Provision of GW-ATP on Crossrail Class 345 trains

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1 Purpose

This document examines the scope for the inclusion of the legacy GW-ATP Train Protection System on the Class 345 Crossrail train.

2 Scope

Identify the engineering and timescale impacts on the delivery of the Crossrail train and the effects that incorporation of the GW-ATP system would have on the Crossrail project overall if a decision were to be made to include this equipment at this stage of the rolling stock procurement process.

3 Definitions

ATO	Automatic Train Operation
ATP	Automatic Train Protection
CBTC	Communications Based Train Control
ETCS	European Train Control System
GW-ATP	The legacy British Rail Automatic Train Protection system installed on the Great Western Main Line
TSI	Technical Standards for Interoperability

4 Background

The Great Western Main Line was equipped with an ATP system following the recommendations of the Hidden Enquiry into the Clapham Junction accident (1988). The system utilises 1980s technology and is now considered to be obsolete.

The 2001 enquiry into Train Protection System by Professor John Uff and Lord Cullen following the Southall and Ladbroke Grove accidents concluded that “While valuable lessons are to be learned from the two BR-ATP Pilots, they do not justify further extension to the existing systems.” In particular they concluded that a case had been established for fitting the trains operated by Thames Trains, the then operator of local services on the Great Western Relief Lines.

At the time of development of the Crossrail Train Specification Network Rail had proposed the provision of ETCS on the Great Western Main Line as a replacement for the obsolete GW-ATP system. The Crossrail train is specified in accordance with the TSIs and will deploy ETCS as its backbone train safety system. On that basis no provision was made for the inclusion of GW-ATP.

Crossrail has re-examined the issues that would arise if the GW-ATP system were to be installed on the Class 345 Crossrail train. The following sections of this document address those issues.

5 GW-ATP Supply issues

There is only one supplier of this equipment who is understood to have been reluctant to produce a further batch for fitment to the IEP trains. There can be no certainty that a further batch of equipment for use on Crossrail trains can be procured.

An order placed now for GW-ATP equipment is unlikely to be capable of being delivered in the timeframe required. It is the case that equipment for the IEP rolling stock was ordered approximately 4 months BEFORE the financial close of the IEP rolling stock supply contract was achieved in August 2012.

6 Integration of GW-ATP into the ETCS Master Protection System

The IEP provision of GW-ATP is not designed to work under an ETCS master protection system. ETCS will be the master train protection system operative on the Crossrail train in accordance with the Technical Standards for Interoperability. Fitment on a Crossrail train would require this to be resolved which is considered to represent a high technical risk.

7 Transition between GW-ATP and other Train Protection Systems

The IEP application of GW-ATP has not included any mechanism for transition between GW-ATP and any other train protection system. This would be required if GW-ATP were to be used on a Crossrail train which will be required to transition on the move onto the CBTC signalling for the Central Tunnel section. To achieve this transition is unproven and also considered to represent a high technical risk.

8 Impacts on the design and production of the Crossrail Class 345 train

It is understood that the provision of GW-ATP equipment on the IEP train driver console was a considerable constraint in optimising the console layout due to the need to place the ATP in front of the driver. Bombardier (the train manufacturer of the Crossrail Class 345 train) has advised that they are unable to fit the ATP driver console equipment in the cab as designed.

Inclusion of this equipment on the Crossrail train at this stage of the train design will necessitate a redesign of the train cab which would incur a minimum of 6 months of delay to the delivery schedule for the train. This would result in the foregoing of the safety benefits (Crashworthiness and train dispatch) arising from replacement of Class 315 rolling stock on the GE route from May 2017 and class 360/165 rolling stock on GW route from May 2018.

Bombardier has also advised that they are unable to fit the ATP equipment cabinet in the driving cab due to insufficient space. Hence, fitment would require this equipment to be located in the saloon, which is considered inappropriate due to the safety critical nature of the equipment.

9 Summary

The adoption of GW-ATP on the Crossrail train would require a fundamental redesign of both the train cab layout and equipment location. In addition the GW-ATP would be required to be incorporated as an additional system within the train's Master Protection System which is ETCS. No design exists for this interface.

The Crossrail train will be required to transition between control systems on the move, particularly at the interface at Portobello Junction (outside Paddington station) where the signalling system in use on the Great Western Main Line (whether TPWS/AWS, ETCS or GW-ATP) will need to interface with the CBTC system in use on the Crossrail Central Operating Section.

Crossrail therefore concludes that the inclusion of GW-ATP into the Crossrail train carries a high risk of delay to the delivery into service of the Crossrail train arising both from the issues around the supply chain and need to redesign the cab and equipment layout but also from the unquantified risks resulting from the need to link the technically obsolete GW-ATP system into the ETCS Master Protection System on the train and allow an on the move transition on the CBTC ATO/ATP system for the Central Operating Section