2 Tuen Mun bound trains were affected with an additional journey time from 6 – 7 mins.	Door concerned was isolated temporarily.	Re-fixed the detection device in non-traffic hours.

Light Rail

	Date	Incident Time	Incident description	Cause of Incident/Findings of investigation	Remedial action taken
1.	01/07/04	7:08 pm	A light rail vehicle hit a bicycle at a road junction. The incident duration was cleared after 8 minutes. The journey time was extended by 8 minutes.	The incident was caused by careless driving of the cyclist.	An annual road safety campaign was launched in July. A new API will be produced and broadcast.
2.	07/07/04	6:00 pm	Overhead line entangled with an object at Kin Sang Stop The incident duration was cleared after 9 minutes. The journey time was extended by 9 minutes.	A piece of cloth got entangled with the contact wire of overhead line equipment. A Light Rail vehicle could not pass through.	The piece of cloth was removed promptly.
3.	13/7/04	7:13 am	A fire occurred at the shopping centre near Siu Hong Station. Route 614P trains could not call at the stop and was diverted.	External cause	N.A.
4.	23/07/04	11:13 am	A light rail vehicle collided with a light goods vehicle (LGV) at a junction. The incident was cleared after 8 minutes. The journey time was extended by 13 minutes.	The incident was caused by careless driving of the LGV driver who ignored the red traffic light.	An annual road safety campaign was launched in July. A new API will be produced and broadcast.
5.	26/7/04	10:44 am	A traffic accident between a light rail vehicle on route 706 and a bicycle occurred at the junction of Tin Shing Road/Tin Pak Road. Service at Tin Wu Stop (Tuen Mun bound) was affected. The incident was cleared at 10:52 am.	The cyclist did not observe traffic light.	An annual road safety campaign is organised to promote safety awareness. A new API will be produced and broadcast.
6.	28/07/04	10:41 am	A Light Rail vehicle could not move forward movement at Tin Wing. The incident duration was 12 minutes. The journey time was extended by 15 minutes.	The incident was caused by bad contact of the power supply control relays.	The relays were replaced immediately. A fleet check was conducted and completed by the end of August 2004.
7.	21/8/04	4:56 pm	Due to breakdown of a Siu Hong bound light rail vehicle, train service between Siu Hong Stop and Tuen Mun Ferry Pier Stop was delayed for 5-10 mins. Service resumed at 5:28 pm.	The train-borne power supply cable was damaged.	The damaged cable was replaced and a fleet check has been carried out.
8.	10/09/04	6.37 am	A Light Rail vehicle derailed in Tin Shui Wai. The incident duration was cleared 2 hours later. Routes 706, 751 and 761 were affected. Service calling at northbound platform of Chung Fu and Tin Fu was affected.	A wheel tyre was broken when crossing a junction, resulting in derailment of the second bogie (轉向架) of the coupled Light Rail vehicle. Non-conformance with to the production standard was found on the broken wheel tyre and admitted by the manufacturer.	A fleet check was carried out. Additional ultrasonic flaw inspection and hammering tests will be conducted.
9.	14/9/04	6:31 pm	Due to point failure near San Wai Stop, light rail vehicles on routes 505, 507, 610, 615 and 615P were delayed for 5 to 7 minutes. Passengers were informed of the delay by platform announcements. Service resumed at 6:38 pm.	The point failure was caused by a loss of power supply to the point controller.	The power supply fuse was reset.
10.	20/9/04	10:50 am	Due to traffic congestion at Castle Peak Road (Yuen Long Section), a fire engine occupied platform no.1 of Tai Tong Road Stop. Service delay for 6 - 7 mins was resulted.	External cause	N.A.
11.	2/10/04	7:09 am	A route 507 light rail vehicle heading for Tin King broke down at Goodview Garden. Services	Train-borne power supply breaker	The breaker was replaced.

			were delayed for 5 to 6 mins.	tripped.	
12.	6/10/04	5:35 am	A Tuen Mun bound light rail vehicle broke down at Hung Shui Kiu Stop. Service was delayed for 7 – 8 mins. The incident was cleared at 5:40 am.	Air-leakage was found in the air bag of the train's suspension system.	The air bag was replaced.
13.	16/10/04	9:15 am	A traffic accident between light rail vehicle on route 610 and a bicycle occurred at the junction between Castle Peak Road and Kuk Ting Street. The service of the incident train was affected for 5 mins. Service resumed at 9:20 am.	The incident was caused by careless driving of the cyclist.	An annual road safety campaign is organised to promote safety awareness. A new API will be produced and broadcast.
14.	18/10/04	7:45 am	Due to a point failure, one of the Tuen Mun Ferry Pier bound platforms at Yuen Long terminus was closed. 2 departures on routes 614 and 615 were delayed for 5 minutes. The incident was cleared at 8:09 am.	The point failure was caused by external obstacle.	The obstacle was removed.