

**Date:** 8 July 2016

**Item:** **Four Lines Modernisation – Automatic Train Control  
Status Update**

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## **This paper will be considered in public**

### **1 Summary**

- 1.1 This paper provides the Committee with an update on the Automatic Train Control (ATC) work of the Four Lines Modernisation (4LM) programme.
- 1.2 Good progress is being made with both the London Underground (LU) enabling works and the Thales signalling works, with the former continuing to be delivered ahead of the Thales need-by dates.
- 1.3 The programme is forecast to complete below the existing Project Authority and ahead of the target dates.

### **2 Recommendation**

- 2.1 **The Committee is asked to note the paper.**

### **3 Background**

- 3.1 On 1 July 2015, the Board approved a revised Project Authority for the Four Lines Modernisation programme. As part of this approval it was agreed that the Committee would receive regular progress updates. This report provides the Committee with an update on the ATC work of the programme. Progress across the whole programme is covered in the Quarterly Investment Programme Report.
- 3.2 The District, Circle, Metropolitan and Hammersmith & City lines together make up nearly 40 per cent of the LU network and include the oldest part of the network built in 1863. As well as circling central London, the lines serve suburbs in the west, north west and east of the capital and carry around 1.3 million passengers a day. Following completion of this work, up to 32 trains per hour (tph) will operate on the core sections of these lines and peak passenger capacity will be increased by an average of 33 per cent.
- 3.3 The programme is scoped to deliver work in two significant tranches which, in combination, will achieve the necessary modernisation of the four lines, as follows:
  - (a) introduction of new trains and substantial associated enabling works; and
  - (b) replacement of existing signalling with a modern ATC system, supported by associated enabling works, to deliver faster, more frequent and more reliable services.

- 3.4 Revised Project Authority was approved by the Board on 1 July 2015 in two separate elements.
- 3.5 The programme is planning to deliver journey time benefits through a series of timetable service uplifts. The planned dates are shown below; however the programme is endeavouring to better these so that benefit delivery can be advanced accordingly.

Timetable step	Main change(s)	Planned Timetable Date
1	Runtime improvements on central area sections	May 2021
2	30tph in central area and 24tph on Metropolitan trunk for 90 minute peaks	December 2021
3	32tph in central area and 26tph on Metropolitan trunk for 90 minute peaks	May 2022
4	32tph in central area and 26tph on Metropolitan trunk for three hour peaks	December 2022
5	32tph in central area and 28tph on Metropolitan trunk for three hour peaks	May 2023
6	Off peak enhancements	December 2023

- 3.6 The signalling system will be commissioned sequentially across 14 migration areas, as shown in Appendix 1. Migration areas MA10 and MA11 will be delivered in a single commissioning. In order to implement the timetable changes associated with the service uplifts referenced in paragraph 3.5, a number of adjacent migration areas need to be commissioned and an appropriate reliability proving period completed.

## 4 ATC Key Achievements in the quarter

- 4.1 Good progress is being made towards delivery of the signalling systems, with Thales letting the subcontract for the wayside installation on the first migration area (MA01) and installation surveys have commenced.
- 4.2 Testing continues on the prototype (V1) ATC fitted S Stock train at the Melton test track. The test results are being used to finalise the design of the ATC installation on the train and the wayside ATC systems. The detailed design of the pre-production (V2) ATC train fitment is being reviewed, with testing due to begin in summer 2016.
- 4.3 The LU enabling works continue to be delivered ahead of the Thales signalling need by dates. A total of 22km of Cable Route Management Systems has now been delivered and the first two signal equipment rooms handed over to Thales for their equipment installation.
- 4.4 The installation of the new cross-over at Paddington has been completed on time, as part of the 4LM End State Track Layout works. Seven of the 21 4LM sites

requiring ESTL work have now been completed.

## **5 ATC Programme Status**

- 5.1 Prior to Project Authority being granted, the programme undertook a Quantified Schedule Risk Analysis on the integrated programme based on Thales bid programme. This analysis identified a range of dates for each key milestone, with varying levels of confidence of achieving each of these. Thus the earliest possible date for each milestone has a theoretical zero per cent probability (P0) of being achieved, with other values being calculated at P50 and P90 levels. The programme is authorised against the P90 dates, but LU is driving to achieve the P0 dates.
- 5.2 The P0 programme is 18 months earlier than the P90 contracted programme, and achievement of this would realise considerable benefit in terms of cost saving and early revenue. The P0 Programme assumes that no risk will be incurred.
- 5.3 As expected some identified risks have occurred causing between 9 and 12 weeks movement from P0 for signalling design, Automatic Train Control fit out and End State Track Layout. For each of the problem areas, robust mitigation plans are being worked for recovery back to the P0 programme.
- 5.4 Signalling design mobilisation has been slower than required, leading to the commissioning of the first migration area being forecast, without further mitigation, nine week after the P0 target. LU and Thales have jointly reviewed lessons from this process and have implemented action to work more closely with the Thales design office in Toronto. Opportunity for recovery back to the P0 programme through the installation and testing phase is currently being explored.
- 5.5 The ATC train fit-out programme is currently three months behind the P0 plan. The LU/Thales/Bombardier collaboration effort has been notable in again assessing and driving review recovery options. The recovery requires increasing the amount of trains being fitted simultaneously and options are being explored for a further London based facility at Ruislip. Further effort is being focused on reducing the installation and test period for each train.
- 5.6 End State Track Layout (the requirement to change the layout of the track for final 4LM performance) is challenging the delivery of signalling by Thales as both workstreams require book wiring control. All relevant sites have been reviewed in detail and only Earl's Court continues to be an issue. Further options are being explored for this site.
- 5.7 To ensure the programme has a broad range of recovery opportunities, the Programme Support Partner is leading an exercise to identify, quantify and drive a series of optimisation initiatives.

## **6 ATC Cost**

- 6.1 The programme (covering both ATC and Train roll-out) is currently forecasting savings of £29m compared to its authority, which exceeds the £21m of declared efficiencies. In addition a further £17m of opportunities are being pursued.
- 6.2 A bottom-up re-evaluation of the estimates baselined at the time of authority is

currently being undertaken in order to identify further savings and opportunities.

## **7 IIPAG Quarterly Review of ATC**

7.1 The Independent Investment Programme Advisory Group (IIPAG) has undertaken its second quarterly review of the 4LM ATC programme since the re-authorisation. The review identified a number of recommendations, which the programme is pursuing.

### **List of appendices to this report:**

Appendix 1: Map of ATC Migration Areas

### **List of Background Papers:**

None

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# 4LM ATC Migration Areas

