

**Legislative Council Panel on Transport
Subcommittee on Matters Relating to Railways**

New Trains for MTRCL

Purpose

This paper aims to introduce the procurement and testing procedures for the commissioning of new trains by the MTR Corporation Limited (MTRCL), and the new features of the ten trains most recently purchased by the Corporation.

Procurement of new trains

2. With the aim to ensuring adequate resources to meet existing and future needs for train service, MTRCL placed an order in 2008 to purchase ten new trains to strengthen its existing train fleet operating on the Kwun Tong Line, Tsuen Wan Line, Island Line and Tseung Kwan O Line. The first of the ten trains arrived in Hong Kong in April 2011. By the end of 2011, a total of seven trains have been delivered. The remaining three trains are expected to arrive within 2012.

3. To ensure new trains purchased meet its stringent requirements for performance and safety, MTRCL has a well established regime for selecting train suppliers with procurement conducted internationally in the form of open tender. In fact, the foremost consideration in new train procurement is the supplier's capability to comply with MTRCL's technical requirements, including internationally recognised safety standards and whether its products are suitable to operate in the MTR system.




4. Based on this stringent selection process, MTRCL awarded tender to the current supplier of the new trains in 2008. Compared to other suppliers, the selected new train supplier can fully satisfy relevant technical requirements of MTRCL, while also is competitive in terms of price.




5. In the procurement of different systems for the new trains, the new train supplier followed MTRCL's technical requirements, and worldwide sourcing was conducted. In fact, many systems and facilities of the new trains come from reputable suppliers in different countries such as France (for the trainborne signalling system), Germany (for the braking system) and Japan (for the traction system). These suppliers also provide systems and facilities for MTRCL's existing trains.

New features of the new trains



6. The new trains have been designed according to internationally recognised safety standards and MTRCL's usual stringent requirements for performance and safety. All component systems of the new trains and their integration in operation are carefully designed to synchronise with the robust and fail-safe operation of the MTR system.

7. To enhance the travelling experience for passengers, the following new features have been introduced:

Feature	Description	Photo
Grab poles	The curved design of grab poles at the end of seats gives train compartment a more spacious feel.	
Passenger seating	Cantilever type of support is used to provide free space underneath seats for passengers to put bags and bulky items.	
Improved lighting	The lighting design has been improved to provide more evenly distributed illumination and add to the feeling of spaciousness.	

<p>Enhanced air-conditioning</p>	<p>Improved ventilation design allows for more even circulation of air.</p>	
<p>Noise reduction features</p>	<p>The floor is designed to reduce noise from the machinery underneath. Rubber seals are also installed all around door frames to reduce outside noise from drifting into train compartments. Quieter condenser fans and improved air ducts also contribute to a more comfortable in-train environment.</p>	
<p>On board passenger information and entertainment</p>	<p>Four LCD monitors are installed in each train compartment to provide passengers with service information and audio-visual infotainment. Quiet cars are provided for passengers who do not wish to listen to the information provided.</p>	

8. The new trains have the following enhanced security and safety features:

Feature	Description	Photo
CCTV cameras	Four CCTV cameras are installed in each train compartment, enabling train captains to see the situation in specific train compartments when responding to passenger requests for assistance.	
Smoke sensors	Smoke sensors have been equipped in the air conditioning system and will trigger alarm to alert train captains in case smoke is detected.	

Preparation for the commissioning of new trains

9. In accordance with MTRCL's established procedures, all new trains will only be put into passenger service after they have passed all the required safety and performance tests and received approval from the Electrical and Mechanical Services Department (EMSD).

10. Testing of new trains is conducted according to MTRCL's established procedures, which comply with the internationally recognised European Standard IEC61133, as well as MTRCL's own additional requirements developed through years of railway operation experience. Stringent management processes have been followed, incorporating necessary checking and testing at overseas factories as well as verification and validation conducted in Hong Kong. Complemented with independent audit conducted by consultant firms from Germany and the UK as well as MTRCL's internal assessments, the process can assure that the new trains delivered have attained high quality and safety standards.

11. The testing procedures begin from the supplier's on-site factory tests and inspections. MTRCL staff members are deployed to oversee the key production processes in the factories of overseas systems suppliers and manufacturer from Changchun. Suppliers are required to submit test results to MTRCL, and MTRCL will also attend and witness major tests. These include functional tests of different systems and components such as traction system, train doors, braking system, pantograph and trainborne signalling system. Taking train doors as an example, the prototype underwent a 1-million open-close cycle test to ensure its smooth and reliable operation. This ensures that the systems and components are of a satisfactory quality before they are used on the new trains. This is an essential step for quality and performance assurance of systems and components, in particular for items that are not easily visible at the next stage of production, before proceeding to subsequent production works.

12. MTRCL also maintains close control on the production processes of safety-critical systems such as the trainborne signalling system, conducting stringent regulation and monitoring during different stages of production. The trainborne signalling system of the current batch of new trains is provided by a supplier from France. MTRCL engineers are involved in examining the design documents provided by the supplier, meeting with the supplier's engineering staff for detailed discussions on system design to thoroughly understand the design principle and ensure the fail-safe elements of the design comply with international standards. MTRCL also appoints international experts as independent safety auditors to verify the trainborne signalling system's design and testing process to ensure they comply with international safety specifications.

13. Before shipment to Hong Kong, every new train is tested thoroughly according to the stringent and approved testing procedure to validate its compliance to performance standards. These include basic quality check, dimensional check, functional tests (e.g. tests on braking and traction systems, door operation, communication function, train control function, water leakage, etc.) and running tests to confirm that the trains are manufactured according to the design and relevant standards.

14. Upon arrival in Hong Kong, stringent testing is conducted in two major stages, namely static and dynamic tests. Static tests are carried out in the depot, where various components of the train are tested while the train is not in motion. Dynamic tests are conducted in the depot and then on the running line during non-operational hours to

validate the performance of the train and its integration with the existing infrastructure and railway systems. The aim of carrying out these tests is to identify and rectify irregularities, including the minor deviations detected in the computer software that caused the train to stop beyond the platform stopping mark during testing in November 2011.

15. In the final part of the testing process, a 400-km trouble-free reliability test is carried out during operational hours. To pass the test, the train must be able to run for 400 km continuously without any critical fault. If any fault, such as doors not closing properly, is detected during the test, the count is reset to zero, even if the train had already gone more than 300 km of smooth operation.

16. Apart from static and dynamic tests, MTRCL conducts a detailed inspection of the train facilities and equipment upon their arrival in Hong Kong. During the inspection of the first new train, MTRCL identified a few areas where improvements were made, including:

- shifting passenger seats forward to minimise the chance of tall passengers bumping their heads on the overhead hand rail;
- adding rubber sealing between moving panels in the gangway to reduce wind noise and prevent passengers from putting their fingers into the gap;
- sealing the gap behind the flashing route map equipment cabinet above the train doors with rubber strips to prevent passengers from misusing the cabinet cover as a handle;
- improving the design of the train captain's seat in the driving cab to make more room for better working environment; and
- changing the opening direction of the detrainment door in train cabs to make it simpler to operate.

17. The first of the ten new trains had been put through non-passenger carrying test runs during late night operational hours on the Kwun Tong Line in October and November 2011, with the aim to confirming proper functioning of all systems under automatic operations including the accurate stopping of trains at station platforms. The test runs were completed smoothly and after receiving the necessary approval from EMSD, the train began passenger service on 7 December 2011 on the Kwun Tong Line. Relevant testing for the second new train was also completed and put into passenger service since late December 2011 on the Kwun Tong Line.

18. As with any new equipment, teething problems are expected during the initial period of operation. For example, shortly after the train began passenger service, adjustments were made to the levelling of the train floor to ensure passenger comfort.

19. The MTR system is designed to be fail-safe. Built-in protections are in place in every system which will bring train operations to an automatic halt whenever any irregularity is detected to facilitate the required inspections. Train service will only resume after the systems and equipment are inspected and confirmed to be functioning normally. As a result, passengers may be inconvenienced by delays, but safety can be duly ensured.

20. Another five trains are in different stages of testing according to MTRCL's established procedures. They will be put into passenger service or used to support major overhaul and regular maintenance works of existing trains after the relevant tests have been completed.

Conclusion

21. The new trains are designed and built in accordance with internationally recognised standards and MTRCL's stringent requirements for performance and safety. The new trains are also equipped with a number of new features to enhance the travelling experience as well as security and safety for passengers.

22. MTRCL has a well established management system on railway safety covering the design, procurement, works implementation and production, testing and operation, etc. Inspections are not just carried out when trains are delivered by the supplier, but rather, different control measures are deployed in different stages of production to ensure compliance with stringent performance and safety requirements. MTRCL will ensure that the remaining new trains pass the comprehensive testing before they are put into passenger service, so that safe and reliable service can be provided to passengers.