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**NEW ROLLING STOCK
FOR THE VICTORIA LINE UPGRADE**

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**A report of the LURS meeting at All Souls Club House on 12 June
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Our speaker is responsible at Bombardier for the integration of new LU signalling and rolling stock from design, through testing to implementation. The Victoria Line project has now been in progress for some four years, and the first of two pre-production trains are undergoing tests.

The Victoria Line is approaching 40 years old, and works far beyond its design capacity with 165 million passengers each year. This project will replace life-expired assets whilst providing a capacity upgrade. By 2025 there are forecast to be over 213 million passengers on the line each year. The current 43 trains provide a 37 train peak service, with a 27 train off-peak service. 47 new trains will provide an 18% capacity upgrade with a 43 train peak service and 31 trains off-peak. The depot is being improved, track is being renewed throughout the line, the power system must be upgraded for the new trains, and a new signalling system will be controlled from a new centre at Northumberland Park.

Bombardier is the world's largest train builder, and the new trains are based on the well-proven Movia product, but severe limitations in the LU environment require a bespoke Derby design. A new larger loading gauge has been defined for the Victoria Line to take advantage of the larger tunnels and platforms on this modern line. Proven components and processes are to be employed to provide reliability. The pre-production trains will test all systems both on the Derby test track and on the Victoria Line before the main build commences, assisting in ensuring high reliability and safety.

The new trains comply with the Rail Vehicle Accessibility Requirements, providing space for two wheelchairs in the end cars of each train. Platform humps will be provided to ease access to these cars. Six folding seats are also provided in the wheelchair area, which may also be used by passengers with strollers or luggage. These regulations also constrain lighting, colour schemes and passenger information displays. A major contractual obligation is to provide an improved Journey Time Capability, which includes the number of trains, seating/standing room, door operation, run times, headway, control systems, consistency, etc.

A modular construction system has been used at Derby for 15 years now, and employs welded aluminium pre-finished body sections which are huck-bolted together. The bogies are based upon the Northern Line flexible-frame design, with air suspension for ride comfort. Well proven Bombardier Mitrac IGBT traction equipment is fitted to 6 cars in each train, providing regenerative or rheostatic braking, although a fully rated Knorr Bremse EP2002 friction brake system is also fitted.

Electrically operated, externally hung wide doors are fitted, with obstruction detection which causes the doors to recycle for safety. By using a slimmer roof section, and slightly smaller wheel sets to allow a lower floor, the internal and door headroom has been increased by about 45mm. Seating is longitudinal to provide a wide aisle for standing passengers and for emergency evacuation. Saloon CCTV is provided for security, and emergency alarms permit two-way communication with the train operator. Pressure ventilation is provided, with a much higher lighting level than on current trains. Surfaces are graffiti hardened for ease of maintenance. In customer acceptance testing of a mock-up car, 93% of Victoria Line users were satisfied with the proposed design.

The new signalling system is a Westinghouse Distance-to-go Radio system, building on the company's reputation with 75% of LU signalling systems supplied over the past 50 years. It will enable trains to safely operate closer together, therefore improving the line's train capacity. During the changeover period both systems will need to operate, and the new trains' performance will be downgraded to suit.

This signalling system has been installed on the 1.5km Derby test track, and has been tested with a modified 1967 Tube Stock train which will also be used for Victoria Line based tests. The test track reduces the need for testing in London, where line access is at a premium. Overnight access is limited to four hours, and weekend closures are needed to achieve the infrastructure renewal required for the upgrade project.

Currently Train 1 is undertaking overnight gauging runs north of Seven Sisters, having spent time on the Derby test track where it was able to reach its top design speed of 80km/h. Some weather problems were discovered which will not arise on the Victoria Line, where train speeds are limited in the only open section, around the depot. Train 2 is now undergoing testing on the Derby test track. Production trains will enter service from mid-2009, with the full system upgrade completed in time for the 2012 Olympics.

John Hawkins