

## Legislative Council Panel on Transport

### Review of MTR Service

#### **Purpose**

In response to the questions raised by members at the special Panel meeting on 10 September 2002 and the supplementary questions from The Hon Andrew Cheng Kar-foo, this paper provides feedback for members' information.

#### **Testing and commissioning of MTR trains**

2. To prepare for the expanded MTR network, 13 new trains were ordered from a Japanese-Korean Consortium. After manufacture in May 2001, the first train was comprehensively tested at the supplier's works and test track in Korea. A full range of proving tests and a 10,000-km test run (simulating one-month service operation in Hong Kong) were done. The first new train was delivered to Siu Ho Wan Depot in October 2001 and was tested to ensure that it satisfied the specified safety and performance requirements. Before entering service, the train underwent a six-month testing and trial running at Kowloon Bay Depot and on Kwun Tong Line without passenger to prove compatibility with the existing railway systems, operational performance and reliability. Key operational and safety features of the trains such as train door operation, door obstruction detection, emergency push-out detrainment, braking, etc. were conducted and witnessed by the Government's Hong Kong Railway Inspectorate. The subsequent 12 trains were similarly tested and commissioned against a sub-set of the tests applied to the first train. It is accepted internationally that with modern complex train control systems a period of fine-tuning is required in service in order to cover the full range of the dynamic characteristics of the train and trackside systems.

3. Before any new line enters passenger service, all systems on the new line including train control, signalling and power supply will be tested and commissioned individually. This will then be followed by a period of trial running to test their compatibility. Trial running of the Modified Initial System (Kwun Tong to Central) took 8 weeks, trial runnings of Tsuen Wan Extension, Island Line phases I and II took 2 weeks, 2.5 weeks and 1.5 weeks respectively. Airport Railway and Tseung Kwan O Line had a longer trial running period of 8 weeks and 6 to 8 weeks respectively. (**Annex I**)

## **Maintenance, assets replacement and train modernisation**

4. The MTR Corporation Limited (MTRCL) puts considerable resources into maintaining all its assets including equipment, systems, structure, tracks and trains to maintain the safety and reliability of service. It also carries out rigorous inspections to ensure quality and safety. A very high priority is put on a high standard of maintenance to keep Hong Kong's MTR system as one of the best performing railway systems in the world. Studies within the group of leading Metro companies have demonstrated that MTRCL has established best practice for whole life asset management. In contrast to the average Metro, MTRCL makes regular financial provision for asset renewal, modification and updating. MTRCL pursues best in class maintenance and risk practice.

5. MTRCL uses three principal philosophies of maintenance:

- Preventive Maintenance – regular procedures established to prevent deterioration or breakdown;
- Condition Based Maintenance – monitoring performance and maintaining the equipment. The intent is that components are changed before they fail; and
- Reliability Centred Maintenance – managing maintenance frequency and content with the objective of avoiding failures, to achieve high levels of reliability and availability for service.

6. Life cycle analysis is used to plan maintenance and assets renewal requirements. There is a plan for every asset which specifies the maintenance process that it will undergo. The maintenance process is programmed, scheduled, documented and recorded. A Management Information System is in place to keep track of all activities, and the analysis of trends focuses attention on any residual maintenance issues. Different components are replaced and renewed according to the condition, maintenance and replacement programme. External experts are engaged to review our asset management practice regularly. They have confirmed that our practice is robust.

7. A comprehensive Quality Management System (QMS) certified to ISO 9001:2000 is used with a three level documented scheme of control. This QMS is the foundation for further improvements in maintenance management on an ongoing basis.

8. The preventive maintenance of trains is carried out according to an established and structured programme at depots and in the main workshops respectively. On a daily basis, train operators conduct a train preparation test before the trains enter into service to ensure all systems and equipment are in good condition and working order. In the depot, the routine maintenance, largely on the safety inspection of structure and car body, and condition of wearing parts, is structured as follows:

- at 7,400 km (about 23 days) intervals visual inspection to check the integrity of body structure and underframe, the condition of consumable parts and lubricants, plus a functional test of the doors, auxiliary power supply, air conditioning, passenger information system, traction system control and the emergency brake; and
- at 14,500 km (about 45 days) intervals a more thorough form of the above including a detailed cleaning, check and adjustment of equipment, plus checking of the roof area.

9. Each train is scheduled to return to the main workshop for an overhaul every 3.25 years, in which components of an assembly or equipment in a train system will be inspected, replaced or renewed to maintain the original function of the equipment and integrity of the system.

10. The MTR Train Modernisation Programme, which started in August 1998 to refurbish MTR trains with new and improved facilities, was completed in September 2001. The programme was one of the initiatives in fulfilling the commitment to making continuous improvements in MTR train service and travelling environment.

11. All the 95 trains (with 8 cars per train) serving Kwun Tong Line, Tsuen Wan Line and Island Line were refurbished with improved air conditioning and ventilation, brighter lighting, dipped seats, multi-purpose space for wheelchairs and baggage, new grab handles, and rewiring of driver cab and saloon, etc. Train Information System was enhanced to monitor on board systems and provide more real time advice to the Train Operator when dealing with incidents and failures. Details are listed in **Annex II**.

12. Currently, there are more than 900 maintenance staff employed in MTR depots and workshops for routine train maintenance and train overhauls. Among them about 240 staff are employed for train maintenance at the depots located at Siu Ho Wan, Tsuen Wan, Kowloon Bay and Chai Wan. While maintenance at Tseung Kwan O Depot is carried out by the contractor who modernised the trains, total man-hour per train spent on train maintenance is

similar to other depots. More man-hours per train is spent at Kowloon Bay Depot and Siu Ho Wan Depot due to the new Korean trains running on Kwun Tong Line and more effort required with the higher mileage of the Airport Railway. Since the staff cost is lower, the maintenance cost of Tseung Kwan O Depot is therefore lower than the other depots. (**Annex III**)

## **Outsourcing**

13. Outsourcing is beneficial when the contractor has specialised expertise, and when performing the same and similar processes for multiple customers. Synergy, cost saving, efficiency enhancement and a reduction in overheads can be achieved through outsourcing the work.

14. Outsourcing is not limited to train maintenance. From the very beginning of MTR operations, maintenance work has been outsourced to experienced contractors. Examples include maintenance of escalators, station lifts, concrete repairs, structure repainting, depot plant equipment, the signalling control panels, trackside cable replacement, station CCTV, signalling software, etc. There have been no redundancies as a result of outsourcing maintenance activities.

15. The outsourcing and tendering process of maintenance follows the high internal standards to ensure no compromise to quality compared to MTR in-house work. Firstly, contractors must satisfy the requirement of pre-qualification which proves their technical competency and financial adequacy. Technical analysis will then be used to review and assess the submission of tenderers. In addition, cost and benefit analysis, and the risk analysis will be carried out to ensure the competency of contractors.

16. Whether the maintenance is carried out by MTR staff or contractors, the requirements and standards are the same. Monitoring and supervision on the quality of work is carried out by MTR staff. Training for contractors is also delivered and completed before the commencement of contract. Comprehensive training on safety, railway qualification and required skills is provided to contractors, they are then assessed and certified to ensure they have the adequate skills and techniques in maintaining MTR trains and systems.

17. The following procedures and system are implemented to ensure high performance of contractors through supervision, inspection, review and monitoring:

- Work instructions
- Job specification
- Regular Train Performance Review Meeting
- MTR Management Information System
- Site inspection
- Control compliance audit
- Process audit
- Equipment condition survey
- Demerit Point System
- Payment retention / reduction

### **Issuing of Red Alerts**

18. MTRCL had issued 18 Red Alerts from January 2000 to September 2002. The Red Alerts were issued for various reasons. They also include those issued because of passenger suicide and action of the Hong Kong Police Force. The guideline and details of the Red Alert record are listed in **Annex IV**.

### **Depot-bound trains carrying passengers**

19. Our records show that there have been a total of 3 incidents, where depot-bound trains were carrying passengers, including the one that took place on 3 September 2002 (**Annex V**). It is recognised that passengers were inconvenienced by the above events with minimal delays on train service. However, under all these circumstances, the movement of trains was fully protected at all times by the signalling system, and passenger safety was not at risk.

### **Conclusion**

20. Priority is always given to safety and the recovery of the train service in the shortest period of time. During any train interruption, train service information will be provided to passengers on board and at stations at the earliest time. Information will also be despatched via electronic media.

21. The Corporation believes that the quality of the whole railway system is the result of a myriad of improvements. Continuous improvement is vital to keep our assets in good condition. Train maintenance is implemented regularly with high standard by both MTR staff and contractors.

MTR Corporation Limited  
September 2002

**Trial Running of MTR lines**

<b>MTR Line</b>	<b>Trial Running</b>	<b>Duration</b>
Modified Initial System	August to September 1979	8 Weeks
Tsuen Wan Line Extension	April to May 1982	2 weeks
Island Line Phase I	May 1985	2.5 weeks
Island Line Phase II	May 1986	1.5 weeks
Airport Railway	May to June 1998	8 weeks
Tseung Kwan O Line	June to August 2002	6 to 8 weeks

**Train Modernisation  
Scope of Changes**

**Saloon:**

- Enhanced saloon air conditioning/ventilation
- Wheel chair spaces with related grab pole arrangement
- Replacement of obsolescent lighting with brighter low energy consumption design
- New ceiling (panels, lighting and coving)
- Dished stainless steel seats to prevent sliding
- New non-slip flooring and sub-floors
- New panelling for walls and gangways
- New grabpole arrangement - Coloured & repositioned to improve passenger flow
- Passenger Information System - "Flashing System Map" and "Electronic Information Display System"
- Rewiring of saloon

**Driving Cab:**

- Emergency door and improved detrainment ramp – easier to use and quicker to deploy
- In-cab CCTV - allowing platform monitoring from within the driving cab
- New cab interior and driver's console to enhance safety and provide an improved working environment in terms of operability and human factors
- Enhanced Train Information System to monitor on board systems and provide more real time advice to Train Operator when dealing with incidents and failures
- Improved cab air conditioning/ventilation
- New cab front design to provide modern shape and new livery
- Rewiring of driving cab



**Train Maintenance at Depot Level**

<b>Depot</b>	<b>No. of trains</b>	<b>No. of maintenance staff</b>	<b>Man-hour/train/year</b>	<b>Maintenance cost/train/year (HK\$)</b>
Tsuen Wan Depot (TWL)	34	64	3,900	0.7 million
Chai Wan Depot (ISL)	28	53	3,900	0.7 million
Kowloon Bay Depot (KTL)	31	62	4,100 (note 1)	0.7 million
Tseung Kwan O Depot (TKL)	15	22 (note 2)	3,900	0.64 million
Siu Ho Wan Depot (AR)	23	61	5,500	1.1 million (note 3)

## Notes:

1. The new Korean trains maintained at Kowloon Bay Depot initially receive more maintenance attention, thus the higher man-hour per train.
2. Contractor staff based at Tseung Kwan O Depot are working on a 54 hours per week duty which is higher than the MTR's 42 hours per week duty.
3. The Tung Chung Line and Airport Express trains maintained at Siu Ho Wan Depot are running at a higher mileage per year, thus requiring higher maintenance cost.

## Abbreviation:

TWL = Tsuen Wan Line  
ISL = Island Line  
KTL = Kwun Tong Line  
TKL = Tseung Kwan O Line  
AR = Airport Express + Tung Chung Line

**Red Alert**

In accordance with the circular issued by the Transport Department on “Emergency Transport Arrangements”, a “Red Alert” is issued as a signal to indicate that a serious disruption has continued or is expected to continue for over 20 minutes, and emergency transport support services from other operators are required. Upon being alerted, the recipient should urgently mobilise their resources to provide appropriate supporting services as quickly as possible.

**Red Alert Record in Year 2000**

<b>Date</b>	<b>Declared Time</b>	<b>Step Down Time</b>	<b>Cause of Issuing Red Alert</b>
7 Jan 2000	2156	2254	Fire in Quarry Bay Congestion Relief Works work-site.
19 Mar 2000	1617	1720	Person run under train at Choi Hung Station Down Track.
18 Jul 2000	1932	2315	Overhead line equipment defect at Chai Wan Station Down Track.
6 Sep 2000	0846	0916	Immobile Train between Quarry Bay and Tai Koo Up Track.
22 Nov 2000	1546	1632	Train service suspension due to Bomb Hoax at Quarry Bay Station Down Platform.

**Red Alert Record in Year 2001**

<b>Date</b>	<b>Declared Time</b>	<b>Step Down Time</b>	<b>Cause of Issuing Red Alert</b>
22 Jun 2001	2318	2353	Traction current tripping from Central to Admiralty Up Track.
25 Jun 2001	1701	2100	Power supply failure at Yam O.
21 Jul 2001	2029	2055	Immobile Train at Mei Foo.
2 Sep 2001	0637	0752	Power supply failure at Lam Tin.
6 Nov 2001	0548	0825	Tunnel Fibre short circuit with overhead line equipment at Tsing Yi Ventilation Building Airport Express Up Track.
10 Dec 2001	1817	1900	Police action at Prince Edward.

**Red Alert Record in Year 2002**

<b>Date</b>	<b>Declared Time</b>	<b>Step Down Time</b>	<b>Cause of Issuing Red Alert</b>
5 Apr 2002	1439	1505	Police action at Fortress Hill Station.
5 Apr 2002	2210	2253	Police action at Tin Hau Station.
8 Apr 2002	1710	1819	Signalling failure between Lam Tin and North Point stations.
24 Jun 2002	1308	1321	Signalling failure at Tsing Yi.
15 Aug 2002	1805	1821	Train defect at Prince Edward Station Down Platform.
5 Sep 2002	0854	0924	Train defect at North Point Station Down Platform.
23 Sep 2002	1556	1558	Train defect at Tai Wo Hau Station Up Platform.

**Depot-bound Trains Carrying Passengers**

<b>Year / Location</b>	<b>Summary and Cause of Incident</b>	<b>Remedial Measures</b>
28 September 1998	A Control Room staff member who, after a service disruption in the evening peak, prematurely used a newly installed automatic timetable reformation system to amend all the train numbers of the trains on the line, to align them with the timetable. This should have been done only after all the extra peak hour trains had returned to the depot. The Control Room staff operated the automatic timetable reformation while one peak hour extra train was still on its way to depot. This resulted in the wrong train being routed to the depot.	The Control Room staff was advised to double check that all peak hour extra trains have returned to the depot before activating the automatic timetable reformation system.
20 November 2001	There was a failure of the train description system which assigns a number to each and every train and is used by the signalling system to route the trains along the line. Whilst manually re-entering the train description numbers, the Control Room staff input the wrong number of a passenger train, thereby routing it to the depot.	A checking procedure was introduced and Control Room staff was required to list out the trains in advance prior to entering them back into the system.
3 September 2002	A Control Room staff omitted to add an additional train which he had previously operated to his list. As a result, the sequence of trains was not in accordance with his list and hence the train operator of this depot-bound train was not advised that his train was heading for depot. He therefore picked up passengers as normal.	A new operating procedure has been put in place to prevent future occurrence of this kind of incidents. The new procedures require Central Control Room to double confirm with the train drivers of depot-bound trains at the last station before the Depot Inlet.