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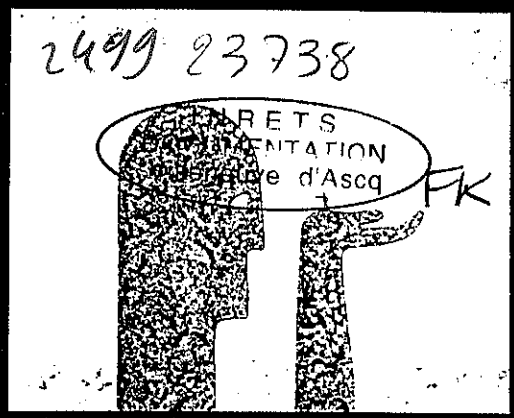
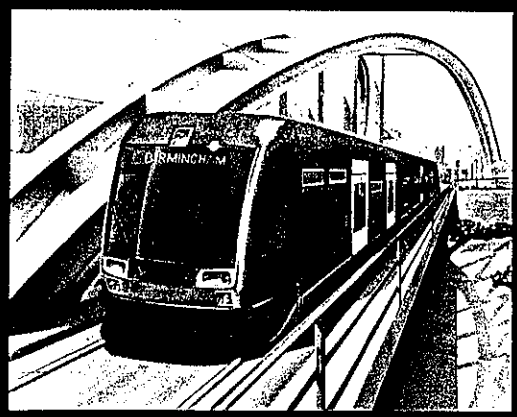


RAIL BUSINESS
Dealing with dominant suppliers



LIGHT RAIL & METRO
an update on UK developments

PROFILE: JOHN SWIFT QC
The Rail Regulator talks to Rail Bulletin about his role.

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Le développement de matériel «léger» : métro et train au Royaume-Uni.

UK metro and light rail developments.

(Rail bulletin, Manchester, avril-mai 1998, pp. 45-47)

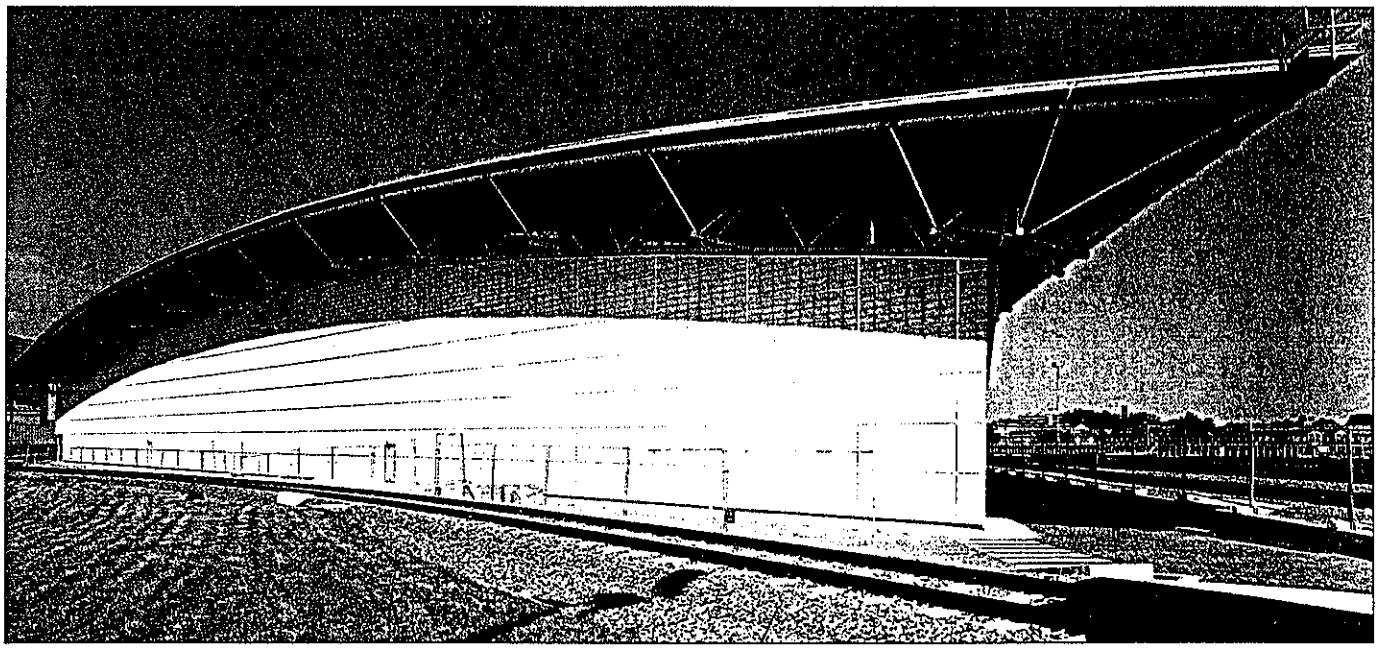
Description des projets en cours à Londres, Croydon, Nottingham, Birmingham : le coût, la voie, les stations, les ouvrages d'art...

METRO LEGER. MATERIEL ROULANT. OFFRE DE TRANSPORT. TRANSPORT URBAIN. TRANSPORT VOYAGEUR. PROTOTYPE. GARE. COUT. PROJET. CONSTRUCTION.

(Document de langue anglaise)

UK METRO AND LIGHT RAIL DEVELOPMENTS

JOHN CORMACK



The striking exterior of Contract 112 – Stratford Market Depot. (Courtesy of the Jubilee Line Extension Project / QA Photos.)

1998 promises to be a big year for both Metro and light rail transit schemes in the UK with the completion of two major transport schemes. These see trains introduced on the Underground's Jubilee Line Extension (JLE) in London – the very latest in Metro developments anywhere in the world – together with the opening of a brand new light rail system in the West Midlands, based on Birmingham.

As if that wasn't enough, new light rail systems are being built at both Croydon and Nottingham and extensions are planned to the successful Manchester Metrolink, now in its sixth year of operation, out to Salford Quays and the airport. Further light rail schemes are in the planning stage for other major cities – once funding difficulties can be overcome – with authorities recognising the benefits of such systems already in operation in the UK, Europe and around the world.

Appropriately, with the market being wide open, a new British-built low-cost light rail prototype vehicle is being trialled with the hope that it will win orders at home and overseas.

This article takes an in depth look at some of these separate developments.

Millions of London commuters will be eagerly looking forward to the opening of London's latest heavy-rail Metro – the JLE. Having suffered a delay from the original planned Spring opening, largely due to the difficulties experienced with tunnelling using the New Austrian Tunnelling Method (NATM) – fully reported in previous issues – it is now due to start operation at the end of September. However, this is not without its own problems. Due to current difficulties with the sophisticated signalling, it is likely that through running will not be possible; the Jubilee Line will have to be worked in two halves with passengers having to change at either Charing Cross or Waterloo.

Costing around £2.75 billion, the ten mile JLE will integrate districts south and east of London with the Underground system north of the Thames, which it crosses no less than four times on the route from Green Park, near Piccadilly, to Stratford.

Apart from a myriad of possible Underground/Docklands Light Railway interchanges en route, there will be useful interchanges with 'heavy rail' lines at Waterloo (South West Trains), London Bridge (Connex South Central/ South Eastern), Canning Town and West Ham (Silverlink) and Stratford (Anglia and Great Eastern), opening up many new journey opportunities.

From the outset of the JLE project, LUL decided that the emphasis for stations and tunnels, quite apart from the trains, should be on a spacious and user-friendly ambience. Accordingly, running tunnels are 4.35m internal diameter instead of the usual 3.85m and have escape facilities – a spin-of from experience of the disastrous King's Cross fire in 1987. This global approach led to architects being engaged at an early stage to lead the design strategy for stations, each one continuing a theme of space, light, easy access and safety.

Each of the 11 new stations is designed as an individual entity to contribute to the neighbourhood, a different London-based architect being chosen for each one. Canary Wharf lays claim to being the most expensive station on JLE, costing £32 million. This is because of its unique construction in a giant box or cofferdam with diaphragm walls, founded deep in the Thanet sand beds just above the upper half of the West India Docks. Tiers of escalators will carry passengers to and from the sub-surface ticket hall and platforms some 24 metres below water level in the docks.

However, this cost pales into insignificance with the £157 million being allocated to the route between Green Park and Waterloo, including Westminster and Waterloo stations. This is a joint venture with Balfour Beatty and Amec and includes distinctive engineering features which mark out the JLE as a radical departure from all previous London underground railways. For example, Westminster JLE platforms are in a huge basement structure dug around and below the existing District and Circle Line station. With a slab base nearly 40 metres below the surface, the basement will vie with Aldersgate Street car park as the deepest hole ever dug and built in London with escalators running 32 metres to the lowest platform level which are housed within a large open well.

Among the most noticeable changes on the JLE will be platform-edge glass screens and doors on all the stations on the route – a first for Britain although similar ones can be found on the Metros in Lille and Singapore. They contribute to efficient ventilation of the stations and reduce the draughts on platforms but, undoubtedly, their biggest advantage is safety-related in that train doors align with the platform doors which only open when a train has stopped and is correctly 'berthed'. Such a system makes it impossible for anyone to fall off the platform onto the track at all other times as the doors remain closed. The doors are clearly marked and the system aims to abolish the rush at busy times although it does not guarantee to abolish overcrowding either on the platform or trains. A further advantage is that platforms will be straight and flush with train floors heralding better access for wheelchair users.

Walkways along the tunnels, with

emergency exits at regular intervals, will also increase safety and although the trains will initially be formed of six cars, all new stations have been designed to accommodate seven cars to allow for business expansion. The new JLE state-of-the-art trains – 59 of them – have been ordered, at a cost of £250 million, from GEC ALSTHOM Metro Cammell with the first trains already on stream and undergoing stringent testing on other lines before gradually entering public service. Each one is capable of speeds up to 100kph (60mph) and able to carry more than 1,000 passengers crush loading, many of them standing.

The trains feature larger areas to accommodate wheelchairs and pushchairs, bright yellow grab poles for the visually and mobility impaired and built-in steps at each end for improved evacuation in the event of a tunnel emergency. JLE has specified that the design target for the new trains includes reliability to run 25,000 kms (well over halfway around the world) between failures. This is equivalent to five times greater reliability over the existing Jubilee Line trains which are to be cascaded elsewhere when the full tranche of new trains is complete.

Two state-of-the-art cab simulators costing £2 million are in use at the new Neasden service control centre to enable Jubilee Line drivers to train on the stock. This represents a radical new approach to driver-training in a risk-free environment in which every eventuality can be explored. The simulators use computer-generated images which enable trainees to drive along the route while travelling in 'real time'. Train operation will normally be fully automatic between stations, as on the Victoria Line, but it can be overridden manually by the driver, with a built-in allowance for service recovery after a breakdown or delay.

A maintenance service contract has been signed by LUL and GEC ALSTHOM with the latter taking on the responsibility for a number of functions. These include train cleaning and preparation for service; day-to-day maintenance; stores management; component and sub-assembly failures; premature obsolescence; trainborne communication; and signalling module removal and replacement. Last but not least GEC has responsibility for security of Stratford Market train depot where the trains will be based.

The depot will have 11 tracks for cleaning, inspection and heavy lift operations. The parallelogram shape of the building was determined by the awkward site and the roof of the 180m x 100m shed is made of a grid of latticed trusses carried on 'tree' columns. The depot won a coveted honour from the British Construction Industry Awards 1997 for the overall excellence in the design, construction and performance of the buildings and civil engineering projects. The architect was Chris Wilkinson Architects, with the engineering carried out by Hyder Consulting Ltd. The contractor was John Laing Construction.

Signalling on the route will be radio-based moving-block, putting JLE at the forefront of the world's metro systems as this form has not been used on such a scale anywhere else. The commissioning of the signalling is taking longer than originally envisaged and this is the reason for the decision, referred to earlier, to run the Jubilee Line effectively in two halves until it has bedded down. When this has occurred, it will enable up to 36 trains an hour in each direction, a frequency which passenger and ridership studies indicate will be necessary to cope with the anticipated number of passengers at peak times.

Also for the first time, resilient mounted track has been installed to prevent train vibrations being transmitted to neighbouring buildings, particularly important in the area around Westminster with Big Ben and The Houses of Parliament in close proximity.

Apart from relieving pressure on the Docklands Light Railway, the JLE will make it possible to get from Stratford to Green Park in only 22 minutes, with London Bridge to Canary Wharf down to around seven minutes. The modern technology used on all aspects of JLE is a far cry from that used during construction of the first six kilometres of underground line between Paddington and Farringdon which began more than 130 years ago. The JLE 'metro' is expected to change the face of much of the south bank of the Thames, breathing new life into a neglected area.

Meanwhile, 115 miles north of London, Britain's latest light rail system is due to open at Birmingham in the summer of 1998, a little before the opening of JLE.

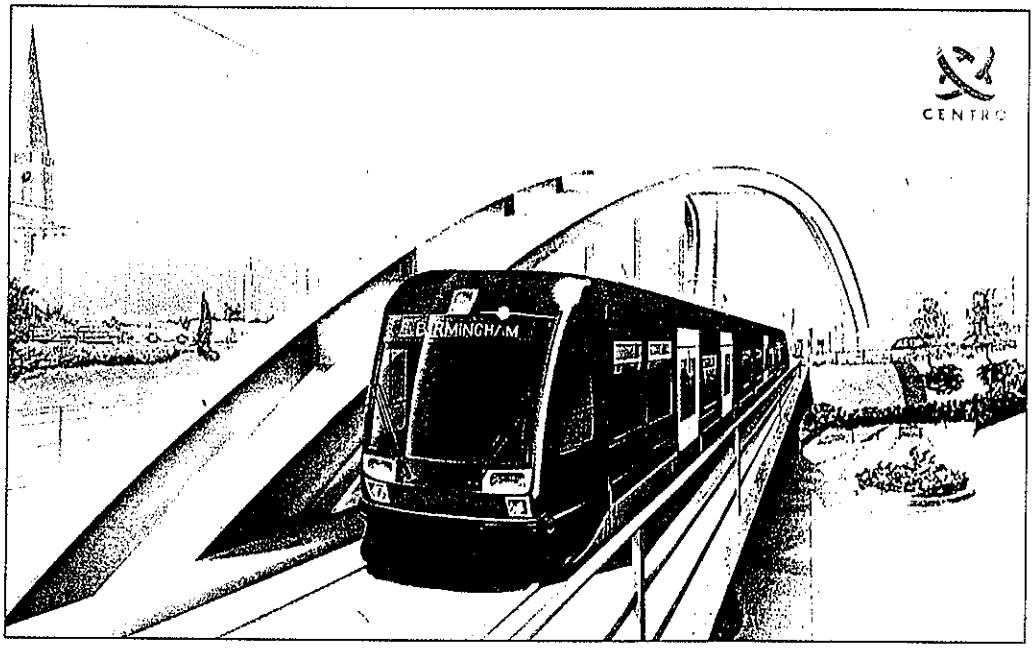
In comparison with JLE, the overall cost of Midland Metro is modest at a mere £145 million. The scheme has been promoted by a consortium consisting of Centro, the West Midlands Passenger Transport Executive (PTE), the seven local councils and partners in the private sector who all recognise the benefits of light rail. A joint venture company known as Altram will build the line and operate it for 20 years, recouping its investment of nearly £11.5 million from the revenue over that period. Altram is a partnership of Italian vehicle manufacturer Ansaldo Trasporti who are building the light rail vehicles, John Laing Construction (UK) and Travel West Midlands, the latter being part of the National Express Group (NEG). The involvement of NEG will ensure that the line is not just an isolated route but part of an integrated public transport network in and around the West Midlands, much as JLE will be an integrated part of the London transport system.

The 20.4km route will run northwest from Birmingham's Snow Hill station along the, mostly intact, formation of the old Great Western railway line to Wolverhampton where there will be street running for the last 1.9km from Monmore Green. Interchange with Central Trains 'heavy rail' services will be available not only at Snow Hill but also at Jewellery Quarter and The Hawthorns (named after the West Bromwich Albion football ground) with considerable traffic flows on match days. It is also 1km from junction one on the M5 and there is to be a park and ride facility as an added benefit for commuters. Studies are underway to assess the possibility of park and ride at other principal locations but cycle parking facilities will be featured at some stops from the outset.

There are two striking architectural features along the route of Midland Metro already in situ. The first is a steel-arched bridge in the shape of a wishbone measuring some 60m long, 13m wide and 11m high, carrying the trams across St George's roundabout in Wolverhampton. The second feature is a spectacular concrete viaduct carrying the route over railway sidings at West Bromwich. The viaduct has a ruling gradient of 1 in 60 on the northern side and 1 in 30 on the southern side. Although these caused some problems for tracklaying trains they were quickly overcome when additional diesel shunters were hired to assist the contractor's small diesel locomotive.

A depot for the trams is being built at Wednesbury, complete with workshop and sidings and the operations centre will also be situated there. The building is located near the crossing with the Walsall to Dudley line which has a bright future of upgrading from freight to passenger use, possibly becoming part of Midland Metro in the future.

Line one will have 23 stops and an overall journey time of 35 minutes giving a speed of around 32kph. Services will run with headways of six minutes through most of the day and every ten minutes in the evenings and on Sundays. It has been estimated that by the turn of the century there will be 60,000 daily passengers with around 15 per cent of them being former car drivers. The tram control system has been designed with the capability of



An artists impression of a Centro tram on the celebrated wishbone bridge.

supervising up to 30 trams operating at less than three-minute intervals so that there is more than sufficient scope for route expansion.

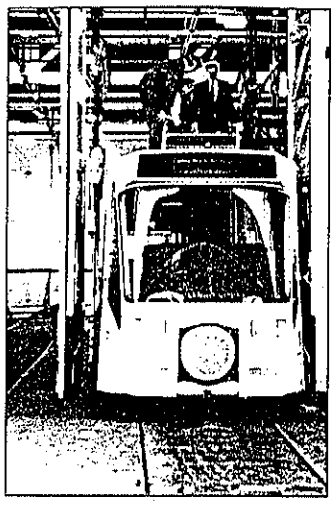
Fifteen double-ended trams are being built by Firema in Italy with the first one due for testing in Birmingham during February 1998. With trackwork completed it will undertake trials on a stretch of line between Wednesbury and Snow Hill where overhead catenary is already energised. Each tram has a centre 60 per cent low-floor section between the powered outer bogies, with access through three doors on each side. The three-section vehicles have two aluminium alloy car bodies connected to a central articulation supported by a non-powered bogie. They will carry 160 passengers, around 60 being seated. This compares with a Manchester Metrolink tram seating capacity of 86 although those vehicles are slightly longer. Until completion of the order, at least one tram is due to be delivered to Wednesbury depot each month.

Traction equipment on each tram includes dc choppers and GTO thyristors and the design will be able to accommodate automatic couplers at a later date should traffic growth require multi-unit operation. Tram body length is 24.24m with two 210 kW motors enabling a maximum speed of 75kph and an unladen weight of 34 tonnes. Normal braking will be with anti-lock disc brakes backed up by regenerative braking and electromagnetic track brakes in emergency. External livery of the trams has been revised from the planned Centro colours of green and yellow, to a striking red and purple with yellow doors – much brighter than the sober liveries of Sheffield and Manchester light rail vehicles.

Although in the early stages, other light rail developments are underway in Croydon and Nottingham. The south London system, known as Croydon Tramlink, will connect central Croydon with Wimbledon, Beckenham Junction/ Elmers End and New Addington. An interesting feature is that Tramlink totally replaces heavy rail train services previously operated by Connex South Central and Connex South Eastern – no integration here – between West Croydon and Wimbledon and part of the Elmers End branch, necessitating their interim closure and replacement by buses.

Building of the 28km network, which will cost £154 million, has been contracted to Tramtrack Croydon, a consortium consisting of Amey Construction, Bombardier Eurorail (who will build the trams), Centre West Buses, Sir Robert McAlpine and the Royal Bank of Scotland. Completion of the system is due before the end of 1999.

In the Midlands, the Nottingham Express Transit is now beginning to take shape, linking Nottingham railway station and the city centre with Banbington and Hucknall in the northwest.



UK Tram consortium 'Roadliner' undergoes topside electrical work during commissioning at Blackpool.

A unique feature of this East Midlands system is that on more than 8km of the outer section of the route there will be track sharing with Central Trains heavy rail Robin Hood Line that links Nottingham with Mansfield Woodhouse. A joint study of track sharing feasibility has been made and the principles accepted by both Railtrack and HM Railway Inspectorate. It marks a first for light/heavy rail track sharing in the UK although the concept is already in operation in Europe, with Karlsruhe in Germany perhaps being the best known example of this type of integration.

The Arrow Consortium comprising Adtranz, AEG, Tarmac, Transdev and Nottingham City Transport has been appointed to steer through the £70 million scheme. The Total Rail Systems company of Adtranz UK is the lead member of the consortium and will be responsible for the project management of the construction phase. The trams will be built by Adtranz in Derby – the first time that UK-built vehicles have been ordered for new light rail systems in this country. The systems should be in operation shortly after the turn of the century.

Finally, a prototype low-cost light rail vehicle has been built by another consortium in the hope of making a breakthrough into future schemes both in the UK and overseas. It is the first tram to be manufactured in Britain for a UK system for many years – the last ones were 'traditional' trams – although ironically, light rail vehicles for the 1994 opening of the Strasbourg system were built in Derby by Adtranz.

The two-car articulated vehicle, known as the Roadliner, was built at Cardiff by Pullman TPL, one of the members of the UK Tram consortium. The prototype is 30m long and weighs just 22 tonnes with a capacity for 200 passengers. It has been designed specifically to prove that an inexpensive light rail vehicle can offer a high quality of comfort and reliability levels, carrying a competitive price tag of less than £1 million.

Two 90kW motors provide power with quadruple braking systems and 70 per cent of the vehicle is low-floor. Four double opening doors are provided per car plus single doors adjacent to the driving cab, offering easy loading and unloading. Top speed will be 33kph. With new light rail operators in the UK previously opting for European-built trams, considerable interest has already been expressed for future schemes in Edinburgh and Bristol. On cost alone it compares very well with trams built overseas and could help to considerably reduce 'first costs' for new schemes, so often stumbling blocks for backers.

At the time of writing (December) the vehicle was 'under wraps' undergoing final assembly and commissioning, prior to night-time running tests at Blackpool. This will be followed by a press launch when more information will be available on this interesting development in UK tram technology.

On the strength of the developments outlined in this feature, 1998 promises to be a turning point for metro and light rail in the UK. There are also strong hopes, by advocates of this type of travel, that on the strength of these schemes, the go-ahead will be given for other new systems at present still in the planning pipeline.

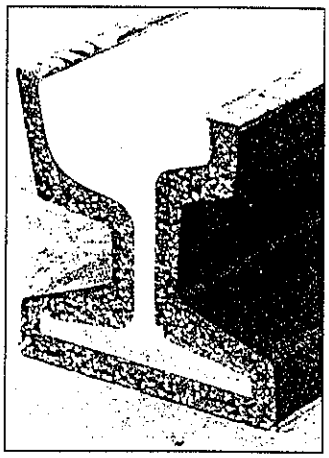
Manchester Metrolink to use pre-coated rail

A pre-coated rail system developed by ALH Systems of Westbury, Wiltshire has been selected for the street running section of the Salford Quays to Eccles extension of Manchester Metrolink.

The system, first used in Wolverhampton for the Midland Metro light rail scheme, was developed by the company in conjunction with Grant Rail and Laing Civil Engineering. Previously, tram rails for street running were installed using a two-part polyurethane elastomer to embed them, although this method is liable to the effects of adverse weather which may occasionally result in poor bonding between the polymer and the rail. This reduces one of its primary functions, that of electrical insulation.

The ALH pre-coated rail takes the embedment process out of the street environment and into the factory, ensuring that the steel rail is pre-coated with the same polyurethane elastomer in the controlled conditions of the factory. Perfect bonding is ensured in such a situation and the pre-coated rail is delivered to the site ready for installation.

The rail is laid on concrete slabs and is lined and levelled using temporary adjusting pads and gauging bars – liquid concrete is poured around the rail to fix it permanently in position. A further advantage of the pre-coated rail is that an anti-skid surface can be incorporated as the polymer is being applied in the factory. The roadway is then finally constructed around the rail, ensuring accurate levels between rail height and the road surface.



Cross section through the new pre-coated tram rail developed by ALH Systems Ltd.

Application for European funding for Metrolink to Oldham

Plans to bring Metrolink to Oldham have progressed a stage further with an approach to the European Regional Development Fund for a £10 million grant to help fund the scheme.

The 24km (15 mile) extension, which will serve Oldham and Rochdale, is Greater Manchester's top priority transport project and will cost £137 million. Powers for construction of the line were granted in May 1994.