Prototype Tatra low-floor design, 12 of which are expected to be delivered to Brno in 1994

Germans supreme in light rail

The dominance of German builders and a proliferation of low floor designs characterise the world LRV market, as Michael Taplin outlines in this exclusive PRm manufacturers' survey*

A strong home market, proven products and generous Federal funding has led to German light rail vehicles (LRVs) dominating the world market. Reunification of Germany and the imminence of European Union regulations on tendering led to a surge in orders in 1992/3, so that the period 1993-98 will see nearly 1600 new cars delivered to German systems by German manufacturers. However, even these builders must have felt a twinge of anxiety about the future when the first large order placed after the implementation of the EU regulations on open tendering went to a non-EU manufacturer.

The other factors affecting the market are the emergence of pan-national groupings of manufacturers and the vertical integration of car builders and suppliers of electrical equipment. For instance, the ABB group, originally formed by the merger of Swiss Brown-Boveri and Swedish ASEA, now has plants engaged in LRV or equipment manufacture in Australia, Germany, Italy, Sweden, Switzerland, the UK and the USA. The foremost German manufacturer, Duewag, is now part of Siemens; and the other German giant in this field, AEG, has increased capacity by acquiring an east German plant and a majority stake in the Czech CKD-Tatra concern.

European manufacturers account for the vast majority of LRV production, but offers of domestic content and assembly are now often part of the contracts with other countries. Indeed, one suspects that before long trams will become rather like motor cars: difficult to pin down to a country of origin just by their name.

ABB

The group was primarily focused on the manufacture of electrical equipment for rail vehicles: when it won the turnkey contract for the Istanbul light rail line, it subcontracted the mechanical parts of the vehicles to SGP in Austria. However, takeovers and the need to have a US plant in order to win North American contracts have led ABB to establish its own car-manufacturing capability. The US plant delivered 35 high-floor articulated LRVs to Baltimore in 1992-93, while UK factories at Derby and York are building 26 low-floor Eurotrams for delivery to Strasbourg in 1994.

ABB Henschel in Germany has developed its Variotram low-floor multi-articulated design, with a prototype about to be delivered to Chemnitz in eastern Germany from the Waggon-Union plant in Berlin, while 42 more Istanbul-type high-floor LRVs are to be built for the new system in the Turkish city of Izmir. In Norway, ABB Strömmen is working with AEG on 12 new LRVs for Oslo. Delivery of 130 high-floor articulated trams for Melbourne from the former Comeng plant in Australia will be completed in 1994.

AEG

The German group has consolidated its acquisition of MAN of Nürnburg, the company which developed the first 100 per cent low floor tram, and the large Hennigsdorf plant in the former East Germany. This has given it good access to the many small tramway systems in this part of Germany, as well as to a large order for Berlin. Low-floor prototypes were delivered to Bremen and München (standard-gauge) and Augsburg (metre-gauge): production deliveries are now in progress to Bremen and Zwickau.

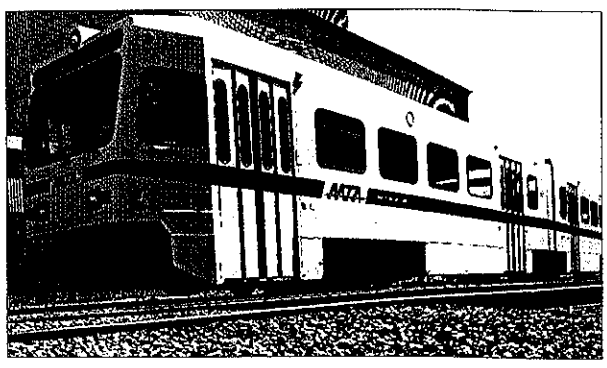


ABB Traction-built two-section high-floor LRV for MTA, Baltimore

* *Michael Taplin is Chairman of the Light Rail Transit Association; fax +44 71 222 1142*

LRV and tram market, showing 1993 deliveries and orders/options for 1994 onwards

Number (option)	System	Type	Electrical Equipment
ABB Traction, (USA)			
1992-93 35	Baltimore	Two-section, high floor	ABB Traction
ABB Transportation (UK)			
1994 26	Strasbourg	Five-section, low floor	ABB Trazione
ABB Henschel Waggon Union (Germany)			
1993 1	Chemnitz	Five-section, low floor	ABB
1994-5 42	Izmir	Two-section, high floor	ABB
ABB Strömmen (Norway)			
1994 12	Oslo	Two-section, high floor	AEG
ASEA Brown-Boveri (Australia)			
1989-94 130	Melbourne	Two-section, high floor	AEG
AEG Schienenfahrzeuge (Germany)			
1993 1	Augsburg	Three-section, low floor	Siemens
1993 14	Bremen	Four-section, low floor	Kiepe
1993 2	Zwickau	Three-section, low floor	AEG
1995 10	Augsburg	Three-section, low floor	Siemens
1995 1	Augsburg	Four-section, low floor	Siemens
1994-95 29(91)	Berlin	Three-section, low-floor	AEG
1994 12(26)	Braunschweig	Three-section, low floor	Siemens/AEG
1994-95 64(30)	Bremen	Four-section, low floor	Kiepe
1994 8(5)	Frankfurt/Oder	Four-section, low floor	AEG
1995 18(20)	Jena	Four-section, low floor	AEG
1996 5(15)	Mainz	Four-section, low floor	AEG
1994-6 70(45)	München	Three-section, low floor	Siemens/AEG
1996 14(26)	Nürnberg	Three-section, low-floor	Siemens/AEG
1994 10	Zwickau	Three-section, low-floor	AEG
Alna Koki (Japan)			
1993 2	Hakodate	One section, high floor	Toyo Denki
1993 3	Kumamoto	One section, high floor	Mitsubishi
1993 2	Tokyo	One section, high floor	Mitsubishi
1994 2	Hakodate	One section, high floor	Toyo Denki
Bombardier-Wien (Austria)			
1993-4 68	Wien	Two-section, low floor	Elin/Kiepe
1995-6 40(80)	Köln	Three-section, low floor	Kiepe
BN Bombardier Eurorail (Belgium)			
1992-3 47	Den Haag	Three-section, high floor	Holec
1993-4 12	Amsterdam	Two-section, high floor	Holec
1993-95 51	Bruxelles	Three-section, low floor	ACEC/GEC Alsthom
Bombardier Concarril (Mexico)			
1992-3 23	Monterrey	Two-section, high floor	Siemens
1994-95 32	Guadalajara	Two-section, high floor	Siemens
Breda (Italy)			
1993-4 24	Lille	Four-section, low floor	AEG
1994-5 33	Ankara	Two-section, high floor	AEG/Siemens
1994-6 40	San Francisco	Two-section, high floor	AEG

Number (option)	System	Type	Electrical Equipment
CAF (Spain)			
1995 23	Monterrey	Two-section, high floor	Mitsubishi
Duewag (Germany)			
1992-3 12	Bochum	Two-section, high floor	Siemens/Kiepe
1992-4 42	Bochum	Three-section, low floor	Siemens/Kiepe
1992-3 31	St Louis	Two-section, high floor	Siemens
1993 20	Bonn	Two-section, high floor	Siemens/Kiepe
1993-4 11	Denver	Two-section, high floor	Siemens
1993-4 34	Dortmund	Two-section, high floor	ABB/Kiepe
1993-4 20(80)	Frankfurt/Main	Three-section, low floor	Siemens
1993-4 16	Freiburg	Three-section, low floor	ABB
1993-4 2(120	Halle	Three-section, low floor	Siemens/Kiepe
1993 10	Karlsruhe	Centre sections	
1993-5 75	San Diego	Two-section, high floor	Siemens
1993-4 25	Sheffield	Three-section, low floor	Siemens
1993 20	Stuttgart	Two-section, high floor	ABB
1993-4 21	Valencia	Three-section, low floor	Siemens
1994 20	Bielefeld	Three-section, high floor	ABB/Kiepe
1994 24	Bonn	Three-section, low floor	Siemens/Kiepe
1994 4	Erfurt	Three-section, low floor	Siemens
1994-5 18(42)	Frankfurt/Main	Two-section, high floor	Siemens
1994 12	Heidelberg	Three-section, low floor	ABB
1994-5 26 (20)	Karlsruhe	Two-section, high floor	ABB
1995-6 20	Karlsruhe	Three-section, low floor	ABB
1994 10	Kassel	Three-section, low floor	AEG/Siemens
1994-5 33	Köln	Two-section, high floor	Siemens/Kiepe
1994-5 25(70)	Leipzig	Three-section, low floor	ABB/Siemens
1994-5 10(20)	Lisboa	Three-section, low floor	Siemens
1995-6 72	Los Angeles	Two-section, high floor	Siemens
1994-6 19	Ludwigshafen	Five-section, low floor	ABB
1994-6 50	Mannheim	Five-section, low floor	ABB
1995-6 39	Portland	Three-section, low floor	Siemens
1994-5 50	Rostock	Three-section, low floor	ABB/Siemens
Firema (Italy)			
1993 1	prototype	Two-section, low floor	Marelli
1993 12	Genova	Two-section, high floor	Ansaldo
Ganz-Hunslet (Hungary)			
1993 1	Debrecen	Two-section, medium floor	Ansaldo
GEC Alsthom (France)			
1993 12	Nantes	Three-section, low floor	GEC Alsthom
1993-94 20	Rouen	Two-section, low floor	GEC Alsthom
1994-5 16	Paris	Three-section, low floor	GEC Alsthom
1995 12	Grenoble	Three-section, low floor	GEC Alsthom
Kawasaki (Japan)			
1992-3 16	Tuen Mun	One section, high floor	Kawasaki
Kinki Sharyo (Japan)			
1994 18	Alexandria	Two-section, high floor	Mitsubishi

Continued on opposite page

Index of advertisers

Single car Series 8500 LRV supplied by Alna Koki to the Transportation Bureau of Tokyo Metropolitan Government

Total orders stand at 262, with options for another 258, and the car will be represented on 10 systems. AEG is part of the successful consortium which won the turnkey contract for the Kuala Lumpur light rail system: assembly of 34 high-floor cars has been subcontracted to Walkers in Australia.

The creation of AEG-Tatra, with its vast new factory in Praha, brought with it access to the small Czech domestic market; an inherited order for 84 high-floor articulated LRVs for a second light rail line in Manila, Philippines; and the potential to re-enter the huge East European market, for which Tatra once built 1000 new trams per year. Another indication of AEG's aspirations in this direction is an agreement with Poland's almost-dormant manufacturer Konstal.

Clearly financing will play an important part in securing orders from such financially-ravaged countries as Bulgaria, Poland, Romania, the former USSR and the former Yugoslavia. AEG also inherited a new Tatra low-floor design in prototype form: 12 of these articulated trams are expected to be delivered to Brno in 1994. AEG is part of the consortium awarded the development contract for the Croydon Tramlink project in London, and is developing a car design for this.

Bombardier

The North American company with plants in Canada, the US and Mexico also has European subsidiaries - in Austria (Bombardier-Wien) and Belgium (BN Bombardier-Eurorail). The Austrian plant has long been a supplier of trams and LRVs to the Wien system, with completion of an order for 68 part low-floor LRVs for the segregated Stadtbahn scheduled for 1994. Demonstration of this car on the street routes in the German city of Köln, and a very competitive tender, brought an order for 40 new trams, with an option for another 80.

BN in Belgium has long been associated with licence-built PCC tram technology: the last of 47 high-floor articulated trams for the Dutch capital Den Haag was delivered in 1993. By contrast 1993 also saw the delivery of the first of 51 low-floor trams to a new high-tech design for Bruxelles (*PRm* Oct-Nov 1993).

BN is also working on 12 new Sneltram LRVs for a new line in Amsterdam. The Mexican plant (formerly Concarril) is working with Siemens on 32 more high-floor articulated LRVs for Guadalajara's second line; but having built a similar batch for Monterrey, has lost the order for 23 more to the Spanish company CAF, which will install Mitsubishi equipment.

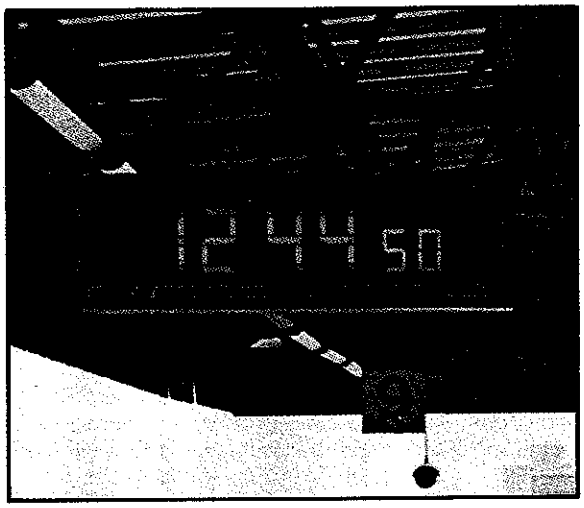
Breda

The state-owned Italian manufacturer is delivering 24 low-floor articulated trams of a novel new design to the French city of Lille in 1993-94, for the total modernisation of the interurban lines to Roubaix and Tourcoing. 40 high-floor cars are bound for the municipal tramway in San Francisco, California, and 33 six-axle cars for the Ankara light rail line.

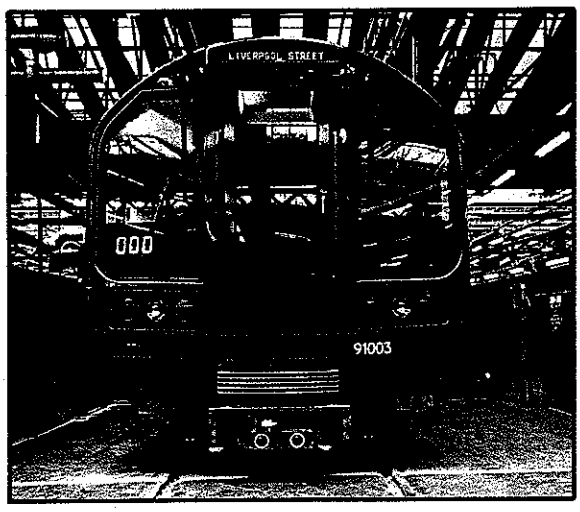
Duewag

After three decades of selling largely standardised tram products, the company now builds a wide variety of low and high-floor designs to customer requirements - but retains economies of scale by developing standard subsystems that can be assembled in different ways. Now a Siemens subsidiary, Duewag has been particularly successful in penetrating the US market for LRVs - after domestic aerospace manufac-

	Number (option)	System	Type	Electrical Equipment
From opposite page				
Linke-Hofmann-Busch (Germany)				
1992-3	10	Hannover	Three-section, high floor	AEG
1994-5	30	Darmstadt	One section, low floor	Trailers
1995-6	40 (80)	Magdeburg	Three-section, low floor	ABB/Siemens
1995-6	20	Würzburg	Five-section, low floor	Siemens
Schindler (Switzerland)				
1993	4	Forchbahn	Two-section, high floor	ABB
1994	22	Basel	Centre sections	
1994	1	Prototype	Three-section, low floor	Sécheron
1994	7	Forchbahn	Two-section, high floor	ABB
AGP Verkehrstechnit (Austria)				
1993	6	Wien-Baden	Three-section, high floor	AEG
1994-9	152	Wien	Five-section, low floor	Elin
Sumitomo (Nippon Sharyo) (Japan)				
1994	15	Los Angeles	Two-section, high floor	ABB
Tatra (Czech Republic)				
1993	1	Prototype	Three-section, low floor	CKD
1993	12	Bratislava	One section, high floor	CKD
1993	5	Brno	Three-section, high floor	CKD
1993	7	Kaliningrad	Two-section, high floor	CKD
1993	1	Kosice	One section,high floor	CKD
1993	4	Moskva	One section, high floor	CKD
1993	29	CIS various	One section, high floor	CKD
1994	6(6)	Brno	Three-section, low floor	CKD
1994	5	Kaliningrad	Two-section, high floor	CKD
1994-6	84	Manila	Three-section, high floor	CKD
1994	10	Ostrava	One section, high floor	CKD
1994	10	Praha	One section, high floor	CKD
1994	5	Pyatigorsk	Two-section, high floor	CKD
1994	34	CIS various	One section, high floor	CKD
Vevey (Switzerland)				
1994	15	St Etienne	Two-section, low floor	GEC Alsthom
1994	5	CFF/SBB	Two-section, high floor	ABB
1994-5	5	Lausanne	Two-section, high floor	ABB
1995	18	Geneva	Centre sections	-
Walkers (Australia)				
1995-6	34	Kuala Lumpur	Two-section, high floor	AEG



9" Clock Installation
Photo courtesy of Mainland



Signage on Central Line Trains
Photo courtesy of ABB

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German low-floor excellence: a Duewag-built three-section vehicle for Kassel (Marcel Vleugels)

turers had proved less than successful in re-orienting. The company's assembly plant in Sacramento, California boosts the local content of US orders.

1993 saw 164 trams and LRVs delivered to 11 customers, while the order book stands at 597 with 352 options. Notable orders include 26 Sheffield Supertrams, the first low-floor cars for the US (39 for Portland), some 72 LRV cars for Los Angeles, and Iberian contracts from Lisboa and Valencia. Six different low-floor designs are being built for German systems.

The company also has plants in Aachen and Uerdingen, and buys bodyshells from Waggonbau Dessau. Although owned by Siemens, it also co-operates with other electrical equipment suppliers such as ABB and Kiepe.

Duro Dakovic

The only Yugoslav plant involved in LRV manufacture is located in a Croatian border town with Bosnia, and is unable to follow up the initiative of its low-cost articulated tram developed a few years ago.

Firema

The Italian manufacturer often builds cars under sub-contract to the Ansaldo group, although it also recently developed its own prototype low-floor tram. 12 high-floor articulated LRVs were built for the Genova light rail line in 1993. Ansaldo is leading the consortium chosen to design and build the Midland Metro light rail system based in Birmingham, UK, and Firema has produced a car design for this - based on the vehicles delivered to Manchester Metrolink, but with a low floor between the power bogies.

GEC Alsthom

The Anglo-French group produces trams at its Aytre plant in France and has won the orders for all the new tramway systems in France apart from Strasbourg. The original high-floor standard French tram, first ordered by Nantes, was quickly superseded by the Grenoble-type part low-floor car: the Nantes trams have now been retrofitted with low-floor centre sections.

1993 saw 12 more cars delivered to Nantes (giving a total of 46) and two to Rouen. The order book stands at 18 for Rouen, 16 for Paris (total 33) and another 12 for Grenoble (bringing its total to 50).

Ganz-Hunslet

The Hungarian subsidiary of the Austrian Jenbacher group delivered a prototype of its new mid-floor tram design to Debrecen in 1993. It is hoped to secure orders from this and other Hungarian systems.

Japanese manufacturers

The domestic market for trams (as opposed to railway rolling stock) is small, but manufacturers are often happy to build batches of one or two cars for different systems. Salna Koki delivered seven trams to three systems in 1993 and so far has orders for only two for 1994.

Other Japanese manufacturers do seek export contracts: Kawasaki finished delivery of 16 LRVs to Tuen Mun (Hong Kong) in 1993, while trading group Sumitomo is having Nippon Sharyo build a follow-on order for 15 LRVs for Los Angeles. This company also supplied five single-section high-floor cars to Toyama during 1993.

Kinki Sharyo has had a fruitful long-term relationship with Egyptian light rail systems (including a licensing agreement with local company SEMAF) and is building 198 LRVs for Alexandria for 1994. It has also won the Dallas, Texas order for 40 LRVs.

Linke-Hofmann-Busch

The Salzgitter group company has traditionally relied on orders from German systems wishing to favour a manufacturer in their own state, and completed a large order for Hannover LRVs in 1993. In October 1993 it signed a 10-year co-operation agreement with ABB, which was seeking additional vehicle-manufacturing capacity in Germany if large orders for Variotram materialise. Low-floor articulated trams are being built for Magdeburg (40 with an option for another 80) and Würzburg (20), while 30 low-floor trailers are on order for Darmstadt.

Schindler

The Swiss company builds rail vehicles in Altenrhein and Pratteln (Basel), bogies in Schaffhausen and electrical equipment in Zurich. A low-floor design for Switzerland's local railways has been developed. Four LRVs were delivered to the Zurich-based Forchbahn in 1993, with a follow-on order for seven expected. Low-floor centre sections are being built for Basel. The company is developing a new 100 per cent low-floor articulated tram: a prototype will appear in 1994, and there is hope of orders from Basel and Zurich.

SGP Verkehrstechnik

With factories in Graz and Wien, SGP has traditionally supplied the Austrian market, and delivered six high-floor articulated trams to the Wien-Baden company in 1993. At the same time it was testing the prototype of a radical new design developed in conjunction with the city undertaking in Wien. This is a 100 per cent low-floor multi-articulated tram with motors vertically-mounted in the articulation portals. Two pre-production cars have been ordered, and if these are successful 150 more will be produced over an eight-year period.

Vevey

Rolling stock manufacture formed only a small part of the Vevey Group's interests, and in 1993 this activity was sold to the Dutch Begemann group which includes the electrical manufacturer Holec). Vevey is building 15 more low-floor articulated trams for St Etienne in France, and 10 standard-gauge LRVs, five to boost the fleet in

Half-price, low weight LRV challenge

Five UK organisations have formed a consortium to develop a new family of light rail vehicles costing around half the price of existing products. A full-scale mock-up was exhibited at last November's Light Rail 93 show in Birmingham, while a prototype should be completed this summer. The project's promoters, TRAM Power Limited, are also adopting a novel approach to vehicle manufacture: while the consortium has the resources to build LRVs to the new design, it will also offer licence agreements based on a royalty per vehicle built, allowing operators to construct locally or with preferred suppliers.

TRAM Power suggests the cost of a 2 x 14m single-articulated unit could be as low as £0.7 million. To achieve this, new LRV design concepts have been adopted. These include component technology transfer from other industries and a "non-heavy rail" approach, as well features aimed at minimising operating costs.

High degrees of modularity offer three-, two-, or single-section vehicles in a choice of three widths, with 70 per cent low-floor or all high-floor alternatives. A typical 28m vehicle would weigh around 20 tonnes - roughly half that of current comparable designs, offering signficant economies in power consumption. Body-mounted three-phase traction motors will be linked to automotive industry driveline components.

Participants in the TRAM Group consortium are: TRAM Research Ltd, which developed the concept from concepts laid down by Professor Lewis Lesley; Blackpool Transport Services, a long-established tram operator on whose system the prototype will initially run as a demonstrator; East Lancashire Coachbuilders Ltd, bus builders; Tickford Rail Ltd, part of Babcock Rail, vehicle designers and builders; and PowerGen, the UK's second largest electricity generating company.

Fax: (TRAM Group) +44 203 644074

Exterior and interior views of the TRAM Group mock-up displayed on the Babcock Rail stand at Light Rail 93

Lausanne, and five for the Swiss Federal Railways Geneva suburban service to La Plaine (the French frontier). Eighteen centre sections are to be supplied to extend the Vevey low-floor trams in Geneva, while there is hope of an order for 15 more low-floor articulated trams from Bern.

Other manufacturers

The break-up of the former USSR into separate states, and subsequent economic difficulties, has meant the regular import of Tatra trams has ceased. Russian tram manufacture is concentrated on the SM Kirov works in Ust-Katav, where new designs of bogie tram have entered production.

Tram production at the works of the world's largest tramway, in Sankt Peterburg, appears to have ceased. The Ukraine is attempting to start domestic tramcar production at the Lugansk railway rolling stock plant. The Riga rail plant in Latvia also produced a prototype design of articulated tram recently.

China's three surviving tramways have relied on domestic production of a few cars each year in the Dalian workshops, but recently the Shenfeng trolleybus factory built 60 copies of a Tatra design of four-axle articulated tram for export to Pyongyang in North Korea, and may be well-equipped to fulfil orders for the several light rail schemes under consideration in China.

Market prospects

Although the recession in mainland Europe means that the boom in orders is unlikely to continue at the current level, large German systems such as Dresden and Hannover are known to be contemplating new orders, and many first-generation Duewag articulated trams will need to be replaced by the turn of the century.

The Scandinavian capitals of Helsinki, København and Stockholm are proposing to order cars (the latter two being new light rail systems), while low-floor cars are on the agenda in cities such as Amsterdam, Antwerpen, Göteborg, Linz and Utrecht. New French tramways are likely to be built in Montpelier, Orléans and Valenciennes. Other cities expecting to build new systems are Barcelona in Spain, Porto in Portugal and Sydney in Australia.

The North American market shows no sign of slackening: Toronto needs low-floor trams, while new US systems will appear in Chicago, Jersey City and New York, with others such as Seattle in the pipeline. Philadelphia and Pittsburgh wish to replace existing cars.

An optimistic view of UK developments would see new systems in Croydon, Leeds, South Hampshire and the West Midlands being built before the turn of the century, and it is notable that a new manufacturing consortium lead by Babcock has been set up to develop a low-cost British LRV. There are several embryonic schemes in third-world countries, though finance is always a problem.

Thus the tram and LRV manufacturers have a good market to aim at, though increasingly the smaller companies are likely to find themselves squeezed by the multinational giants, particularly if an enlarged EU brings its competitive tendering rules to more countries.

NB In some cases the contracts referred to may have been placed with electrical equipment suppliers.

TGV under air counter-attack

While rail and air are working together closely in France to create intermodal hubs, Air Inter is strongly challenging SNCF for long distance domestic passengers, as François Batisse explains

Up to 1990, expansion of France's high-speed rail network was so significant that experts predicted that TGV could halt the already limited growth of domestic air traffic - and might quickly oust French domestic carrier Air Inter from all main routes. The previous year, TGV had carried more than 20 million passengers, overtaking Air Inter's total of 15.7 million. Then the airline's results were hit by the 1991 recession, only climbing in the following year to carryings of 16.4 million. Meanwhile TGV passed the 30 million mark in 1990, thanks to the addition to the network of TGV-Atlantique, and reached 39.3 million passengers in 1992, more than double the level achieved by Air Inter.

Air response

However, a substantial recovery in domestic air traffic occurred in 1992 and continued during 1993, with an increase of 3.7 per cent each year, while TGV results were unexpectedly disappointing. TGV-PSE lost 400,000 passengers in 1991, a fall of 2 per cent, and did not recoup the loss in 1992, when growth of 1.7 per cent was achieved against an expectation of 2.3 per cent. TGV-Atlantique also fell short of expectations in 1992, increasing carryings by 13.5 per cent against planned growth of 24.5 per cent.

While TGV has suffered from a slack economy, the slowdown in TGV traffic growth has also in part been attributed to customer dissatisfaction at the high perceived cost of reservation fees and to drastic increases in season ticket prices. At the same time growing competition from airlines on routes parallel to TGV has offered passengers increased flight frequency - in some cases 20-30 daily flights - and "frequent flier" inducements. And SNCF's much-publicised difficulties with its Socrate ticketing and reservation system was also set to contribute to an expected six per cent fall overall in main line passenger traffic in 1993, in spite of the launch of TGV-Nord.

For its part, Air Inter responded much more effectively to TGV-Atlantique than it did to the first TGV attack ten years ago. Instead of throwing in the sponge by reducing its frequencies, contributing to a loss of 500,000 passengers on the premier Paris-Lyon corridor, the airline maintained the number of flights on its Paris-Bordeaux and -Nantes routes, introduced ticket-vending machines for passengers with cabin baggage only and offered frequent flier benefits and an attractive range of special youth fares. As a result, after an initial 25 per cent fall in traffic, Air Inter contained TGV competition between Paris and Bordeaux and reported a 10 per cent rise in 1992. The air counter-attack appeared finally to have brought the TGV threat to a standstill.

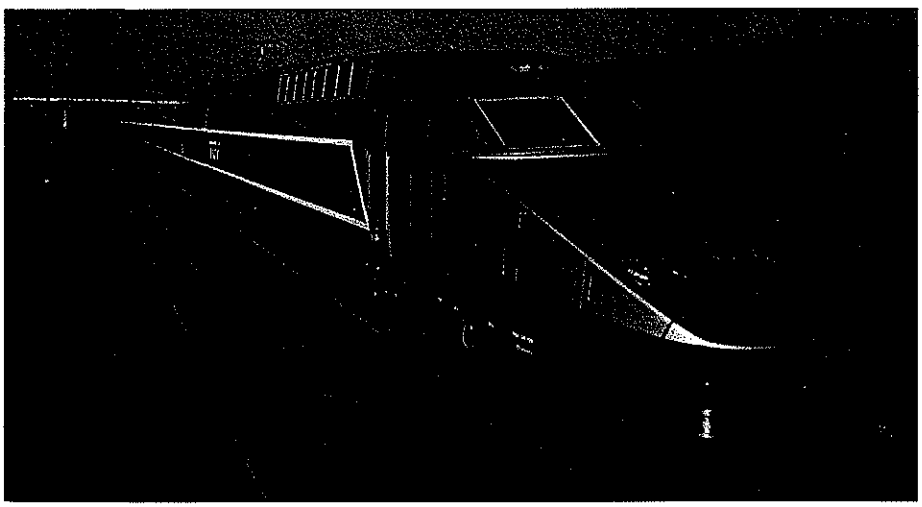
Now Air Inter is challenging SNCF on the planned extension of the TGV network to Marseille and Montpellier as part of the Grand Sud project. While SNCF predicts that 3.5 million passengers will transfer annually to TGV from air, Air Inter asserts that only 1.4 million will switch modes. In support of these claims Air Inter points to its own traffic growth, which is faster than that for TGV-PSE, and its current 65 per cent portion of air and rail's share of the Paris-Marseille market. Further south, air's market share currently reaches 75 per cent on the Paris-Toulouse route and 85 per cent between Paris and Nice, the busiest air corridor in Europe after Paris-London. On the Paris-Strasbourg route, to be served by SNCF's planned TGV-Est line, rail and air are shoulder to shoulder.

Rail wins the day

However, in its opposition to SNCF plans Air Inter has not won the investment argument, either on the Paris-Marseille or on Paris-Strasbourg routes. Airline executives claimed the advantage of being able to increase capacity with practically no new expenditure, while the two high-speed rail projects would incur infrastructure costs of FFr20 billion and FFr25 billion. This argument was not strong enough, although it came from a carrier that nearly balanced its account with a minimal loss in 1992 of less than one per cent of its turnover, compared with SNCF's five per cent. The comparison will be more marked in 1993 when Air Inter expects losses equivalent to two or three per cent of turnover, while SNCF losses will probably reach 15 per cent.

Now Air Inter is turning its attention to the issue of indebtedness. The airline's long-term debt is just a fraction of the fast-growing figure for SNCF, which in 1992 stood at FFr142 billion and for 1993 could rise to FFr 160 billion. With such a burden, it is difficult to see how SNCF can fund new line construction without facing the unsupportable weight of huge financial charges.

The next round in the contest will focus on air-rail connections at the new stations being provided at Paris Charles de Gaulle and Lyon Satolas. Within the next year, TGVs will deliver passengers to the terminals at both airports, but both industries must wait to see how many passengers will use medium-haul rail services to join long-haul flights, or the degree of modal switch that will occur: one million passengers per year are expected to arrive by TGV at Charles de Gaulle, far fewer at Satolas. Whatever the result, Air Inter will do its utmost to limit the impact on its own traffic through air-rail complementarity and to persist with its arguments against such investments.



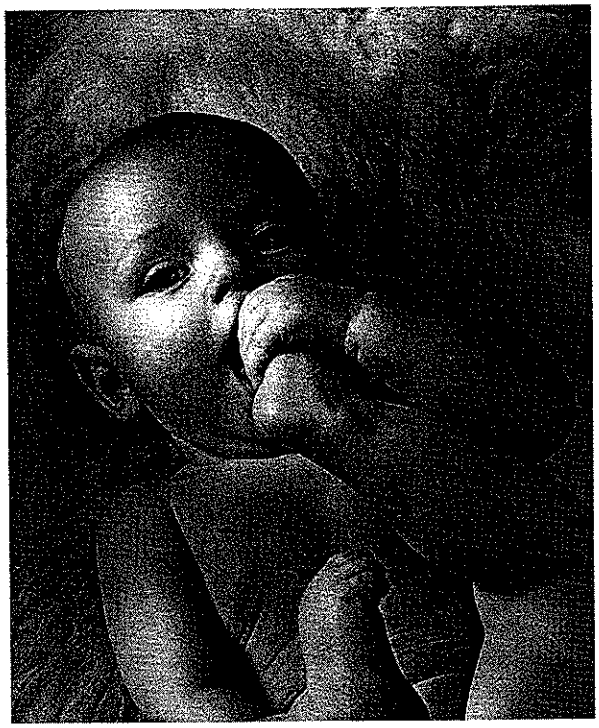
TGV-Atlantique: under increasing pressure from air competition

TGV derailment leaves just two injured

Investigations by SNCF into the high-speed derailment of a TGV set on its Nord Europe line on 21 December blame the accident on the subsidence of previously undetected World War 1 trenches following exceptionally heavy rainfall.

Four vehicles of an early morning Valenciennes-Paris TGV left the rails at around 300km/h near Ablaincourt-Pressoir. Injuries were sustained by only two passengers, one of which required hospital treatment, a remarkable reflection of the safety of the TGV design.

In a statement issued in January, SNCF forecasted that TGV Nord Europe services would suffer delays of at least ten minutes for six to eight weeks while a detailed survey was made of the area. As compensation, all passengers were being offered a ten per cent price reduction, while those delayed by more than 30 minutes would receive a 20 per cent rebate.



David Holler,
8 months old

"There are very few alternatives to the pram. One of them is the Variotram."

When little David goes shopping with his Mum, he feels fine. He rides in a pram that offers every comfort. And what better chauffeur could you wish for than Mummy? The only trouble she has is negotiating those high steps into the tram. David is well aware of the problem – and complains each time.

In future things will be a lot easier for both of them. The floor of ABB Henschel's new Variotram is at just the right level that mothers (and fathers) with prams, people in wheelchairs, and the elderly will be able to get on and off without any trouble at all.

The passenger friendly, low-floor design of the Variotram is just one of the many benefits this innovative urban transit system provides. Based on a unique modular design concept, this light rail system of the future adjusts to the needs of the operator: it has all the joys of a pram, but it's as quiet as a whisper. And with state-of-the-art three-phase AC drive technology and a new concept in hub motors, it is designed for economy in operation and sensitivity to the environment.

The Variotram.
Another good idea from ABB Henschel.

ABB HENSCHEL

DLR sets new standards

London's Docklands Light Railway has published details of target service standards it aims to provide, including train service performance, already running at 98 per cent reliability, information and ticketing, and cleanliness of trains and stations. DLR also aims to build "good neighbour" relationships with local communities close to its lines.

Commenting on the initiative, Managing Director Malcolm Hutchinson said, "Systems have been set up to monitor performance targets regularly - the results will be published quarterly at stations - and our staff appraisal and reward procedures will be based on the success our staff have in meeting the standards set."

Completion of resignalling using the Alcatel Seltrac moving block system, together with other capacity improvements, should allow the re-introduction of late night weekend services by mid-1994.

- Government go-ahead has been given for DLR to develop a joint venture between private and public sectors to extend the network to Lewisham. The scheme had already received Parliamentary approval in May 1993. Tenders for the £100 million 4.2 km line, which includes a tunnel beneath the Thames, should be invited next year, with construction starting in 1995. Opening is expected in 1997/98.
- DLR's Beckton extension is scheduled to open on 28 March 1994 with a service between Beckton and Poplar. Opening of the 7.7 km line, which includes ten new stations, has been delayed until DLR management is fully confident in perfect functioning of the Seltrac automatic train control system.

- **Works locomotives and wagons:** a £6 million contract has been placed with RFS Engineering Ltd to supply 14 works locomotives, with an option for a further six. First delivery will take place in June/July 1995. Works wagons valued at around £2 million are to be supplied by Bombardier Prorail Ltd.

Contracts for trackwork are yet to be awarded.

Ove Arup & Partners have been appointed Secretary of State's Agent to provide expert technical advice as the project goes ahead.

- A seminar on sub-contractor opportunities connected with the Jubileer Line Extension will be held in London on 2 February. Details are available from the London Chamber of Commerce & Industry, fax +44 71 489 0391.

- In early December, LUL launched its application for powers to build a 4km northern extension to its East London Line. The £100 million project would link Whitechapel with Dalston via four new stations, and include a new stock servicing facility at Silwood. If LUL is successful in attracting private sector finance for the project, work could begin in 1995, allowing opening in 1997.

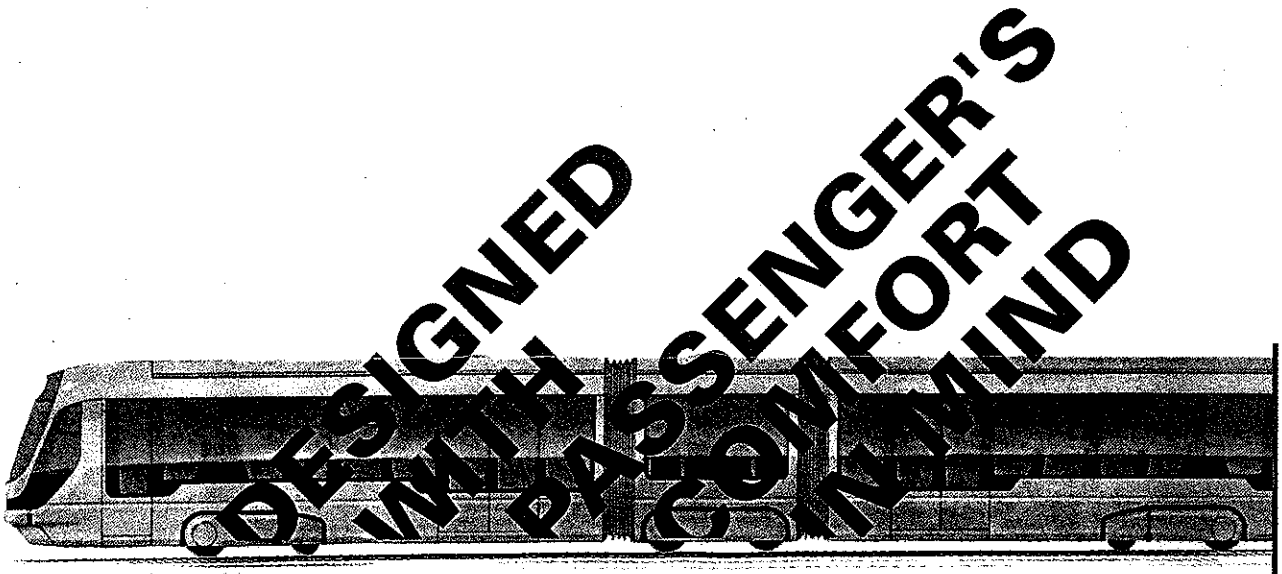
Meanwhile, planning continues on the proposed southern extension of the East London Line from Surrey Quays to East Dulwich, with an application for powers to build scheduled for 1994. Discussions are also progressing on a further extension to the north from Dalston Junction to Highbury & Islington.

NSE links east with west

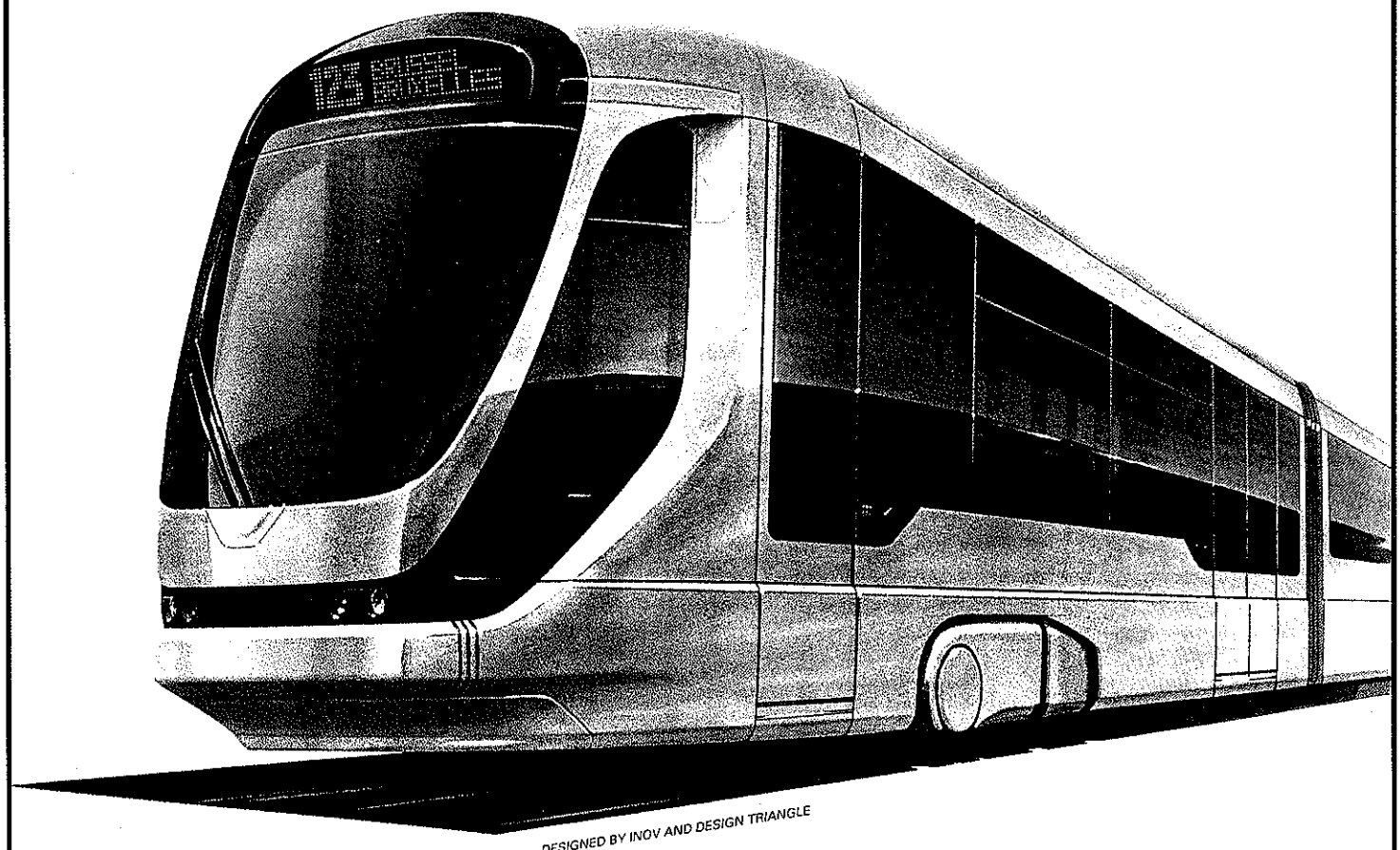
Network SouthEast's North Division has announced a £60 million modernisation of its North London line linking Richmond in the west with North Woolwich in the east of London.

Developed in partnership with European Passenger Services, Trainload Freight and Railfreight Distribution, the project will benefit from the need to provide 25 kV electrification over part of the route to allow North of London Eurostar services access to the East Coast Main Line. Other work will include some track relaying, refurbishment of selected stations, and improved interchange facilities. Most of the work will be completed by May 1995.

100 % LOW FLOOR LIGHT RAIL VEHICLES



Brussels' low floor tram



DESIGNED BY INOV AND DESIGN TRIANGLE

BN division of
Bombardier Eurorail

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PRm PASSENGER RAIL management

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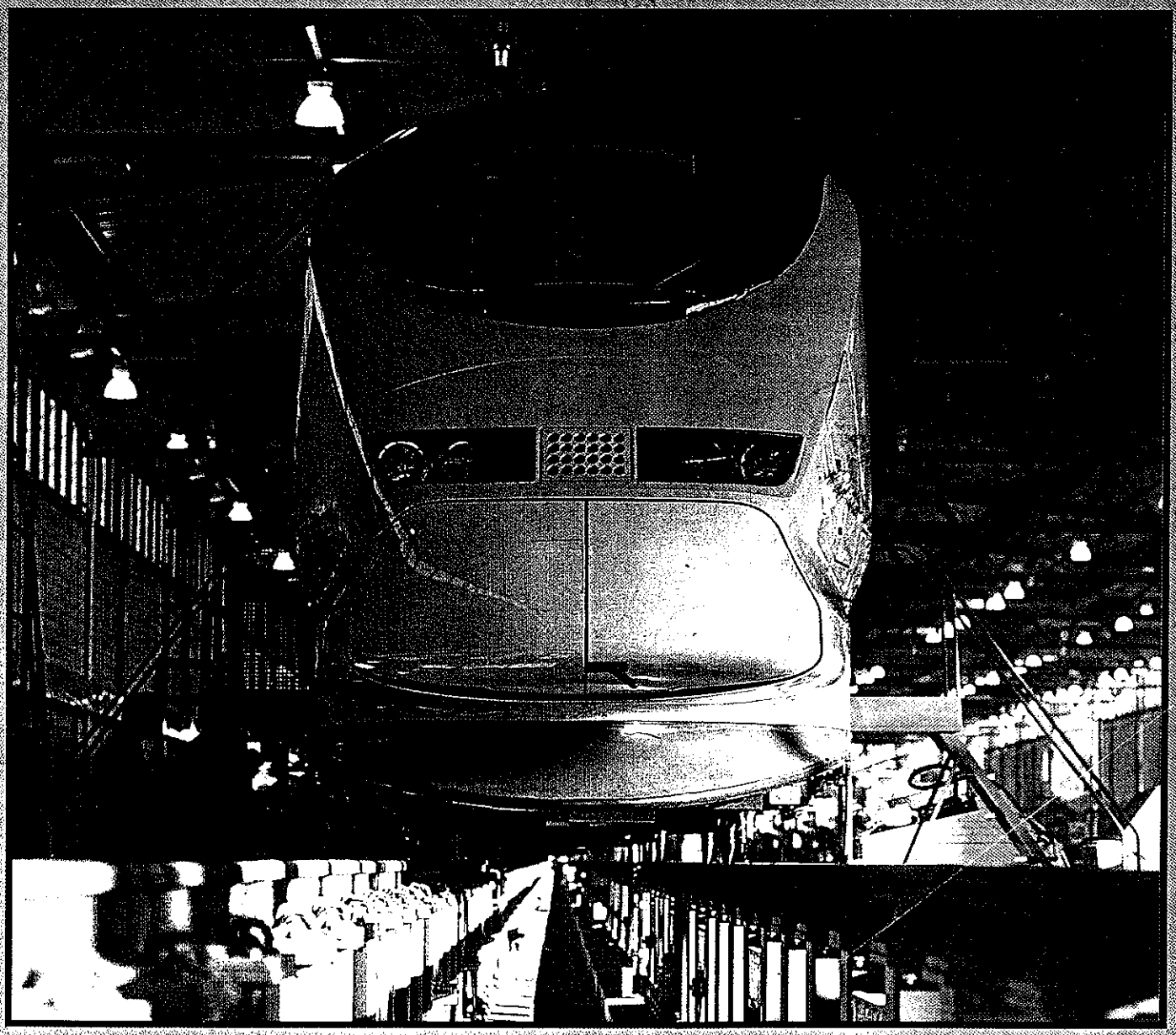


French high-speed
Passenger information
LRVs: builders and buyers

Go-ahead for Jubilee Line Extension

After much delay, the £1.9 billion, 16km Jubilee Line Extension from Green Park to Stratford was finally given the go-ahead in late October and inaugurated by Prime Minister John Major on 8 December. The JLE heads up a range of projects to extend East London's urban rail network

UK Government approval for work to begin on the London Underground's much-delayed Jubilee Line Extension was finally given on 29 October. Prime Minister John Major ceremonially inaugurated work on the £1.9 billion, 16km project at Canary Wharf on 8 December.

Key to the go-ahead for the scheme, which will considerably improve links between Docklands and central London, was the High Court's decision to discharge from administration Olympia & York (O&Y), developers of the Canary Wharf property complex.

The Jubilee Line Extension had always been dependent on O&Y's private sector contribution, and became a victim of the company's financial difficulties. Under the current funding package, O&Y will contribute an initial £100 million, funded by a loan from the European Investment Bank, followed by a further £300 million to be paid by the Canary Wharf company over approximately 24 years after the line's completion.

The new line will run from Green Park, currently penultimate station on the existing Jubilee Line, to Stratford. The first 12km will be in deep twin tunnels on concrete slab track, and four of the line's 11 stations will be new. The rest of the route will be at surface level following an existing rail alignment.

Amongst the many safety features in the design of the new line are sliding screen doors at platform edges, the first such application on LUL. A new control centre at Neasden will be built, and signalling and control systems on the existing line will be upgraded. Rolling stock will be maintained at a new depot at Stratford Market. Completion of the project is expected in the first half of 1998.

Contracts for the scheme worth £1.3 billion have already been placed. Among these are:

Civil engineering: contracts worth over £600 million for various sections of work have been placed with Aoki-Soletanche Joint Venture; Balfour Beatty-Amec; Christiani & Nilesen-O'Rourke Joint Venture; Costain-Taylor Woodrow Joint Venture; John Laing Construction Ltd; McAlpine-Wayss & Freytag-Bachy Joint Venture; John Mowlem Construction plc; Wimpey Construction Ltd

Rolling stock: GEC Alsthom Metro-Cammell Ltd are to supply 59 6-car train sets at a cost of some £250 million. These will be aluminium-bodied with an ac traction package.

Propulsion and auxiliary power systems will be supplied by GEC Alsthom Traction Ltd. The new trains will be phased into service on the existing Jubilee Line from early 1997, replacing current stock, which will not be equipped for moving block automatic train control.

Power, cable and conductor rail: to be supplied by GEC Alsthom Transmission & Distribution Projects Ltd. The £52 million contract also covers reinforcement of power supplies on 21km of existing line.

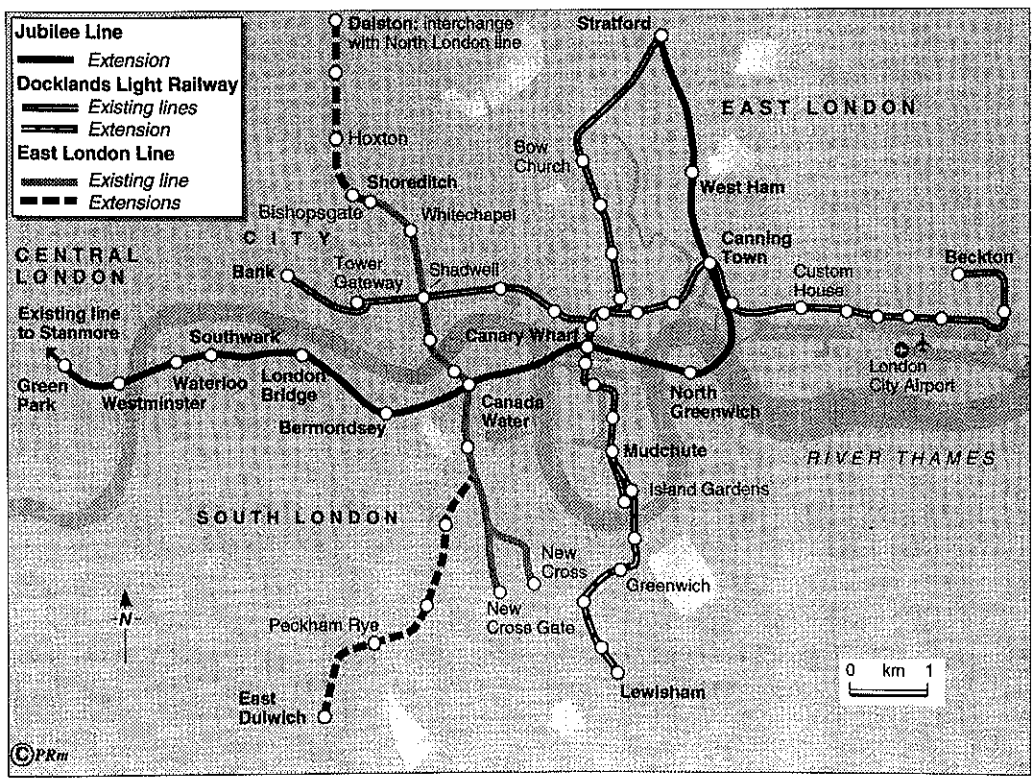
Communications: a £60 million contract has been placed with GPT Ltd to supply radio communications facilities, passenger information displays, public address, and station and network management systems. CCTV coverage of all public areas will be provided, and dedicated station operations/control rooms will enable staff to monitor all functions within the station.

Lifts and escalators: O & K Escalators Ltd will supply these under a contract worth over £50 million. Lifts will be fire-hardened to ensure safe evacuation of passengers with disabilities.

Signalling and train control: Westinghouse Signals Ltd has been awarded a £50 million contract to provide signalling and automatic train control equipment for the Extension and to upgrade the existing Jubilee Line to the same standard. The radio-based automatic train control system will use moving block techniques to allow the operation of up to 36 trains per hour in each direction.

Station and tunnel services: JWP (UK) Ltd-Drake & Scull Engineering Ltd Joint Venture.

Ticketing system: under a £10.5 million contract, Westinghouse Cubic Ltd (WCL) will design, manufacture, install and commission automatic fare collection equipment. WCL will supply 210 automatic gate stanchions to a new design, 48 clerk-operated ticket machines, 70 passenger-operated ticket machines of advanced specification, and station level computers, control units and printers. Trial operation is planned for October 1997.



Planned or projected extensions to the East London urban rail network