# TRIAL RUNS CRITERIA FOR AUTOMATED METRO LINES

## DEFINITION AND RECOMMENDATIONS FROM THE UITP OBSERVATORY OF AUTOMATED METROS

## KNOWLEDGE BRIEF

### INTRODUCTION

*The Trial Run phase is becoming increasingly important during the start-up of a new line or its extension. Its successful completion is a key precondition for the start of passenger service.*

*During the Trial Run, the Operator provides evidence of being capable of operating and maintaining the system in an efficient and safe manner, according to the required specifications.*

*Compared to traditional non-automated lines, the Trial Run of an automated system assumes greater importance, due to both a higher techno-logical system complexity as a whole, and a critical organisation considering the smaller amount of staff on trains and stations. Furthermore, an enhanced level of knowledge and training for the staff is required.*

### GOALS OF THE TRIAL RUN PHASE

**The purpose of the Trial Run is to verify:**

- That the Operator staff knows all the practical aspects of their job, are capable of performing it effectively and that the Operation & Maintenance (O&M) organisation in place functions effectively as a whole;

- That the Operator is capable of operating and maintaining all assets of the system in a safe way, in order to obtain the license for the start of passenger operations;

- That the Operator is capable of operating the systems according to the required specifications in normal, fallback and emergency operation modes;

- That the system can be operated in accordance with its expected performance.



*Completion of the trial phase is a key precondition for the start of passenger service.*
*(photo: © VAG Verkehrs-Aktiengesellschaft Nürnberg – Claus Felix)*

## INPUT FOR THE TRIAL RUN

**Following are the general requirements for the start of the Trial Run period:**

- All relevant sub-system tests & interface tests are completed and documented;
- The Systems Integration responsible party has handed over a fully tested and functional system;
- All necessary systems for passenger service are available;
- An adequate O&M staffing level is in place and all Operator staff are fully trained, tested and certificated.

Before the start of the Trial Run, the Operator must take over the responsibility for the operation and maintenance of all systems and facilities. For this, the Authority must have given approval that the system is sufficient for trial running operation. At the start of the Trial Run the Operator's organisation should be fully formed, all necessary personnel (sufficient for short and medium term maintenance activities) should be employed and have received the necessary training in order to perform their jobs. Business processes should be sufficiently established to support the orderly management of the organisation and ensure that the organisation is stable and sustainable.

The Operator remains responsible for all activities concerning operation and maintenance of the system, including the operational safety. All major subsystems should be under direct control of the Operator. However supplier's assistance should be available for support during the Trial Run to fine-tune the systems in case of need and to augment the delivered documentation.

## GOVERNANCE

The governance of the Trial Run assumes a great importance, considering the numerous entities playing a role in both the Trial Run and the Operator Certificate processes (i.e. Authorities, Owners, Contractors, Operator, etc.).

Therefore, a specific dedicated Trial Run Team should be established – under the lead of the Operator – to plan and monitor the activities during the Trial Run period, while the Operator remains in charge of performing and coordinating all activities. The team should comprise personnel from the Operator, the Suppliers, the System Integrator/Engineer (if present).

A Trial Run Board, comprising Operator, Suppliers and Authorities, should assess the Trial Run progress and the outstanding actions towards the Operator Certificate (OC), in order to obtain the license. The final evaluation of the Trial Run should be responsibility of an independent Operator Certificate Board (e.g. Transport Authority) that will release the license at the end of the whole process.

*All Operator staff should be fully trained, tested and certificated before the start of the trial run phase*
*(photo: © Metro Company - Metroselskabet I/S)*

*During the Trial Run period, the Operator should run normal service simulating passenger service according to the schedule (photo: © Azienda Trasporti Milanesi)*

## ACTIONS

The focus of the Trial Run is on staff familiarisation with the new assets being brought into passenger service. Specifically, the following actions must be carried out:

### A. Simulation of Normal Operation

During the Trial Run period, the Operator should run normal service simulating passenger service according to the schedule, except for the periods where specific demonstrations requiring other train services are planned. Service availability should be measured during the period to quantitatively measure both the ability of the Operator to run the service and the availability and reliability of all systems.

### B. Simulation of Degraded Operation

A part of the Trial run period should be used to demonstrate the ability of the Operator to manage full scale operations, including the possible need for Fallback Operations after start of Revenue Operation and covering all fallback possible modes of operation.

A part of the Trial Run period should be used to demonstrate the ability to manage emergencies. Some of the demonstrations should be performed in conjunction with the Emergency Services and include passenger actors. This will include verification of related procedures, associated training and deployment of special equipment.

## FINAL RECOMMENDATIONS

A complete set of Key Performance Indicators (including Service Availability) should be established, in order to track the performance of the system, the overall safety, and the maturity evolution of all subsystems.

Daily reports should be produced to provide evidence of the familiarisation of the staff with the system and the fulfillment of the emergencies simulation. The reports should contain the main KPI (e.g. Service Availability), in order to show the Trial Run progress to the Trial Run Board. All safety related incidents, together with any deviation from the safety-related procedures, must be reported in the daily reports.

A final Trial Run report should be prepared by the Trial Run team for the Trial Run Board assessment, before formal submission to the Operator Certificate Board.

Depending on the contractual arrangements, the Trial Run period should last until a particular agreed contractual service availability has been delivered or certain reliability is achieved during a continuous period and the Operators Certificate/License is given to the Operator for passenger service commencement.

**According to the experience of the members of the UITP Observatory of Automated Metros, it is recommended that the Trial Run of an automated system lasts as follows:**

- **not less than 3 months in case of new lines;**

- **between 1 and 3 months in case of line extensions (depending on the size of the extension, the number of new staff and the operating complexity).**

## OBSERVATORY OF AUTOMATED METROS

Fully automated metros can be operated without staff on board of the trains. This type of operation is also known as Unattended Train Operation (UTO), or Grade of Automation 4, as considered in standard IEC 62267.

In 2015, there are 732 km of UTO lines operating in public transport service in the world, spread over 52 lines in 25 cities (see map).
For 2025, this number is set to increase to over 2,200 km of automated metro lines.

This Knowledge Brief is based on an official report of the Observatory of Automated Metros coordinated by Carlo Bianco, Direttore di Esercizio Metropolitane automatiche, ATM Servizi S.p.A.

The UITP Observatory of Automated metros gathers the world's leading operators with experience in UTO. It exchanges best practices in key issues affecting automated metro operation and monitors the global evolution and trends in line automation development and implementation.
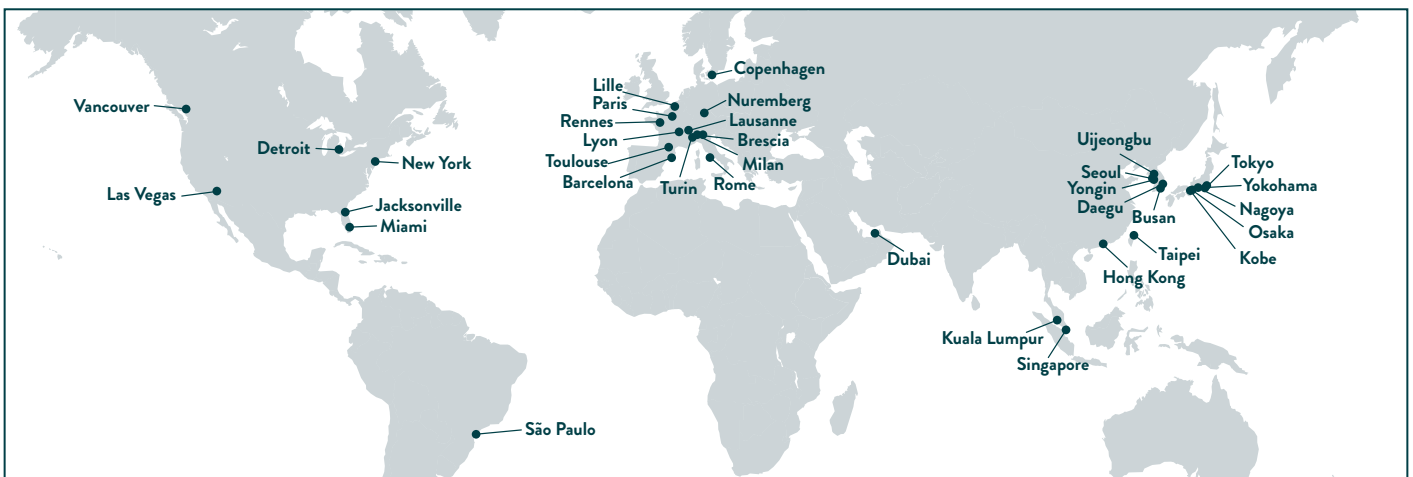


*Automated (GoA4) metro systems in the world, October 2015*

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