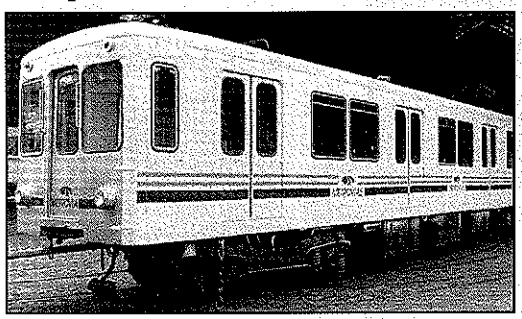
VOL XXXIV No 12 DECEMBER 1994

World News

Rapid Transit Review



Signalling

Features

Front Cover

Level crossings supplied by ABB Signal, Sweden, will operate in deep snow and extreme cold. The lowering of the barrier is adapted automatically according to the category of train and its approaching speed. **(Reader Service number 510)**

NATM Challenged After Tunnel Collapse

Mike Knutton

TWO well-publicised collapses in tunnels being driven using the New Austrian Tunnelling Method have tarnished the reputation of the technique and renewed a vigorous professional debate about the circumstances and ground conditions in which it should be used. A catastrophic tunnel collapse in Munich in September produced a hole in a road into which a bus plunged, killing three people. A collapse beneath one of the world's busiest airports, London Heathrow, in October severely damaged a building 20m above the works for the station complex for the Heathrow–London rail link and caused serious disruption for air travellers.

The New Austrian Tunnelling Method (NATM) is anything but new, having been introduced about 40 years ago and used successfully on many projects including the Frankfurt U-Bahn, the Washington metro, and the crossover chamber on the British side of the Channel Tunnel.

NATM was developed for use in rocky ground and the controversy which surrounds the method is about its suitability in softer materials such as London Clay. The technique uses the strength of the ground surrounding the tunnel to minimise the need for any extra strengthening required to prevent collapse or settlement. NATM may involve rock bolting or ground freezing in conjunction with laying a steel mesh over the excavated area and shotcreting it.

The advantage is that the tunnel can be driven using ordinary diggers rather than tunnel boring machines (TBM) and this can reduce tunnelling costs by up to 25%. The disadvantage is that ground conditions are absolutely critical. There have been a number of collapses during railway construction over the years and the question seems to be: what level of risk is acceptable?

There were a series of collapses during construction of the 330km Hannover–Wurzburg high-speed line in Germany, which has about 120km of tunnels. The most spectacular was a failure at Krieburg when 55m of tunnel caved in. On average, there was one collapse for every 10km of tunnel on the line.

In the Heathrow airport incident in which four months tunnelling work was lost, the ground could only be stabilised by the injection of structural concrete into a shaft at the rate of 27 truckmixer-loads/hour to create a 9m-deep plug at the bottom. Car parks were evacuated, a metro station closed, and the damaged building above the devastated area will have to be demolished. All this follows the precaution of an NATM test section.

The authoritative British journal, *New Civil Engineer*, reported: "Early doubts about using this method in material as soft as London Clay for the first time were dispelled in 1992 after a £1.2 million trial tunnel showed settlement well within the tolerances permitted in such sensitive areas as Heathrow."

The fact that the collapse has reintroduced the doubts could have serious consequences for railway construction, not only in Britain but throughout the world. In London, NATM work excavating two stations on the Jubilee Line extension was halted.

It is not difficult to imagine a number of schemes being killed off on financial grounds if TBMs instead of excavators have to be used to excavate tunnels. The debate about NATM has been going on for years. Today, there has never been a greater need for consensus from the tunnelling professionals on whom project promoters and rail operators have to rely for advice and information.

M Knutton

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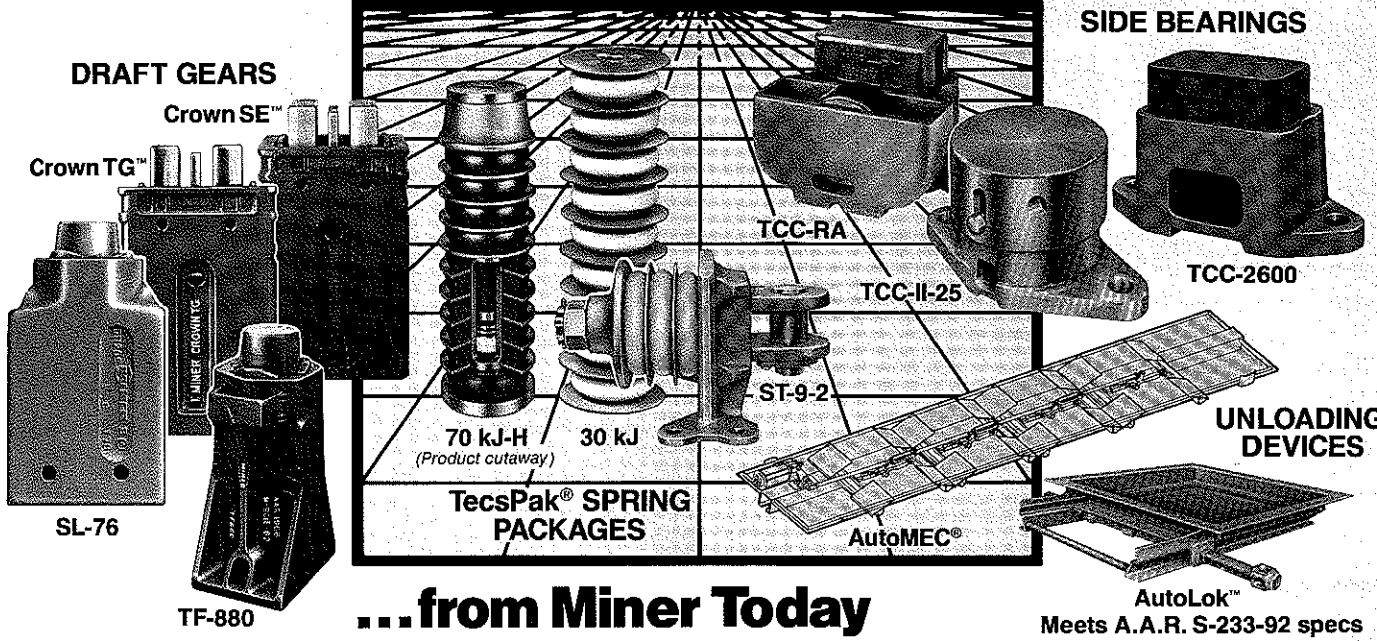

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EFE To Sell 51% Of Fepasa

CHILEAN State Railways (EFE) was due to sell off a controlling 51% share in its freight subsidiary, Pacific Railways (Fepasa), by the beginning of this month. EFE has been considering several offers submitted by a revised deadline of October 31, and it was expected to choose the winning bid on November 30.

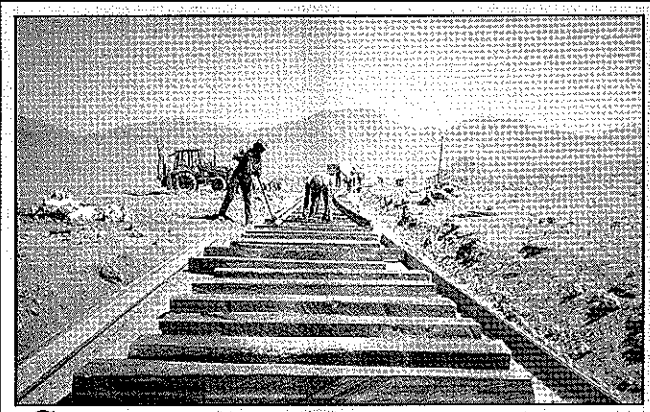
Privatisation of Fepasa was delayed to allow more time for companies and consortia to formulate their technical proposals. Tenders were originally due to be submitted by June 26 (IRJ March p2). The amount offered for the shares was given a 75% "weighting" by EFE in the evaluation procedure, while the remainder of each assessment was based upon each bidder's strategy for developing railfreight, its proposed operational plan up to 2000—including commercial policy and equipment maintenance programmes—and investment plans, as well as its overall financial policy up to 2000.

Those expected to submit bids for the shares were:

- The Pacific Consortium, comprising the port authority of Ventanas; the Chilean electricity generating company, Chilgener; Chilean Navigation and Interocean (CNI); Agunsa, Chile; the American Investment Company; and consultant Transurb, Belgium
- CSV, a South American shipping company
- CAC, a Chilean forestry and paper company
- Anacostia and Pacific, United States, and Cruz Blanca, a Chilean healthcare company, and
- Spanish National Railways (Renfe), and CTF, a Chilean equipment maintenance company.

EFE is also likely to press ahead with privatisation of some passenger services in the near future. It has drawn up a plan for upgrading track and acquiring passenger coaches and sleeping cars from European railways (see p55), and the Chilean government has suggested it would be willing to approve funds for the project if EFE makes further moves towards privatisation.

EFE's president, Mr Ignacio Echevarría, has already said he would like to dispose of the railway's entire network of inter-urban passenger services. He feels this would ensure that future governments could not force the railway to operate or reinstate loss-making services.



CONSTRUCTION of the new 50km line being built by the Antofagasta (Chili) & Bolivia Railway (FCAB) through Chile's Atacama desert, connecting Pampa station to O'Higgins, is presently three months ahead of schedule. The line will enable mineral traffic to be carried from the new Zaldivar copper mine to the deepsea port of Mejillones, and is due to be completed early next year. FCAB anticipates annual traffic of 375,000 tonnes.

Spain To Fund Renfe Infrastructure Directly

THE Spanish cabinet has approved Spanish National Railways' (Renfe) 1994-98 Contract-Programme. For the first time, the state has agreed to assume financial responsibility for infrastructure, with a total of Pesetas 683.1 billion ($US 5.4 billion) in subsidy to be transferred to Renfe during the course of the programme.

During the same period, Renfe has been contracted by the government to manage the infrastructure and to oversee all maintenance.

With its role reduced to that of a provider of transport services only, Renfe will receive subsidies only for suburban and regional services. Pesetas 197.2 billion will be allocated to the former and Pesetas 35.8 billion to the latter. However, levels of subsidy for regional services will be reduced in the long term.

Both long-distance passenger and freight services are expected to break even by 1998. To achieve this requires a growth in income of 5 and 10% respectively.

The government has also agreed to assume responsibility for Renfe's historic debt, which stood at Pesetas 486.4 billion at the beginning of 1994, while Renfe has undertaken to reduce costs, which will result in the loss of 4350 employees in 1995.

Italy To Invest More In Rail

ITALIAN Railways (FS) will invest Lire 40,000 billion ($US 25.9 billion) under the proposed contract programme covering 1995-97, which is expected to be signed by the end of the year by FS' managing director, Mr Lorenzo Necci, and the Italian Minister of Transport, Mr Publio Fiori.

Lire 30,000 billion relates to investment planned, but not made, under the contract programme between FS and the government which was signed in December 1992. To this has been added another Lire 10,000 billion for new projects.

The agreement will allow several large-scale projects to go ahead. These include the construction of the Milan–Venice and the Milan–Genoa high-speed lines (IRJ October p29).

Fiori said that international priority projects are the proposed new line from Turin to Lyon in France, to which Lire 100 billion will be allocated for planning, and the connection to the new Gotthard base tunnel in Switzerland.

Also included is Lire 9500 billion for motive power, rolling stock, signalling, and train control equipment. This includes Lire 2500 billion for the high-speed trains and equipment.

SBB Projects 1995 Deficit

SWISS Federal Railways (SBB) forecasts a deficit of SFr 343 million ($US 272 million) in its budget for 1995, but says it will balance the accounts during its medium-term plan from 1996 to 2000. SBB's commercial case will now be considered by the Swiss parliament, which is due to renew the railway's mandate from the beginning of next month.

SBB blames the likely deficit next year on several factors, including a reduction in annual government subsidy from SFr 725 million to SFr 692 million, an increase in value added tax amounting to an extra SFr 90 million, and the cost of radical changes which will see SBB adopt separate accounts for railway operations and infrastructure, and reorganise its operating divisions into profit centres (IRJ June p4 & 16).

Total anticipated revenue from passenger and freight traffic during the coming year is an estimated SFr 6.42 billion, while expenditure is forecast to be about SFr 6.76 billion. This deficit will be added to SBB's existing debts, currently amounting to SFr 13 billion, though there is a possibility that the Swiss government will write-off the entire amount as a prelude to privatisation of the railway.

SBB should reduce its costs in subsequent years as a result of the reorganisation, as well as the disposal of its loss-making door-to-door parcels delivery services. In addition, the ambitious Rail 2000 project has been scaled down dramatically, with a revised infrastructure budget of SFr 7.4 billion—approved by parliament earlier this year—in place of the original SFr 16 billion budget. This saving was achieved mainly by scrapping proposals to build three out of four new high-speed lines.

A study is also being made into ways of cutting down the costs of track maintenance, and reducing the amount of fixed track equipment in use on the network. A pilot study of three lines has already identified a potential annual saving of SFr 15 million, which would be achieved partly through removal of more than 150 switches and 12km of track.

The lines involved in this initial assessment are Lausanne–Bern, Wohlen–Arth-Goldau, and Schaffhausen–Romanshorn. If similar "simplification" is applied throughout the network, it is believed that the maintenance costs overall could be reduced by more than SFr 100 million.

First-class interior of the lower deck of the new Interregio trains.

New NS Double-Deckers Ready

NETHERLANDS Railways (NS) is to start operating new double-deck emus, ordered for Interregio passenger services, on its Amsterdam–Vlissingen route from the beginning of next month.

Trials on the Dordrecht–Roosendaal line are reported to be progressing smoothly, following the arrival of the first train during the summer (IRJ July p5). The railway has ordered 34 three-car and 47 four-car sets, costing Guilders 1.15 billion ($US 680 million), from Waggonfabrik Talbot, Germany.

The trains offer improved facilities for passengers, and they will also be easier to clean. Their interior design is meant to reflect a "lounge" concept, with individual seating with headrests, soft curving lines for luggage racks and lighting units, and soft lilac, grey, and purple colour schemes. Other features include additional luggage space between seats, air-conditioning, toilets accessible to wheelchair users, and electronic on-board information displays. A lift will also enable one refreshment trolley to serve both decks.

Delivery of the fleet is due for completion before Interregio services begin to form the second tier of NS' new three-tier timetable in 1996.

Talgo US Lease Extended

THE company Renfe-Talgo of America, in which both Talgo, Spain, and Spanish National Railways (Renfe) each have a 42.5% stake, has agreed to renew a leasing contract for a Talgo Pendular train imported from Spain with the US state of Washington for a further six months.

The twelve-coach train commenced service between Seattle and Portland, Oregon, in March. About 60,000 passengers were carried, double the number expected, with occupancy rates as high as 80% and no serious breakdowns or incidents recorded.

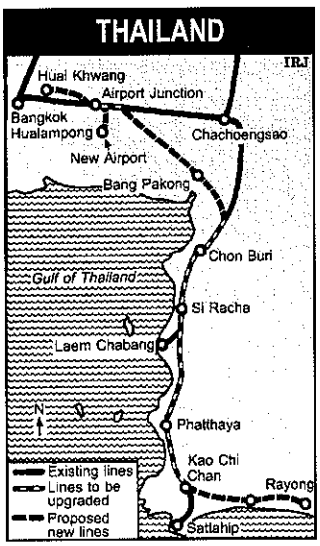
The same Talgo Pendular set undertook a promotional visit to California in October, then appeared in Chicago along with Mr José Borrell, the Spanish minister of transport. State authorities are expected to issue tenders at the end of 1995 for seven 12-coach trains for upgraded 200km/h services between Chicago and St Louis.

Rail Link Planned To Bangkok's New Airport

A PROJECT to create a new 160km/h rail link between Bangkok and Rayong, via Thailand's planned second Bangkok International Airport, a distance of 200km, has been approved by the Eastern Seaboard Development Board. This follows an economic feasibility study which concluded that the project could be viable.

Thailand's government has subsequently asked for grant aid from the United States' Trade and Development Agency, which will enable it to go ahead with environmental impact studies, as well as investigate possible methods of attracting private finance for the construction and operation of the line.

In the meantime, the State Railways of Thailand (SRT) has been told that it will be responsible for implementing the design stage of the project. The government's final decision will depend largely upon the results of the US-funded studies, which it hopes can begin early next year.



The project involves a mixture of upgrading and electrifying existing lines—mainly a large part of the Sattahip Line—and new construction. The latter comprises a new terminal in Bangkok at Huai Khwang, a new branch line to the airport, a cut-off to Chon Buri, and an extension from Khao Chi Chan to Rayong.

Rolling stock will comprise a fleet of four-car emus, capable of being formed into eight or 12-car consists. It is envisaged that passenger services will operate every 30 minutes in each direction when the line is opened. There will be additional Bangkok-bound services from Phatthaya, interspersed with the services to Rayong, which would provide a 15 minute frequency for services into Huai Khwang.

The proposed airport shuttle service will operate at a 10 minute frequency in each direction, and, at a later stage, this will be reduced to 5 minutes, while trains will also be lengthened.

JZ Plans To Upgrade Lines

YUGOSLAV Railways (JZ) is planning to upgrade sections of its rail network, which covers Serbia and Montenegro, following the recent easing of trade restrictions against Serbia by the United Nations (UN).

Lines to be modernised are the Belgrade–Subotica electrified line, and the non-electrified line from Nis to Dimitrovgrad. Further proposed work includes the construction of a new junction in Belgrade, while the railway is also planning investment in rolling stock.

A Serbian spokesman claimed that the country's pre-war role as a major rail transit route could be restored in the future.

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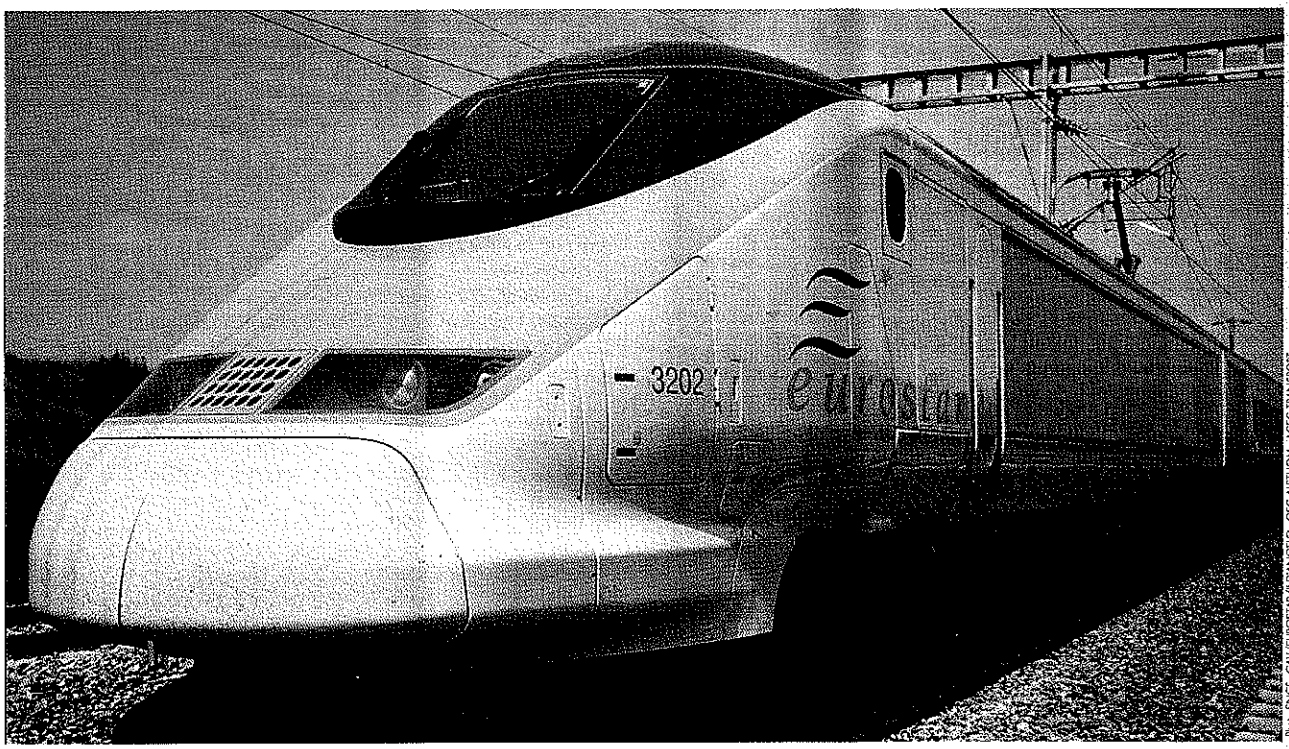

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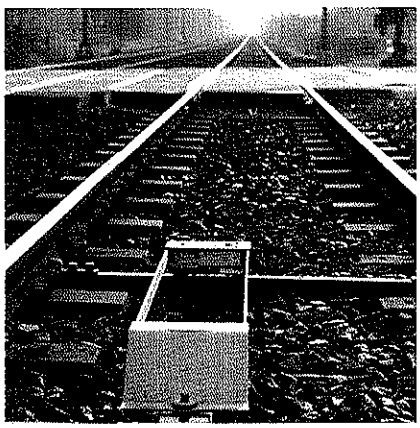

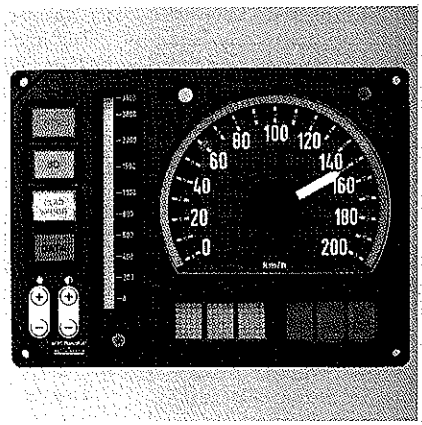

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Lithuania Plans Upgrading

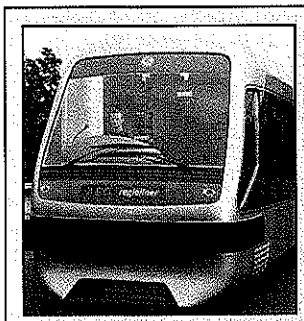
LITHUANIAN Railways (LG) plans to go ahead with vital improvements to its rail network, following an agreement between the government and the European Bank for Reconstruction and Development (EBRD), which will provide funds towards a $US 46.5 million project for uprading rail and highway links in Lithuania.

LG will replace 131km of track on lines connecting the country's eastern border to the Baltic coast, and it also plans to use its share of the finance to carry out a study into improving handling methods for intermodal traffic at Klaipeda, the country's principal port. Railfreight accounts for 95% of all freight traffic currently passing through Klaipeda.

The EBRD is to contribute a loan of $US 18.8 million, while the Export-Import Bank of Japan is expected to provide a further $US 18.9 million, and the Lithuanian Ministry of Transport must find the remaining $US 8.7 million to enable completion of the entire project.

First vice-president of the EBRD, Mr Ron Freeman, said: "Lithuania's formerly well-maintained transport system has deteriorated progressively since the break-up of the Soviet Union, due to a lack of foreign exchange. This situation calls for immediate support.

"The EBRD loan will enable construction to proceed, and it should help Lithuania to retain its important international transit role, linking Klaipeda to Sumskas on the border with Belarus."



A LIGHTWEIGHT modular diesel railcar, called regioliner, has been developed by AEG, Germany, for regional services. It can be operated as a single vehicle or as a two-car train, and has a 70% low floor. It is powered by series 183 diesel engines supplied by MTU, Germany. The regionliner is designed for services which have short distances between stops.

QR Buys Hitachi Tilting Trains

QUEENSLAND Rail (QR), Australia, has awarded a $A 62.5 million ($US 46.4 million) contract to an Australian-Japanese consortium consisting of Evans Deakin Industries and Hitachi-Itochu for two tilting electric trains. One of the reasons why QR selected this group, rather than a competing bid from Morrison Knudsen and Fiat, was that Hitachi has proven narrow-gauge tilting train technology—QR and JR have the same 1067mm track gauge. This is the first export order for Japanese tilting train technology.

The trains will be designed and built by Evans Deakin Industries' Walkers subsidiary using Hitachi tilting equipment, electrical components, and traction motors. Each train will accommodate 323 passengers.

The 160km/h trains are to be introduced in 1997 between Brisbane and Rockhampton. They will complete the 641km journey in less than seven hours. This compares with 9h 25min by the *Spirit of Capricorn*.

This is the first order for tilting trains by an Australian railway. However, State Rail Authority of New South Wales may soon import a demonstration tilting train from Europe for evaluation on the Sydney–Canberra line. Mr Ron Paul, chairman of Evans Deakin Industries, said that his consortium hoped to supply tilting trains to New Zealand Rail and railways in the Far East.

SBB To Approve Major Orders

THE Board of Swiss Federal Railways (SBB) was due to approve on November 24 three major orders for new driving trailers, diesel locomotives, and two more ETR 470 Pendolino trains. The total value of the orders is about SFr 287 million ($US 228 million).

SBB will purchase 60 Mark 4 driving trailers from Schindler Waggon, Switzerland, at a cost of SFr 155 million. These 200km/h coaches will be used on InterCity and EuroCity locomotive-hauled services. They will enable SBB to save eight locomotives, by avoiding the need to change locomotives at terminals. They will be introduced in 1997 when SBB will start its Impulse Programme to operate more intensive passenger services on main lines.

A batch of 30 diesel-electric 1MW locomotives will be ordered from GEC Alsthom, France, at a cost of SFr 68 million. Eleven companies bid for this order offering 16 different types of locomotive. The Bo-Bo units will be powered by a 920kW eight-cylinder diesel. They will be built partly in Spain with final assembly in Switzerland. The locomotives will be used to power infrastructure maintenance trains and for freight trip working as part of SBB's plans to reduce freight operating costs.

The two ETR 470 trains will be ordered from Fiat Ferroviaria, Italy. They will be added to the seven already on order for Cisalpino, the company set up by SBB, Bern Lötschberg Simplon Railway (BLS), and Italian Railways (FS) to operate these trains between Milan and Geneva and Milan and Bern starting in 1996. The new trains will be introduced between Milan and Zurich in 1997 and will cut 50 to 60 minutes off the existing journey time.

Paris Airport TGV Station Opens

THE clumsily-named interchange module and TGV-RER station at Charles-de-Gaulle airport, Paris, was opened last month by the French president, Mr François Mitterand, along with Mr Jean Bergougnoux, president of French National Railways (SNCF), and Mr Jean Fleury, president of Paris Airports.

The complex, claimed to be unique, has been built at the heart of Terminal 2 between existing buildings and future extensions. It comprises tracks for TGV trains, direct RER lines to central Paris, roads and pedestrian access to air terminals and aircraft and, from 1996, an automated mini-metro network serving a number of points within the airport. The interchange and station cost FFr 2.4 billion ($US 464.5 million), 53% of which was provided by SNCF.

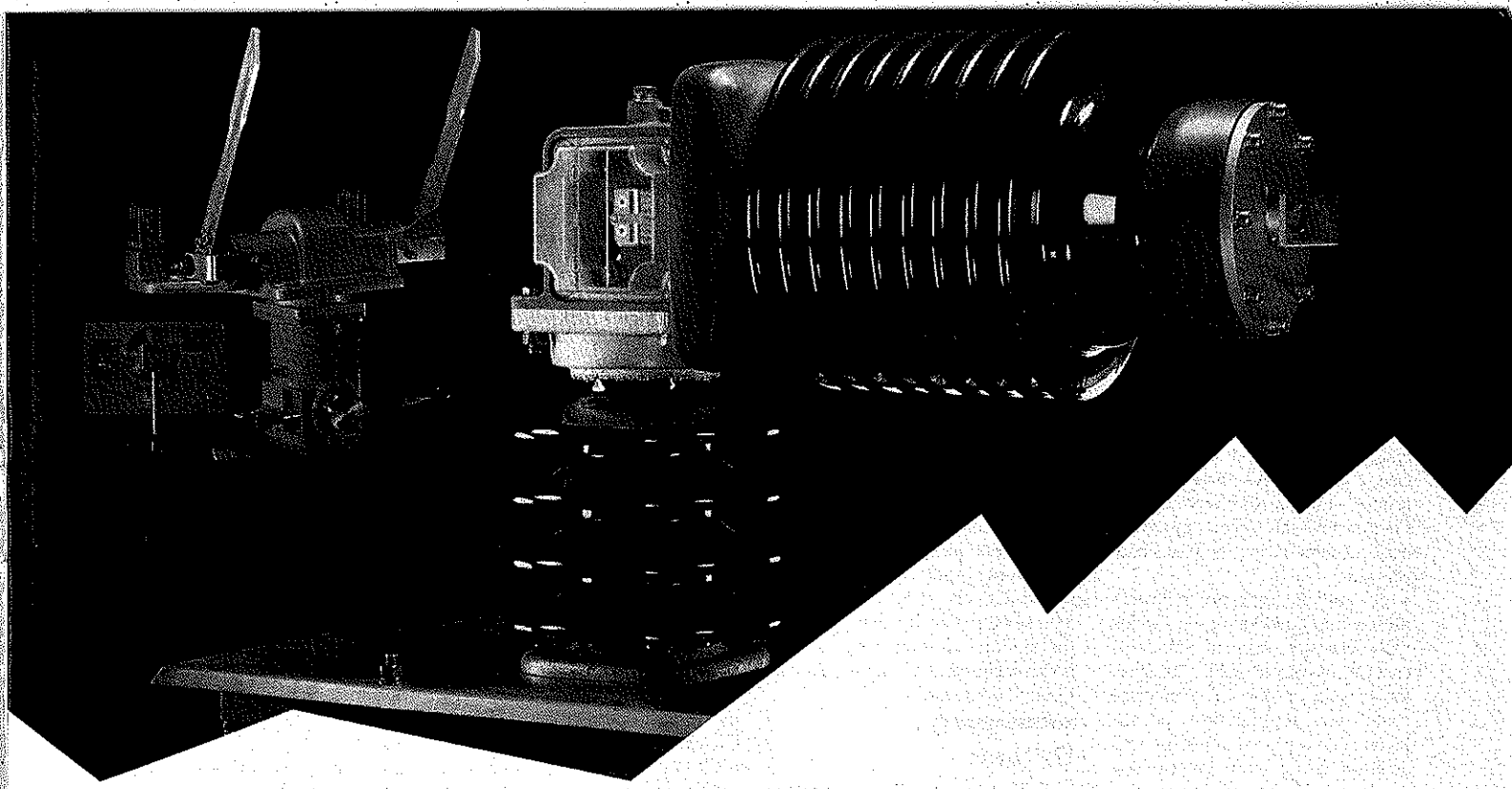
Seven TGV trains/day now serve Lille in a journey time of 50 minutes, six trains/day serve Lyon Part-Dieu in 2h 2min. There are three trains/day to Valence, Avignon, and Marseille, two/day to Nimes and Montpellier, and one/day to Toulon, St Raphaël, Cannes, Antibes, and Nice, plus a seasonal service to Alpine ski resorts.

JR West Share Sale Postponed

THE Japanese government has postponed the planned privatisation of JR West, probably until after the railway announces its annual results in June next year.

It was feared that the railway might not attract bids for all available shares if it was listed on Japanese stock exchanges during the current financial year, which ends in March. The delay follows the recent disappointing outcome of the privatisation of Japan Tobacco, which failed to sell 280,000 shares because its share price was too high.

Mr Shizuka Kamei, Japanese transport minister, said the flotation of JR West would have "adverse effects on the stock market" if it was allowed to go ahead as scheduled.



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World in Brief

Australia:

The State Rail Authority of New South Wales (SRA) expects to wipe out its operating losses by 1995-96. It reduced its annual operating costs by a further $A 23 million ($US 17 million) in 1993-94, and says it has achieved cumulative savings of $A 6 billion in six years, due to fewer operating costs and greater efficiency gains. SRA's three business groups—Freight Rail, CityRail, and Countrylink—all report improved performances during the past financial year.

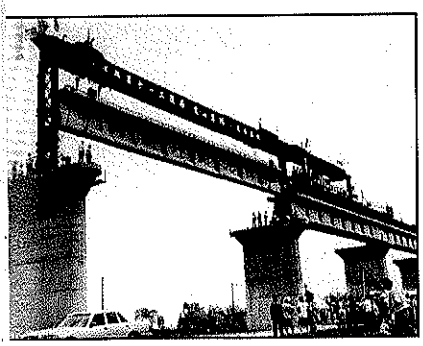
• Australian transport ministers have set up a working group which will determine national standards ensuring access to public transport for disabled people. The outcome could have repercussions on the layout of railway stations, as well as affect the future design of rolling stock for light and heavy rail networks.

• A new $A 8 million locomotive workshop is being built by SRA Freight Rail in the Hunter Valley, New South Wales. The maintenance facility, designed for a faster turnround of locomotives, is expected to be completed by October next year.

Belarus:

Belarus and Lithuania were expected to reach an agreement on the ownership of railway track and stations, following recent talks between governments on demarcation of the border between the countries. Belarussian deputy foreign minister, Mr Stanislaw Agurtsov, said that Adutiskis station, currently in Belarus, would become part of the Lithuanian network, while a previously disputed cross-border section of main line would remain part of the Belarussian network.

China:



WORK is progressing on construction of the 2370km Beijing–Shenzhen line in China, which is due to be completed by the end of next year, two years ahead of schedule. Pictured is a new railway bridge being erected over the Ganjiang River at Ji'an, in the province of Jiangxi.

Bolivia:

Bolivian National Railways (Enfe) could soon be privatised under the government's capitalisation programme, which would transfer about an eighth of the country's economic activities from the public to the private sector. Enfe could be separated into three divisions, with privatisation likely to take the form of 99-year operating franchises awarded to the successful bidders. The sell-off may be completed by the middle of next year if the government can force its legislation through Congress.

Britain:

The Rail Regulator has invited views from the railfreight industry on track access charges for freight services, which must now be negotiated with the new track authority, Railtrack. In a consultation document, the Regulator, Mr John Swift, says his aim is to prevent Railtrack from imposing "excessive" charges or "distorting" the market. This document follows quickly on the heels of the Regulator's recent guidelines for passenger train operating companies (IRJ November p5).

• RFS Industries' remaining maintenance business has been sold by the Adminstrative Receiver to a management team of four senior managers, together with Mr Jonathan Mitchell, who joins the new company as managing director. The group's passenger rolling stock and bogie design and assembly business had previously been sold to Bombardier Eurorail, Belgium, in May.

• A new consortium, Prisms Developments, has been formed by four privately-owned British bus companies, which intend to bid for some of British Rail's (BR) passenger rail services when they are offered for sale from early next year. The consortium, comprising Blazefield Holdings, Q Drive Holdings, EYMS Group, and Lynton Travel Group, says it is also interested in bidding to operate urban light rail networks in Britain.

• BR's three passenger rolling stock leasing companies (Roscos) are attracting strong interest from potential foreign bidders, according to Hambros Bank, which has been appointed by the government to market the Roscos ahead of privatisation. Hambros claims the future sale of Eversholt Train Leasing, Porterbrook Leasing, and Angel Train Contracts could kindle interest in Europe, the United States, and Japan.

Canada:

Via Rail plans to improve passenger services between Toronto and Windsor at a cost of $C 58 million ($US 43 million). A $C 7.5 million track upgrading programme has already been completed, allowing services to operate at 153km/h, compared with the previous maximum speed of 128km/h. This has reduced the Toronto–Windsor journey time by 24 minutes. In addition, Via is to introduce a fleet of 33 refurbished steel coaches which will replace half its ageing stock on the line. The refurbishment is being undertaken by AMF, a subsidiary of CN Rail, Canada.

• CP Rail has selected Bangor and Aroostook Railroad (BAR), in partnership with Iron Road Railways, as its preferred bidder for the 292km Sherbrooke–Brownville Junction line, which crosses the US state of Maine. Final negotiations have begun for the sale of the line, which had been scheduled to close next month.

• CN Rail announced a profit of $C 186 million for the first nine months of 1994, compared with a loss of $C 41 million during the same period last year. In the third quarter alone, the railway recorded a profit of $C 86 million. CN President, Mr Paul Tellier, said: "The overall improvement in the Canadian and American economies led to higher volumes, particularly in our Canadian rail operations." Revenue was up in all major business units, with the exception of petroleum and chemicals.

• CN has appointed Mr Jean-Paul Beaulieu as its new treasurer. Beaulieu is experienced in corporate finance, financial planning, and merger and acquisition activities. He replaces Mr Gerry Church, who has retired.

China:

Preparatory work has started on a planned line which will link Tibet to the Chinese rail network, according to an announcement by the Tibet Planning Committee.

Europe:

Combined Transport Ltd (CTL), the private operator of intermodal services between Britain and Europe, via the Channel Tunnel, has acquired five new shareholders, including Cosco (UK), a subsidiary of China's national shipping company. CTL is partly-owned by Novotrans, France, plus more than 50 British-based transport companies. BR and French National Railways (SNCF) are also shareholders.

• Allied Continental Intermodal (ACI), a through-Tunnel competitor of CTL, has added a new dedicated service from Glasgow, Manchester, Birmingham, and London to Paris Valenton, which becomes the hub of ACI's newly-created 28-terminal network in France.

Netherlands:

The government is considering a Guilders 1.5 billion ($US 887 million) plan to upgrade Netherlands Railways' (NS) existing lines from Amsterdam to Utrecht for 200km/h operation, and beyond to the German border for 300km/h operation. The high-speed project is regarded as relatively "cheap," and could be completed by 2003.

• Another government committee has been set up to investigate whether there are financially viable alternatives to the proposed 100km Betuwe dedicated freight line (IRJ February p8). The committee will report its findings next month, enabling the Dutch parliament to make a final decision on the controversial link in March 1995.

Romania:

The World Bank has pledged to support the Romanian government's $US 380 million project to rehabilitate Romanian Railways' (CFR) network. Plans include track upgrading, improving telecommunications, development of information technology, and upgrading CFR's fleet of diesel locomotives.

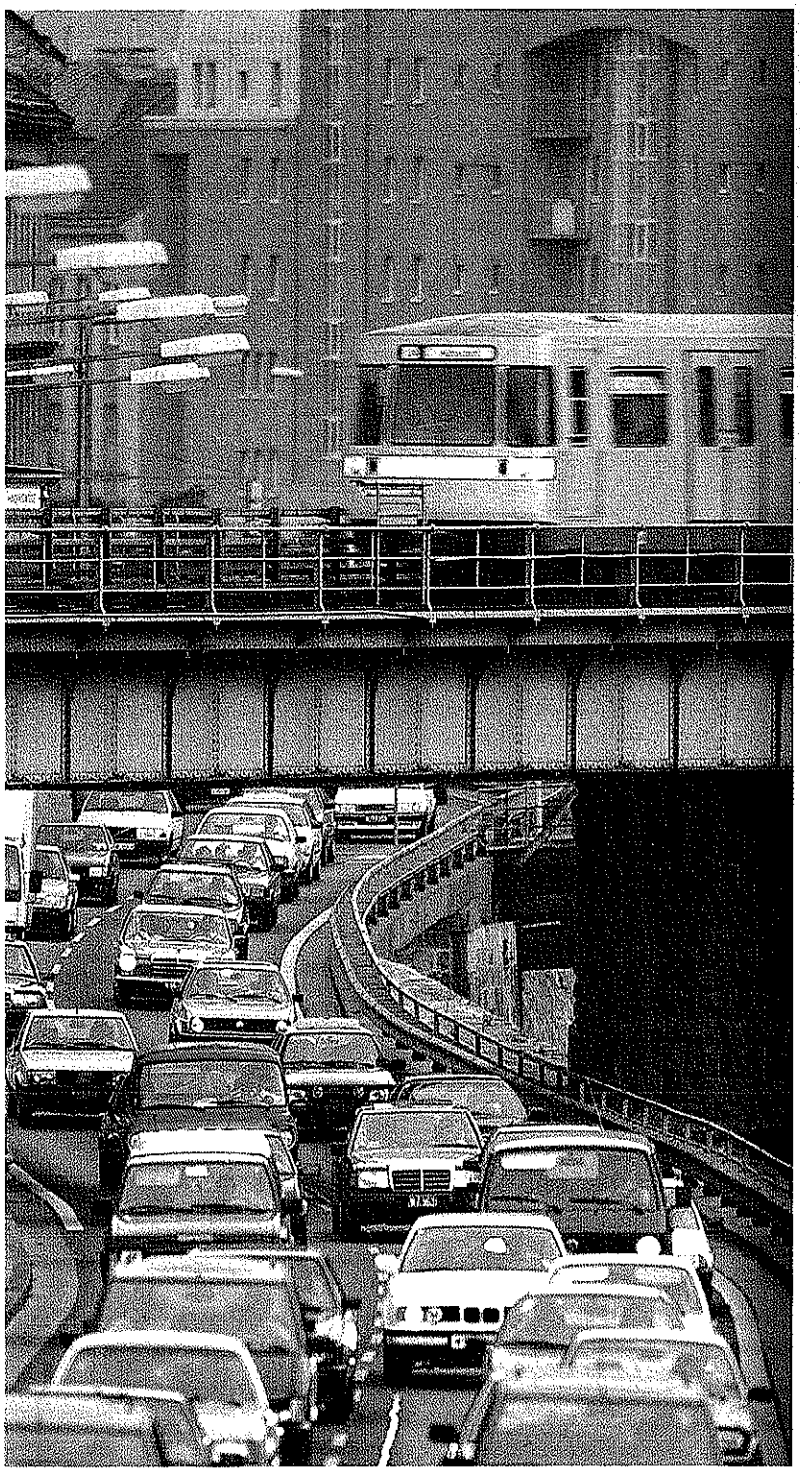
• A 2.5km branch and a railway station have been proposed to serve Otopeni international airport on the outskirts of Bucharest. The extension would provide a direct link with Bucharest North station.

Turkey:

A $US 500 million scheme to upgrade Turkish Railways' (TCDD) Istanbul–Ankara line has been deferred until next year because of the government's austerity programme. Feasibility studies and tender documents have already been completed for the construction of new track, tunnels, and bridges. New tilting trains are also due to be ordered to operate passenger services on the 570km line. Other projects which have been delayed indefinitely are the proposed $US 4 billion Istanbul–Ankara high-speed line, and an underground crossing of the Bosphorus. **IRJ**

SIEMENS

On Top of Traffic.



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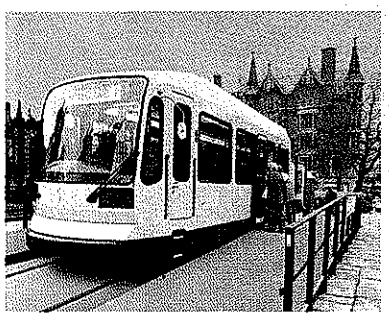

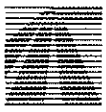

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Australia:

Delivery is due to start in February of the first of 29 heavy-haul diesel locomotives being supplied by Goninan to Hamersley Iron, which will start to put them into service in June. The Dash-9 locomotives are being built by General Electric, United States, and will be maintained by Goninan.

Brazil:

Brazilian Urban Trains Company (CBTU) has issued a call for tender for the refurbishment of 73 coaches for the Rio de Janeiro suburban rail network to be partly funded by a World Bank loan. Closing date for bids is December 22.

• Paulista Metropolitan Trains Company (CPTM) invites bids for 10 four-car emus for the São Paulo suburban rail network. This may be followed by an invitation to tender for another 30 four-car emus. CPTM also plans to invite tenders for signalling and communications equipment, station rehabilitation, and the construction of an electronics research laboratory.

• Ferronorte plans to invite bids for 40 locomotives and 1300 freight wagons.

• Vitória a Minas Railway expects to call tenders for the supply of 20 locomotives and 70 freight wagons, and the refurbishment of 7700 wagons and five passenger coaches.

• Carajás Railway plans to invite bids for two locomotives and 142 freight wagons.

Canada:

CN North America has invited wagon manufacturers and leasing companies to bid for the supply of 1000 new or used grain wagons under a seven-year lease. CN needs the wagons by September next year.

• BC Transit has now signed a $C 55 million ($US 40.7 million) contract with Bombardier for 55 double-deck coaches for a new commuter service in Vancouver (IRJ November p54).

Germany:

German Rail (DB) has awarded a contract worth more than $US 10 million to Intergraph for a geographic information system which will be used to store information about the rail infrastructure network in a single model. It will be installed first in DB's surveying department.

Ghana:

Ghana Railways Corporation was due to open bids on November 24 for the supply of 14 diesel-electric locomotives. The order will be funded partly by a loan from Japan's Overseas Economic Cooperation Fund.

Hungary:

Stone Ibérica has supplied 71 air-conditioning units to Hungarian State Railways (MAV) for installation in intercity coaches built by CAF, Spain.

India:

Indian Railways (IR) has placed a Rs 314.4 million ($US 10 million) order for 10 electric 3MW locomotives with Bharat Heavy Electricals.

• Chittaranjan Locomotive Works has developed a prototype 3.7MW electric locomotive with Hitachi, Japan, traction motors for hauling 26-coach passenger trains. The prototype is an improved version of the 2871kW type WAP-1 locomotive.

• IR invites consultants to prequalify for a contract to develop a computer simulation model of the Bombay urban rail network which can used to identify capacity constraints and evaluate investment projects.

Ireland:

Irish Rail (IE) invites tenders by December 6 for pre-cast level crossing panels.

• Stone Ibérica has won a contract to supply 28 air-conditioning units for coaches being built by De Dietrich, France, for IE.

Israel:

Stone Ibérica is to supply air-conditioning equipment for 20 coaches being built by CAF, Spain, for Israel Railways.

Japan:

JR East has awarded a $C 1.75 million ($US 1.3 million) contract to Giro, Canada, for its Hastus software for scheduling train crew in the Tokyo area. This follows two years of trials with Hastus.

• JR West invites tenders by December 6 for 13 track motor vehicles for delivery by January 31 1995.

Korea:

Hyundai Precision & Industry has awarded a $US 8.4 million subcontract to Union Switch & Signal, United States, to provide MicroCab cab signalling equipment for installation in trains being built for Line 5 of the Seoul metro. Union Switch provided the initial signalling and train control for Line 5 and is installing similar equipment on lines 7 and 8.

Malaysia:

Vossloh Rail Fastening Systems, Germany, is to supply rail fastenings for concrete and timber sleepers, slab track, and special trackwork for the phase 1 light rail project in Kuala Lumpur.

Netherlands:

Siemens, Germany, has handed over to Netherlands Railways (NS) in Rotterdam what it claims to be the largest electronic microcomputer-controlled signalbox in the world. The new box replaces seven electromechanical signalboxes covering 20 route-km of track including the new four-track tunnel under the New Maas river. The computer is based on Siemens' Simis microcomputer system.

• Amsterdam Municipal Transport (GVB) is seeking a failsafe train detection system for a 10km section of the new Ring Line metro in Amsterdam.

• Stone Ibérica is to supply air-conditioning units for 37 LRVs being built by CAF for GVB.

Pakistan:

Pakistan Railways is seeking the following types of wagon: tank for petroleum products, container, covered, high-sided open for phosphates and scrap iron, and brake vans.

Singapore:

Singapore Mass Rapid Transit invites tenders by January 6 for the supply of common and swing-nose crossings.

Spain:

Spanish National Railways' (Renfe) Regional sub-sector has invited bids for the construction of 16 dmus, with an option for a further 54 units within a seven-year period. Two prototypes will be required in advance of the main order. The contract will be worth Pesetas 7 billion ($US 55.7 million). Closing date for bids is January 10 1995. The 160km/h air-conditioned trains must be able to accommodate 100 to 140 passengers, and be accessible to the mobility impaired. There will be a guarantee period of either three years or 500,000km.

• Stone Ibérica has won orders to supply air-conditioning units for the 46 three-car class 447 emus being built by GEC Alsthom and CAF for Renfe, the four two-car dmus being built by CAF for Majorca, and the 10 series 200 coaches being built for Basque Railways by CAF.

Thailand:

State Railway of Thailand (SRT) invites tenders by December 15 for 22 air-conditioned first-class metre-gauge coaches for use on day and overnight travel.

United States:

Metro-North Commuter Railroad, New York, has awarded a $C 59.3 million ($US 44 million) contract to Bombardier for 34 push-pull commuter coaches.

• Massachusetts Bay Transportation Authority has placed a $US 33.8 million contract with Safetran Systems to resignal 100km of lines linking Boston South with Braintree, Middleborough, and Plymouth. This is part of the $US 560 million Old Colony Railroad rehabilitation project to introduce commuter rail services on three lines starting in late 1996.

• New Jersey Transit has ordered 10 ALP-44 electric locomotives from ABB Traction at a cost of $US 47 million.

Uzbekistan:

CKD Tatra, Czech Republic, was due to start delivery at the end of October of 50 type T6B5 trams to Tashkent Tram and Trolleybus Company.

Zambia:

The Zambian government has awarded a $US 1.2 million contract to consultant Swedish International Enterprises Development Corporation (Swedecorp) to help implement its planned reorganisation of Zambia Railways (ZR). Swedecorp will recruit and employ Swedish personnel, including a senior economic adviser, who will work with ZR's management in an effort to restructure the railway. The company has already provided its consultancy services to the government's communications and transport ministry, enabling it to draw up a comprehensive programme for railway reorganisation. **IRJ**

Renfe Plans Passenger Changes

Spanish National Railways' (Renfe) long-distance passenger sub-sector has announced major changes to its long-term strategic plan to take account of the reduction in the ridership on traditional locomotive-hauled services and the subsequent increased losses.

RENFE's long-distance passenger sub-sector showed a Pesetas 840 million ($US 6.7 million) shortfall against budget in the first six months of 1994, with income down by Pesetas 670 million over the previous year. The new strategic plan will help to cut costs, which must fall by Pesetas 3 billion by 1998.

Traditional overnight trains with sleeper and couchette accommodation are to be phased out and these dedicated vehicles offered for sale. Three years ago, these services accounted for 48% of all long-distance passenger income, but have since fallen victim to improved journey times on day trains.

Only the Talgo hotel-trains will be retained, since these operate profitably. Renfe is negotiating with Portuguese Railways (CP) to replace the conventional overnight *Lusitania Express*, which links Madrid with Lisbon, with a Talgo Hotel-Train.

Conventional locomotive-hauled daytime passenger services continue to be unprofitable overall, and unprofitable trains will also be withdrawn.

Day services worked by both InterCity emus and Talgo trains remain popular. However, Renfe acknowledges that its current fleet of 31 InterCity emus is inadequate, while many of the existing Talgo III coaches will be life-expired by the turn of the century. As a result, bids will be called for a fleet of InterCity 2000 emus in early 1995, with an initial budget of at least Pesetas 8 billion available.

Broad-gauge AVE trains will be introduced in 1996 on the Mediterranean corridor between Barcelona, Valencia, and Alicante. Several of these trains may become first-class only, to stem the loss of first-class passengers from this route, whereas second-class patronage remains healthy despite improved motorway links and price-cutting from parallel bus services.

Improved customer loyalty is being sought on the flagship Madrid–Zaragoza–Barcelona route, where deregulated air services have made inroads into long-distance travel, although several new market initiatives have stemmed losses on Madrid–Zaragoza and Zaragoza–Barcelona shorter-distance InterCity services.

Bids will be called for a fleet of InterCity 2000 emus in early 1995, with a budget of Pesetas 8 billion

Part of the former complex tariff system, disliked by many passengers, has been abandoned, and an alternative one, based on blue and white days, reintroduced, although classification of trains into high, medium, and low tariff bands will be retained.

Traditional restaurant car services are also to go, replaced by a system of pre-cooked meals which has proved so successful on AVE high-speed trains between Madrid and Seville.

However, it is not all gloom and doom. Several former summer-only trains have been retained in the winter timetable as a result of higher than expected demand. These include: two daily return trips between Madrid and Gandía via Valencia; an InterCity emu service from Zaragoza to Málaga via Madrid and Linares-Baeza; a through Barcelona–Zamora/Salamanca train; a weekly Basque Country–Alicante train; and the *Tiana* Talgo. **IRJ**

Eurostar Teething Problems

THE launch of London–Paris/Brussels Eurostar services to the world media in October demonstrated that a number of things need to be tightened up if the service is to be reliable and attractive. But one problem—congestion on the busy lines through the London suburbs—will not be solved until a new line is completed between London and the Channel Tunnel.

The launch got off to a bad start on October 20 when the Paris-bound train failed minutes before departure from London Waterloo. A replacement set had to be summoned from North Pole depot, resulting in a one hour delay. However, the replacement train completed the non-stop run in 2h 48min, 12 minutes less than scheduled. A Eurostar later that week failed en-route with an even longer delay.

Guests on the day trip from London to Brussels and back on October 25 fared a little better. The outbound service arrived in Brussels 17 minutes late due to signalling problems in the Channel Tunnel, which necessitated single-line working between the undersea crossovers all day, and a delay in Lille.

The return trip arrived at Waterloo 16 minutes late. In addition to the same problems in Lille and the Channel Tunnel, a tamper was late clearing the track on the new line between Lille and the Tunnel. These delays meant the train lost its scheduled path through the London suburbs, and got stuck behind a local train. The final delay occurred just outside Waterloo, when an empty stock train was routed over the track which is supposed to be reserved for Eurostar.

Mr Malcolm Southgate, deputy managing director of European Passenger Services (EPS), the British partner in the operation of Eurostar services, said electronic traction control problems were to blame for the train failure on October 20. "Teething problems, I hope," he told IRJ on October 25. "In six months of trial operations, we have only had four complete breakdowns. Last week, we ran 30 trains of which half arrived at their destination on time or within 5 minutes."

"In two to three years time, we expect to be making the sort of return on investment that a private sector company would be looking for."
—Southgate

Southgate confirmed that the problem caused by the Interference Current Monitoring Units tripping out each time a Eurostar arcs when crossing a gap in the third rail has now been resolved following the modification of about 1600 track circuits in Britain. However, not all Eurostar trains in service have yet been modified, as a trip on November 3 demonstrated.

Another potential problem is the time it takes to board a Eurostar which has seats for 794 passengers—about the equivalent of two jumbo jets. If the majority of passengers turn up only 20 minutes before departure, which is the minimum check-in time, then delays are likely. A trip from Paris to London on November 3, filled with French travel and ticket agents, departed 20 minutes late because of the time it took to process passengers at Gare du Nord, which appears ill-equipped for the job.

Southgate says that the initial service of two round trips a day from London to Paris and Brussels, will start to be expanded in January. "We plan to build up the service at two-monthly intervals," he revealed. "It should take us six to eight months from now to reach an hourly-interval service on both routes."

EPS expects Eurostar services to carry about 10 million passengers in the first year following the start of the hourly-interval services. "We are aiming for 60 to 65% load factors as services build up," Southgate said. "In two to three years time, we expect to be making the sort of return on investment that a private sector company would be looking for."

Delivery of the first overnight train is expected in May next year and the first services are expected to commence in late 1995. The first of the so-called north of London Eurostar trains should be delivered in June, and these services should start in early 1996.

Eurostar services will be able to stop at Ashford in southern England late next year, when construction of a dedicated platform and terminal facilities have been completed. Between 20 and 25% of services are expected to stop there.

Eurostar journey times from London to Paris and Brussels are highly competitive with air, even before new lines are completed in Belgium (in 1997) and Britain (in 2002). Eurostar therefore has the potential to win over a lot of traffic from the airlines and to generate new business, but it will only do so if the service is easy to use and reliable. Eurostar services will operate over the tracks of four different railways, and are managed jointly by three, so the potential for things to go wrong is great. Managers need to have a tight grip on train operation if they want to have a reliable service. **IRJ**

CN Tries To Save East Network

ANALYSIS by CN North America of CP Rail's offer of $C 1.4 billion ($US 1.04 billion) for CN's rail network in eastern Canada shows that CP could end up getting the CN lines for half this amount or even much less because of the conditions which CP has attached to the deal. The main fear is that the sale could push CN's remaining western rail network to the point of insolvency. CP has set a deadline of December 22 for a decision on its offer, but says it is prepared to be flexible.

Outside specialists were brought in to help CN evaluate CP's bid for CN's loss-making rail network east of Winnipeg and Chicago. They comprise A T Kearney Consulting, a Montreal law firm, and financial analysts Nesbitt Burns and Morgan Stanley.

All CN freight trains in eastern Canada would have to be hauled by CP locomotives and crews. This could make CN uncompetitive in the east, drive it out of the intermodal and automotive businesses in eastern Canada as well as transcontinental freight, which in turn would deplete CN's western traffic possibly to the point of insolvency.

CP wants CN to invest $C 250 million in 1995, and to give it CN's unused tax credits worth about $C 300 million. CP also wants a virtual tax subsidy from the federal government. These conditions combined would cut CP's offer by half.

CN says the government should also consider CN's own improving financial performance. CN has already made a profit of $C 189 million in the first nine months of this year and expects to end the year with a profit of between $C 230 million and 240 million. This compares with a loss in excess of $C 1 billion in 1992.

CN wants the government to reject the CP offer. However, other options would be for the government to force CP to revise the haulage agreement so that it does not penalise CN, or for a terminal company to operate the yards and freight terminals in Montreal and Toronto leaving CN and CP to concentrate on line-haul traffic.

CN claims that its tracks and yards in eastern Canada are in better condition than those of CP. To remain competitive, CN says CP must either buy CN's assets or invest between $C 300 million and 400 million in its own network. CN's eastern rail network is more than twice the size of CP's and generates almost three times the revenue.

CN says it has made a lot of progress towards preparing itself for privatisation, although there is still a long way to go. Priorities are reducing labour costs, eliminating restrictive working practices, and turning a lot of its lines in Ontario over to short line operators.

Two major CN investment projects will come to fruition soon. A new $C 200 million tunnel under the St Clair river between Sarnia and Port Huron, United States, will open in March and enable CN to introduce double-stack container trains and triple-deck automobile carriers on the route. A $C 100 million computer system will enable it to introduce scheduled freight trains, and to monitor time-sensitive freight better.

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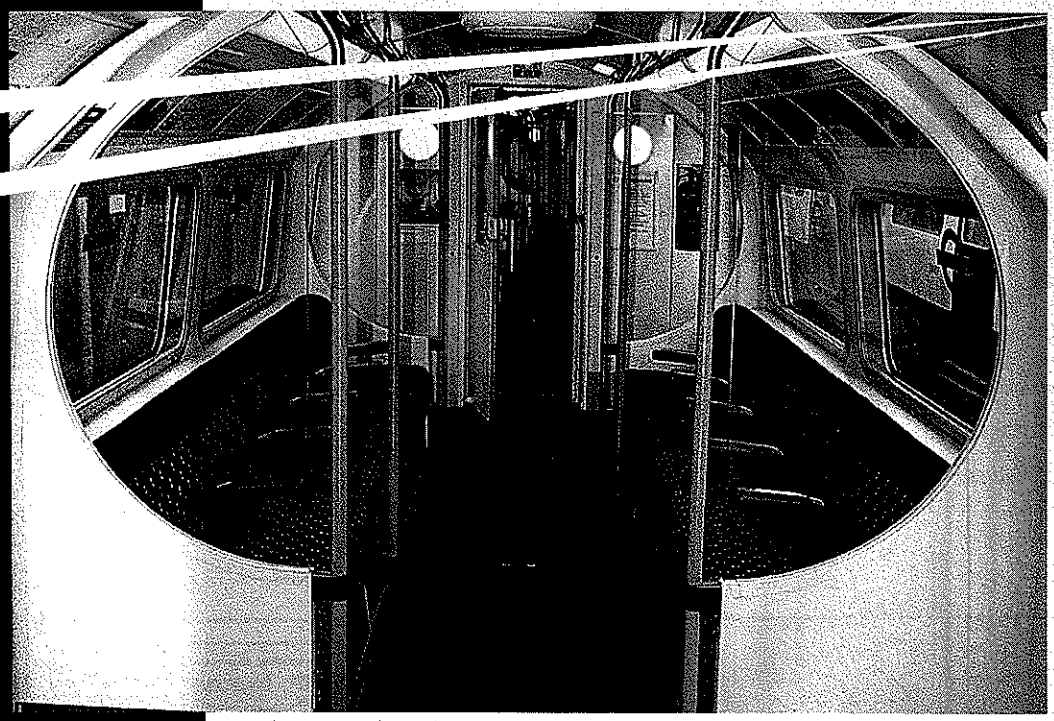

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Argentine Suburban Lines Are Privatised

The process to privatise the Femesa suburban rail network and the metro in Buenos Aires, Argentina, which began three years ago, will be completed this month when the final three suburban lines are handed over to the private sector. The networks were in very poor condition following years of neglect. While a lot remains to be done to improve the quality of these services, passengers can already see some improvements.

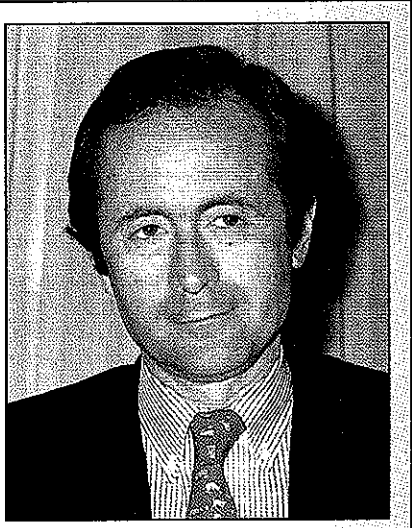
Marcos Pipan
Regional Editor, Argentina

THE following networks have been privatised so far: the metro and the Urquiza Line are in the hands of Metrovias, Belgrano North has been transferred to Ferrovias, the San Martin Line to Transportes Metropolitanos San Martin (TMS), and Belgrano South to Transportes Metropolitanos Belgrano (TMB). This month, the Roca Line will be transferred to Transportes Metropolitanos Roca (TMR), and the Mitre and Sarmiento lines to the same group of companies which make up Metrovias, but using a different commercial name.

For the moment, the new operators have been concentrating on upgrading tracks, locomotives and rolling stock, and signalling to improve reliability. "We're working below the floor of the cars and not inside them, which is the main reason why passengers can't see major changes yet," Mr Ronald MacKay, operations manager of Metrovias, told IRJ.

The Railway Privatisation Coordination Unit, headed by Mr Jorge Kogan, carried out a passenger survey recently on 10 suburban rail corridors and five metro lines. Regarding service quality, 45% of passengers responding said it was bad, 39% average, and only 15% good. Things which passengers were dissatisfied with most were: cancellation of services (51%), punctuality (44%), and service frequency (40%). Conversely 86% of passengers considered existing fare levels to be good or very good. The results of the survey will be used as a reference on service quality prior to the privatisation of the Roca, Mitre, and Sarmiento suburban lines.

Metrovias appointed a local consultant to survey metro passengers to see whether they noticed any improvement to services after Metrovias had been operating the metro for six months. A total of 1300 passengers expressed the following opinions: 42% considered that the service had improved in general, 42% that it had remained the same, and 10% that it had deteriorated.

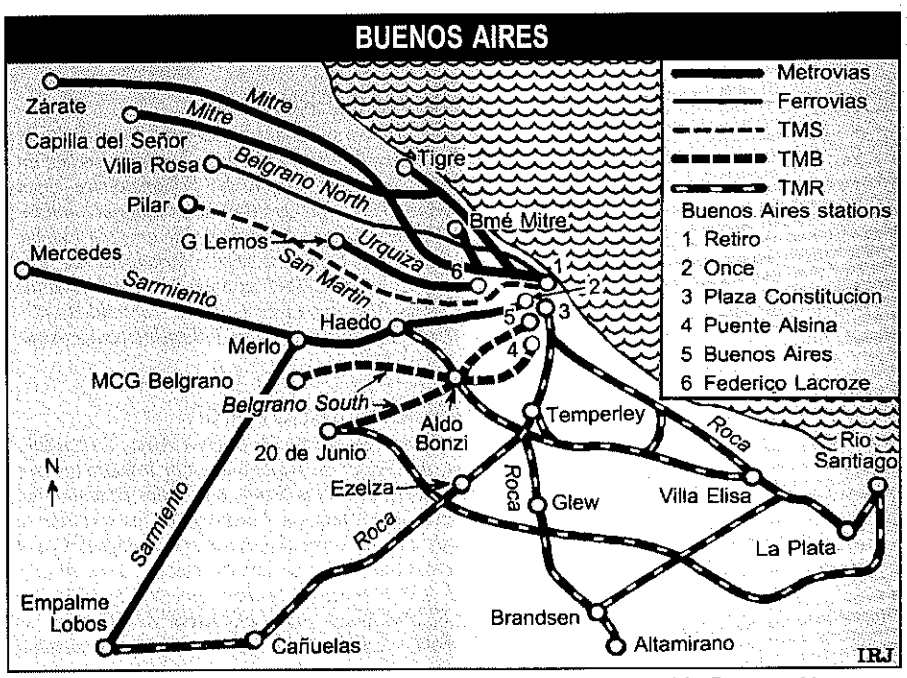


JORGE KOGAN

Priorities

Metro passengers said that priority should be given to improving: frequency (34.8%), comfort (26%), punctuality and reliability

One of three Alco RSD16 diesel-electrice locomotives refurbished by TMS.



Privatisation of suburban lines and the metro has been completed in Buenos Aires.

TBM has replaced Tafí Viejo coaches (left) with rented long-distance coaches built by Materfer (right).

(19%), and car maintenance (13%). One of Metrovias' main priorities is to increase frequency. It is trying to cut headways on Line D from four to two minutes. As far as inconvenience is concerned, 58.7% of the passengers cited over-crowding, 32.6% delays, and 10.8% stops between stations.

One of the main reasons why the survey results are not that good, is that it has not been possible to improve service performance yet because of the many mechanical problems which the new operators still face.

All the former Femesa motive power and rolling stock was handed over in very poor shape. For example, only eight of the 20 General Motors G22CU locomotives which Ferrovias received were in reasonable condition. The main problem was that the locomotives were equipped with four instead of six traction motors, which resulted in very poor performance.

Bad Condition

All the coaches received by TMS were in such a bad condition that TMS decided, as a first objective, to fit new windows, seats, and doors. So far, about 80% of coaches have been refitted and now have lights which work at night—a rarity in the past!

TMB received many coaches built in the 1930s and 1940s which were in very poor condition. TMB decided to rent 40 long-distance coaches, which were no longer in service as a result of the nationwide withdrawal of long-distance passenger services. This was cheaper than trying to rebuild its own coaches.

TMB's fleet of General Electric U12C locomotives was also in very poor shape. While these are being rebuilt, TMB has rented a diesel railcar from Materfer. TMB is confident that its motive power and rolling stock will be in good condition by mid-1995 and that it will be able to offer commuters a level of service unknown in the past.

All the new operators declared that track was in such bad shape that it was a miracle that trains did not derail constantly. TMS, TMB, and Ferrovias quickly set about repairing the worst sections, but very soon drew up plans to renew the track on entire lines. The only exception is the Urquiza Line, where track is only sufficiently bad on some sections to warrant complete renewal; elsewhere tracks will be upgraded.

"Buenos Aires commuters will soon have good rail services . . . Trains will be reliable, run on time, and be operated by rebuilt vehicles . . . Services will be safe."
—Jorge Kogan

All the new operators are in the process of installing track-to-train radio. As a stop gap, Metrovias issued a mobile phone to each of its drivers on the Urquiza Line.

Kogan told IRJ that he is very confident that Buenos Aires commuters will soon have good rail services. Although they may not be of the same quality as those in other cities around the world, they will be far better than before. Train services will be reliable, run on time, and will be operated by rebuilt vehicles. Stations will be in good condition, and most important of all, services will be safe.

All the suburban rail concessions are for 10 years, with options for another 10 years. But, provided the state and the operators agree to it, the contracts can be renewed every 10 years in perpetuity. Metrovias has a 20-year concession, with an option for another 10 years. Again, this could be renewed every 10 years. **IRJ**

BUENOS AIRES TERMINE LA PRIVATISATION FERROVIAIRE

LE processus de privatisation du réseau ferroviaire de banlieue et du métro de Buenos Aires en Argentine, qui a commencé il y a trois ans, sera terminé ce mois-ci lorsque les trois dernières lignes de banlieue seront remises au secteur privé. Les réseaux étaient en très mauvais état suite à des années de négligence. Bien qu'il reste encore beaucoup à faire pour améliorer la qualité de ces services, les voyageurs peuvent déjà voir quelques améliorations. Le plus grand progrès réalisé jusqu'ici est dans le métro qui est exploité par Metrovias depuis janvier. La fréquence et la fiabilité ont été améliorées ce qui a donné une augmentation de trafic de 14% durant la première moitié de 1994. En mars 1995, les trains vieux de 60 ans de la ligne B, seront remplacés par des trains métropolitains d'occasion rachetés à Tokyo. Un système de billeterie automatisée sera installé l'année prochaine.

BUENOS AIRES SCHLIESST EISENBAHNPRIVATISIERUNG AB

DIE vor drei Jahren in Angriff genommene Privatisierung des Vorstadtbahnnetzes und der U-Bahn in Buenos Aires, Argentinien, wird in diesem Monat mit der Übergabe der letzten drei Vorstadtstrecken an den Privatsektor abgeschlossen. Nach jahrelanger Vernachlässigung wiesen die Schienennetze einen äußerst schlechten Zustand auf. Obwohl noch viel zur Verbesserung der Qualität dieser Bahnverbindungen getan werden muß, können Reisende bereits einige Verbesserungen bemerken. Die größten Erfolge wurden bei der U-Bahn erzielt, die seit Januar von Metrovias betrieben wird. Verkehrsdichte und Zuverlässigkeit wurden erhöht, was in den ersten sechs Monaten von 1994 zu einer Verkehrszunahme von 14% führte. Im März 1995 werden die 60 Jahre alten Züge der Linie B durch "Second-Hand"-U-Bahnzüge aus Tokio ersetzt. Im nächsten Jahr wird ein automatisches Fahrgeldeinzugssystem installiert.

BUENOS AIRES CONCLUYE LA PRIVATIZACION FERROVIARIA

EL proceso de privatización de la red ferroviaria de cercanías y del metro de Buenos Aires, Argentina, que comenzó hace tres años, quedará concluido este mes, una vez se entreguen al sector privado las tres últimas líneas de cercanías. Estas redes se encontraban muy deterioradas debido a los años de abandono que han sufrido. Aunque queda aún mucho por hacer en lo que a mejorar la calidad de los servicios se refiere, los pasajeros pueden ya observar algunas mejoras. Los mayores progresos se han logrado en el metro, que explota Metrovias desde el pasado mes de enero. Como consecuencia de mejores frecuencias y de una mayor fiabilidad, los tráficos han aumentado un 14% durante el primer semestre de 1994. En marzo de 1995, los trenes que circulan por la línea B, que tienen una antigüedad de 60 años, se sustituirán por coches de segunda mano del metro de Tokio. Asimismo, se instalará un nuevo sistema automático de expendición de billetes el próximo año.

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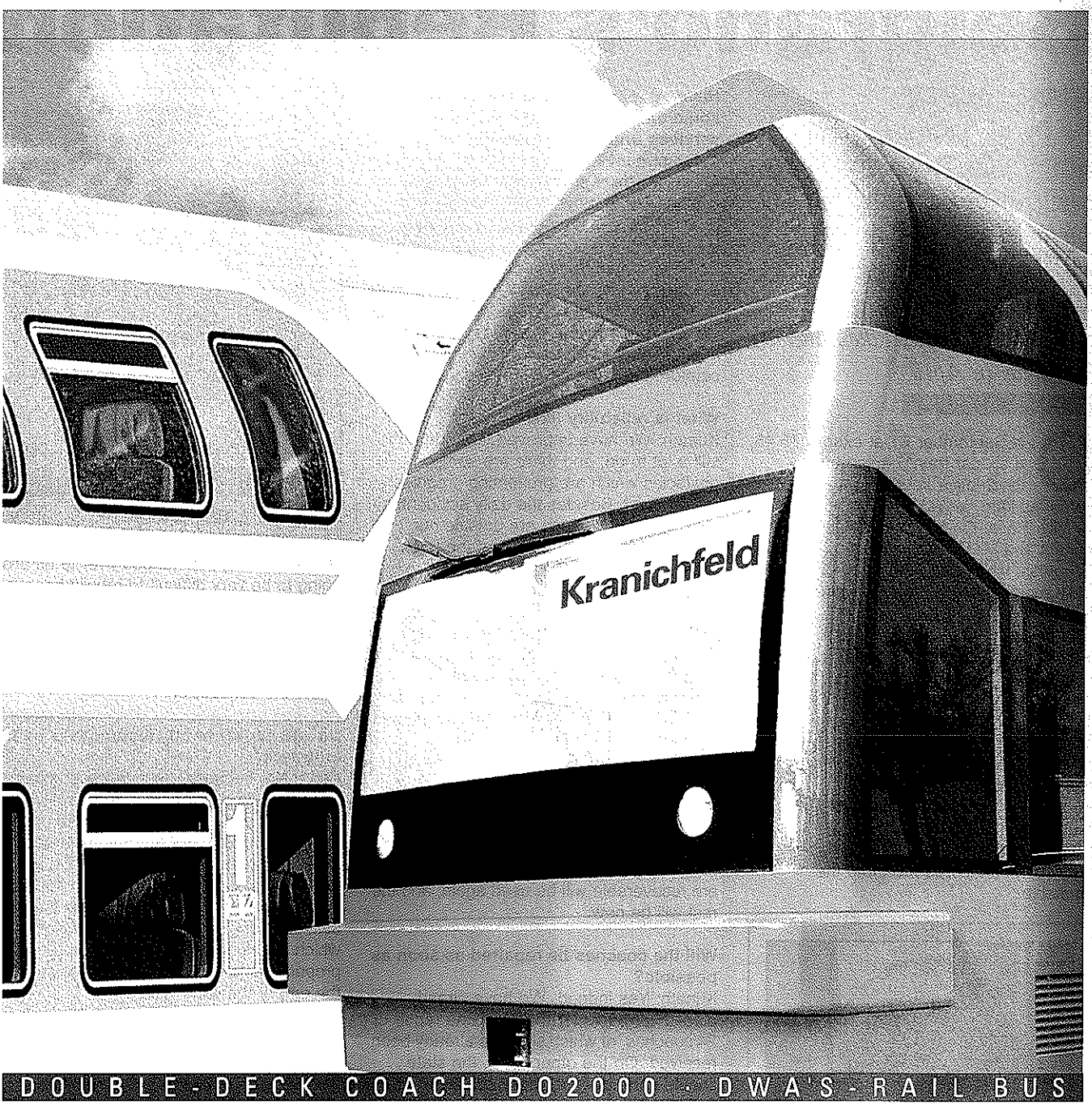

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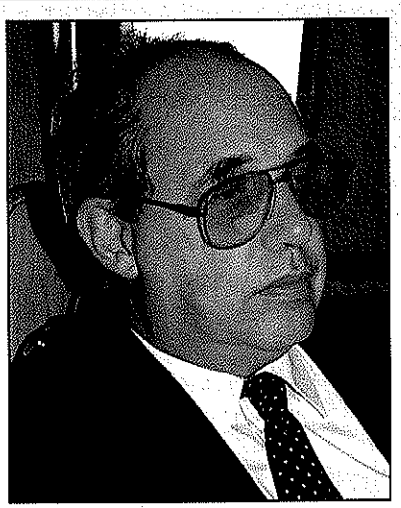
Ferrovías Improves Belgrano's Reputation

The former Belgrano North suburban line had one of the worst reputations of all the commuter rail services operated in Buenos Aires. But many things have been done to improve the service since it was taken over by Ferrovías in April.

ON September 21 at exactly 15.45, a six-car train, hauled by a locomotive sporting a provisional Ferrovías logo, pulled out of Retiro station for Villa Rosa. On board were Mr Eric Kunath and Mr Héctor S Cimó, directors of Ferrovías, who were preparing to talk to IRJ's regional editor, Marcos Pipan, about the improvements being carried out.

What sort of picture can you paint for us?
Kunath: The first improvements are starting to show, particularly regarding operations, safety, and cleanliness. Cancellations have begun to decrease sharply because we have managed to stabilise the rolling stock. We now have enough trains available to run additional services almost every day. We are confident that these services can very soon be incorporated into the timetable.



ERIC KUNATH

Have people started to notice at least some differences compared with services under the previous management?
Cimó: We think so. We are continually carrying out surveys which indicate this, and the surveys conducted by the state show that there have been some changes. Some of the improvements may seem insignificant, but on a railway like ours, they have great importance. For example, today we can ensure that 90% of coaches have interior lighting, which not only improves comfort, but more importantly safety.

What is reliability like?
Kunath: We have improved it, but there is still a lot to do, and there are some obstacles which are preventing progress at the moment. Besides the daily accidents at level crossings, which are outside our responsibility, the condition of the track which we took over will not allow us to increase train speed until we have completed our repairs. Trains are delayed at the moment because of the track repairs, but at least this confirms that we are on the right path, which is to improve safety. Our coaches are unsafe because of the poor state of the bogies, brakes, couplings, and so on. Safety is a real obsession for Ferrovías, which is why this was the first thing we wanted to attack.

How will you tackle track upgrading?
Cimó: Between 70 and 80% of tracks will be completely rehabilitated. Materials which are recoverable will be used again, and the rest will be new.

Will the coaches be repaired as soon as possible?
Kunath: Yes indeed. We have already placed contracts for the complete repair of 24 coaches, of which six have already been received. On the other hand, the state should hand over 30 more coaches to us through Femesa.

What is the situation regarding motive power?
Kunath: All the locomotives we received had only four of their six traction motors working, and even those working were continually failing. We have repaired a large number of traction motors and to date we have a significant number of locomotives which have all their traction motors working. We are also repairing some locomotives in our Boulogne workshops. Two or three of

HÉCTOR CIMÓ

the 20 locomotives handed over to us are going to be very difficult to rebuild because they were virtually dismantled. All the same, we have to rebuild them. There are also some locomotives which Femesa should hand over to us out of our allocation under the concession.

Do you expect to buy locomotives in the long term?
Cimó: No, because, despite the problems, our locomotives are fairly new in railway terms. They are all General Motors units dating from 1978. When they have been repaired, and then well maintained, they will provide many years of service. In addition, this is a concession, which means that the assets belong to the state. Any assets which we incorporate into the company's property remain in the hands of the state at the end of the concession.

What was the condition of your Boulogne workshops?
Kunath: Everything was in a deplorable state. The floor of the workshop had to be cleaned with picks and shovels to remove the years of accumulated earth and grease. We had to renew the electrical and lighting installations, which were virtually non-existent. When we cleared all the tall grass and brushwood surrounding the workshops, we found 41 tonnes of scrap iron.

What are you doing to upgrade stations?
Cimó: The Ferrovías board has approved a

plan to renovate our 22 stations. This includes washing, painting, lighting, and signalling. We will fund it ourselves. It will cost $US 1.5 million and take a year to complete.

What is the condition of the signalling?
Kunath: The signalling, like the communications, motive power, and rolling stock, is not very old as far its technology is concerned, but it has never been maintained. It works because we have to make it work to keep the trains running, but we are going to have to change it.

What sort of communications will there be between train crews and the control centre?
Cimó: The investment plan provides for a track-to-train radio system. Included in the work which we are obliged to do during the first eight years under the concession contract, is the installation of a trunking system in year five.

Do you plan to bring some works forward or will you stick to what the concession contract says?
Cimó: We are reviewing the whole investment plan, and we will try to bring forward some works. We want to reduce the completion times of the works to half that stipulated.

Would this be subject to the approval of the concession agency?
Cimó: Yes, in principle, but it is also a question of funding. The state will not spend more than it has promised. It will not object if we want to bring work forward, but it will not bring forward its funding. It is therefore a financial problem for Ferrovías.

How many staff did you take on from the ranks of Femesa?
Kunath: Theoretically, we could have taken over this railway without a single employee from Femesa. However, it wouldn't have been possible to make the railway work without some skilled staff such as train crew and signalmen. Ferrovías started off with about 600 staff, of whom about 350 came from our predecessor and the rest were new.

How have the former Femesa employees reacted to being part of a private company?
Cimó: These staff were well aware that the railway would sooner or later grind to halt and the state could not carry on subsidising it. Employees, therefore, expected that their working conditions would improve under private management. We are optimistic that staff are accepting the new work rules well. Furthermore, we are training staff and giving them qualifications.

What improvements are you making to fare collection?
Cimó: Initially pre-printed tickets will be issued via PCs to be installed in station ticket offices. This system has been developed by our own staff. In the not too distant future, we want to have some form of magnetic or electronic ticket together with ticket barriers.

Is there much fare evasion?
Cimó: We need to study this reliably, but we estimate between 30 and 40%. Nevertheless, we are certain that fare evasion has decreased as a result of ticket inspections carried out at stations. We are going to enclose stations to prevent evasion. Revenue has increased by 40 to 50% as a result of the small improvements to services which we have introduced. We know that revenue will increase as services improve, and we shall be able to ask more from our customers in proportion to the improvements we make.

Have you managed to reduce the number of assaults which were so common on this line?
Cimó: Thanks to the security checks which we have implemented, and illuminating the trains at night, assaults and criminal attacks have completely disappeared. **IRJ**

IRJ's interview took place on board this train between Retiro station and Villa Rosa.

BA Gets Tokyo Metro Trains

Metrovías began its 20-year concession in January to operate the five-line Buenos Aires metro and the Urquiza suburban rail line, which connects with Line B. A major improvement will take place on the metro in March next year, when Metrovías starts to replace the 60-year-old trains on Line B with much newer second-hand trains from the Tokyo metro. An automatic fare collection system is also planned.

Marcos Pipan
Regional Editor, Argentina

THE replacement of the Line B metro fleet is Metrovías' initiative, as Mr Jose Barbero, its technical and operations manager explained: "There was no obligation, in the invitation to tender for the concession, to renew any of the rolling stock fleets. We are doing it because Line B has many old coaches, while at the same time it carries the greatest number of passengers. We will all benefit. The users will have a better service, we expect to carry more passengers, and the state will have a more advanced means of transport at the end of the concession."

Tokyo will supply 100 metro cars, plus corresponding spare parts. The trains are in excellent condition, having been maintained well, and represent an important technical advance for the Buenos Aires metro. The introduction of the Tokyo trains will enable Metrovías to overcome a rolling stock shortage on Line B far quicker than would have been possible if it had decided to repair the existing fleet.

Some infrastructure improvements—mainly to the tracks and power supply—are being carried out prior to the arrival of the Japanese trains. The Tokyo trains are lighter and have a different profile compared with the existing trains, and so some modifications will be needed.

Solid steel plates, 50.8mm thick, will be laid on the vehicle floors to match floor height at the doors to that of station platforms. The Tokyo cars are narrower and so will be fitted with thresholds at doorways to bridge the gap between the car and the platform. The current collection shoes will be moved 113mm outwards and 8.5mm downwards to ensure correct contact with the third rail. Each car will have 54 seats and room for 168 passengers standing at 6/m^2. Trains will be formed of six cars to match platform length on Line B.

Metrovías has invited major fare collection companies to prequalify for a tender for the provision of a system based on magnetic tickets and barriers, with an option for single or multiple journey tickets. Metrovías wants the new system to come into service during the second half of next year.

The First Six Months

According to a report submitted by Metrovías, it has achieved the following improvements during its first six months compared with the same period last year:

- 6% increase in car-km
- 14% increase in passengers
- 23% reduction in service interruptions, measured in minutes
- doubling the service on Line A
- introduction of three surface trains on Line B to achieve three-minute headways in peak periods
- a programme to repair or replace compressors on Line C which will reduce service interruptions by 50%
- addition of two trains on Line D and increased reliability
- introduction of 70 extra cars during peak periods
- 1 minute reduction in the interval between trains at peak times
- introduction of 300 security guards to patrol stations and prevent fare evasion
- 270 staff employed to clean stations
- installation of 660 litter bins
- catching up with deferred rolling stock maintenance
- implementation of a station refurbishment plan
- installation of track-to-train communication on the Urquiza Line using mobile telephones
- renewal of five busy level crossings
- improvement of the drainage system at General Lemos station—it now dries out in two hours after flooding compared with two days before
- mechanisation of track maintenance to increase the rate from 10m/h to 200m/h
- introduction of rail flaw detection, and
- repair and improvement of staff quarters.

Investment Plan

The concession contract obliges Metrovías to invest $US 436 million during the 20-year concession in accordance with a programme agreed between Metrovías and the concession agency. The programme envisages not only the renewal of obsolete installations, but also the transformation of outdated methods of operation. The objective is to run a more frequent service and to carry more passengers. A total of $US 11.5 million is to be invested in the first year.

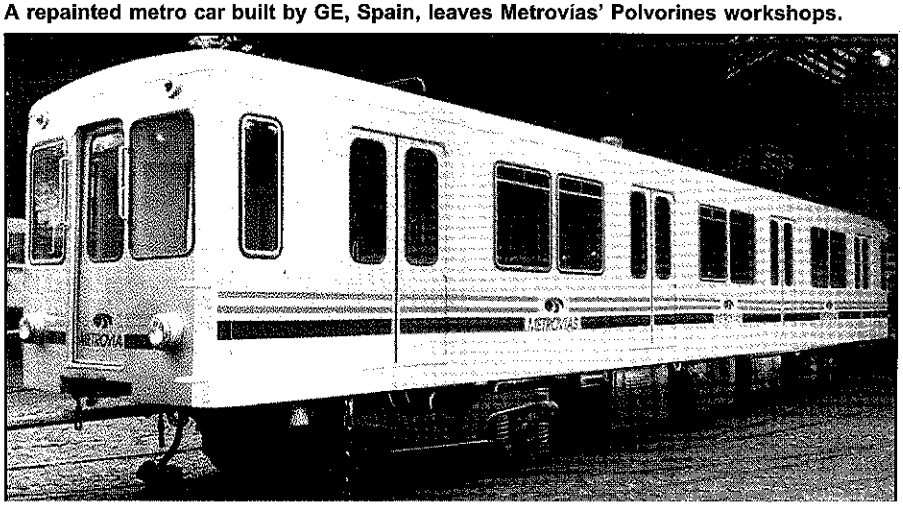
A number of major improvements are already underway, the results of which will begin to be seen by passengers during the first half of next year. A track-to-train communications system is being installed on the metro which will allow continuous contact between train crews and the operations control centre. It will also enable defects to be reported immediately so that repairs can be expedited, and it will allow passengers to be informed of delays.

The signalling on lines B, C, D, and E is to be replaced by a system which will allow supervision and remote control of train services from a central point. It will also enable headways to be reduced.

Sections of track on lines B and D, which are in a critical state, are to be renewed. Pumping equipment is to be replaced to reduce the problems caused by water seepage into tunnels. Escalators will be repaired or replaced.

On the Urquiza Line, track repairs will be carried out as far as Km24. About 2km of third rail is to be renewed. A radio link is to be established between Federico Lacroze, Lynch, and R Dario stations for data transmission. An underfloor wheel lathe is to be provided. **IRJ**

A repainted metro car built by GE, Spain, leaves Metrovías' Polvorines workshops.



Mexico City Starts Work On 11th Line

Mexico City metro has expanded at a faster rate than any other on the American continent, and is now the largest metro in North America. Spectacular rates of construction, however, have still been inadequate to match the growth in the city's population.

Control centre at Constitución de 1917 station.

PRELIMINARY works are underway for construction of a tenth rubber-tyred metro line in Mexico City. The Comision de Vialidad y Transporte Urbano (Covitur), which is responsible for the metro's infrastructure, plans to invest $US 214.6 million in 1995 on civil works. The line is due to open in 1997.

The 21.32km line will run from Buenavista railway station—which could ultimately provide the metro's first connection with suburban railways depending on the outcome of studies to reintroduce suburban trains to Mexico City—to Aztecas in the north-east. It will be operated by 30 trains.

National Railways of Mexico (FNM) has developed long-term plans for upgrading or realignment of tracks for the re-introduction of suburban services in four strategic corridors up to 2010. A separate, and older proposal from the government envisaged a network of satellite dormitory cities around Mexico City, served by five high-speed railway lines radiating from the Federal Center.

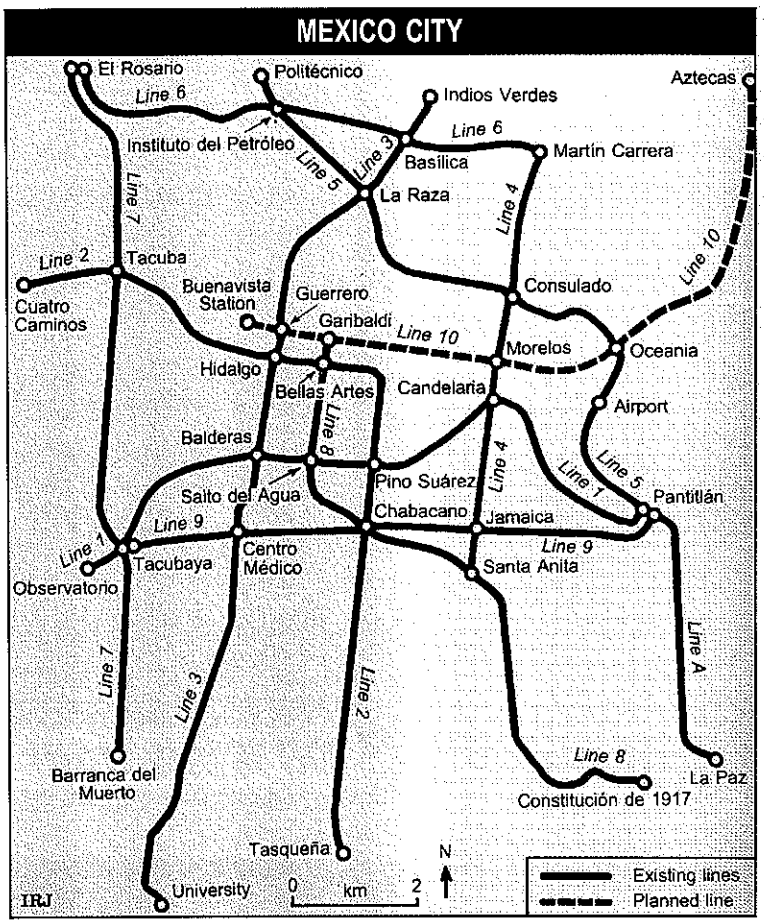
Mr Roberto Ocampo, Covitur's coordinator general of advisers, told IRJ that the 1995 investment in the new metro line includes $US 33.3 million for construction of 5.57km of line underground, $US 30.7 million for construction of 12.43km at grade, and $US 15.3 million for construction of 3.32km of elevated line.

The largest single investment is $US 88.8 million for 21 stations, seven underground, 11 at grade, and three elevated. An additional $US 46.4 million is for six highway bridges and associated roadworks.

Line 10 will have almost identical characteristics to the 20km Line 8, the newest metro line which opened in June. Line 8 is equipped with the new-generation Sacem ATO/ATP as used on Line A of the Paris regional express network (RER). Trains on the new line will operate at a maximum speed of 75km/h and a commercial speed of 37km/h, with a capacity to handle 33,000 passengers/h/direction. Headways will be 165 seconds initially, reducing later to 90 seconds.

Traffic on Line 8 is building up and was expected to reach 250,000 passengers/day in the short term and 660,000 in the medium term. It is operated by a fleet of MP82 rubber-tyred trains, which were built between 1982 and 1985 and were transferred from other lines. New trains are being supplied by CAF, Spain. The original vehicle supplier, GEC Alsthom, refurbished all the traction and braking equipment on MP82 stock, following a study by Sofretu, the consulting arm of the Paris public transport authority, RATP, which has been closely involved in development of the Mexico City metro since the earliest days.

It is not surprising, then, that the metro is very closely modelled on the Paris metro not only in physical terms such as rubber-tyred rolling stock and general architecture, but also in terms of operating philosophy. "Just as happened in Paris, we believe Mexico City now needs a regional express RER-type of operation to cope with the transport demands of a Greater Mexico City population of about 20 million," commented Mr Guy Larraufie, Sofretu's project chief for the Mexico City metro. "I hope also that



A 15-line, 332km network is planned by 2010.

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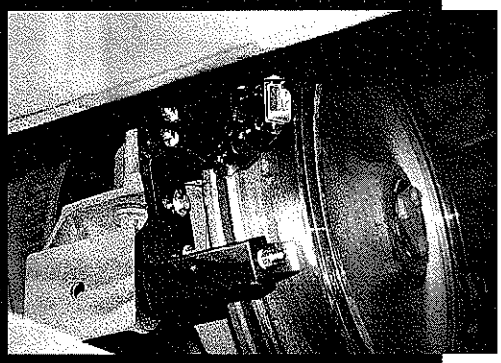

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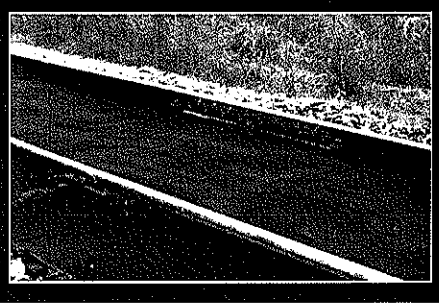

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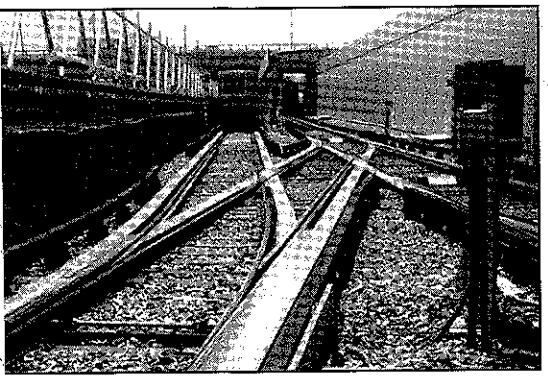
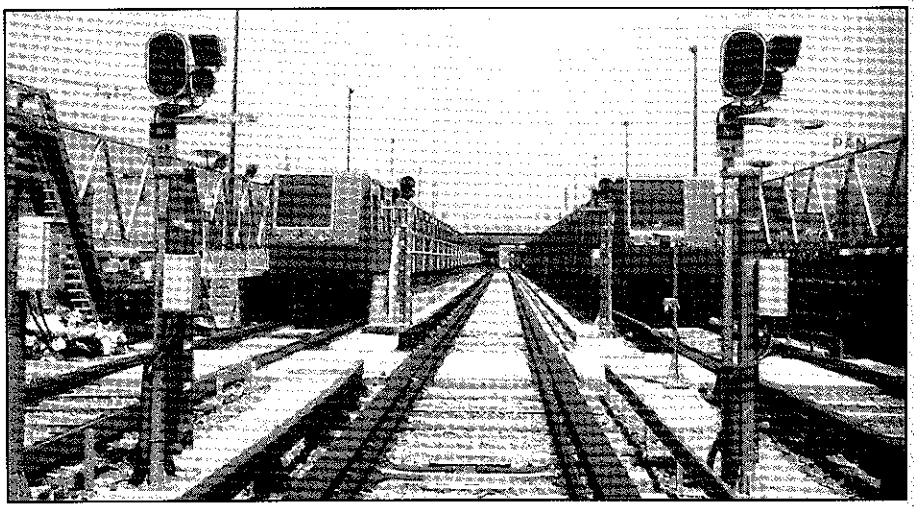


Turnback facility at Constitución de 1917, at the end of Line 8.



Mexico City metro depot and workshops serving Line 8, which opened in June.

Covitur will go to the federal authorities and FNM to establish a new level of local authority to develop the suburban network to link with the metro."

Mexico City has long been famed for the speed of its metro construction and Line 8 was no exception with 20km being produced in three years. The 12km Line A took 18 months, so the target opening of mid-1997 for Line 10 is not unrealistic.

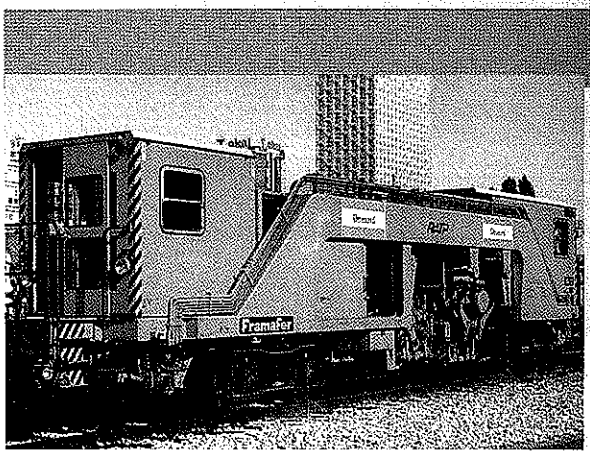
Metro construction has continued without interruption since the first line opened in 1969. The city has had the benefit of a multi-stage, long-term plan which envisages a 15-line, 332km network carrying 12 million passengers/day by 2010. Up to now the plan has been closely followed, but the possibility of revisions are looming as the coordination with suburban services becomes an increasingly important issue.

Despite the speedy rate of construction, the metro has never been able to keep pace with demand. It carries about 6 million passengers/day (1.5 billion a year) which represents just under one-quarter of all journeys in the Federal District. But an imbalance exists because three metro lines each carry 1 million passengers/day, leaving relatively low traffic on the other lines.

Mexico City's "odd man out", the conventional steel-wheel-on-steel-rail Line A carried 48 million passengers in its first full year of operation in 1992. The line, from Pantitlan to La Paz, runs in the median strip of a 10-lane highway. Six bridges take road traffic across it.

Line A is operated by 20, six-car trains built by CNCF (Mexico), with Mitsubishi (Japan) traction equipment, Duewag (Germany) bogies, and Faiveley (France) doors and pantographs. The operator, Sistema de Transporte Colectivo (STC) originally planned to operate 32, nine-car trains, and is now purchasing additional cars to increase the fleet. **IRJ**

Track maintenance machines made to measure



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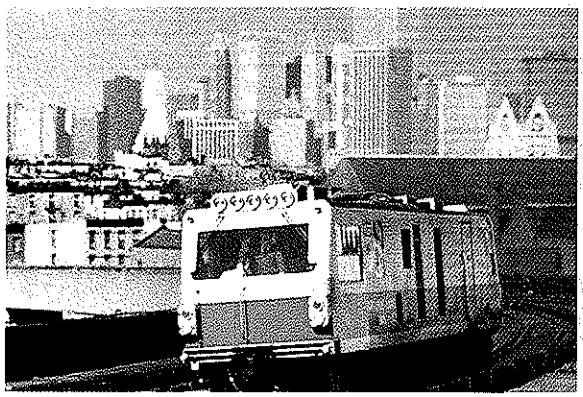
Metropolitan 08-275 UM with universal tamping unit for plain track, switches and crossings, Singapore

Tamping machine for London Transport



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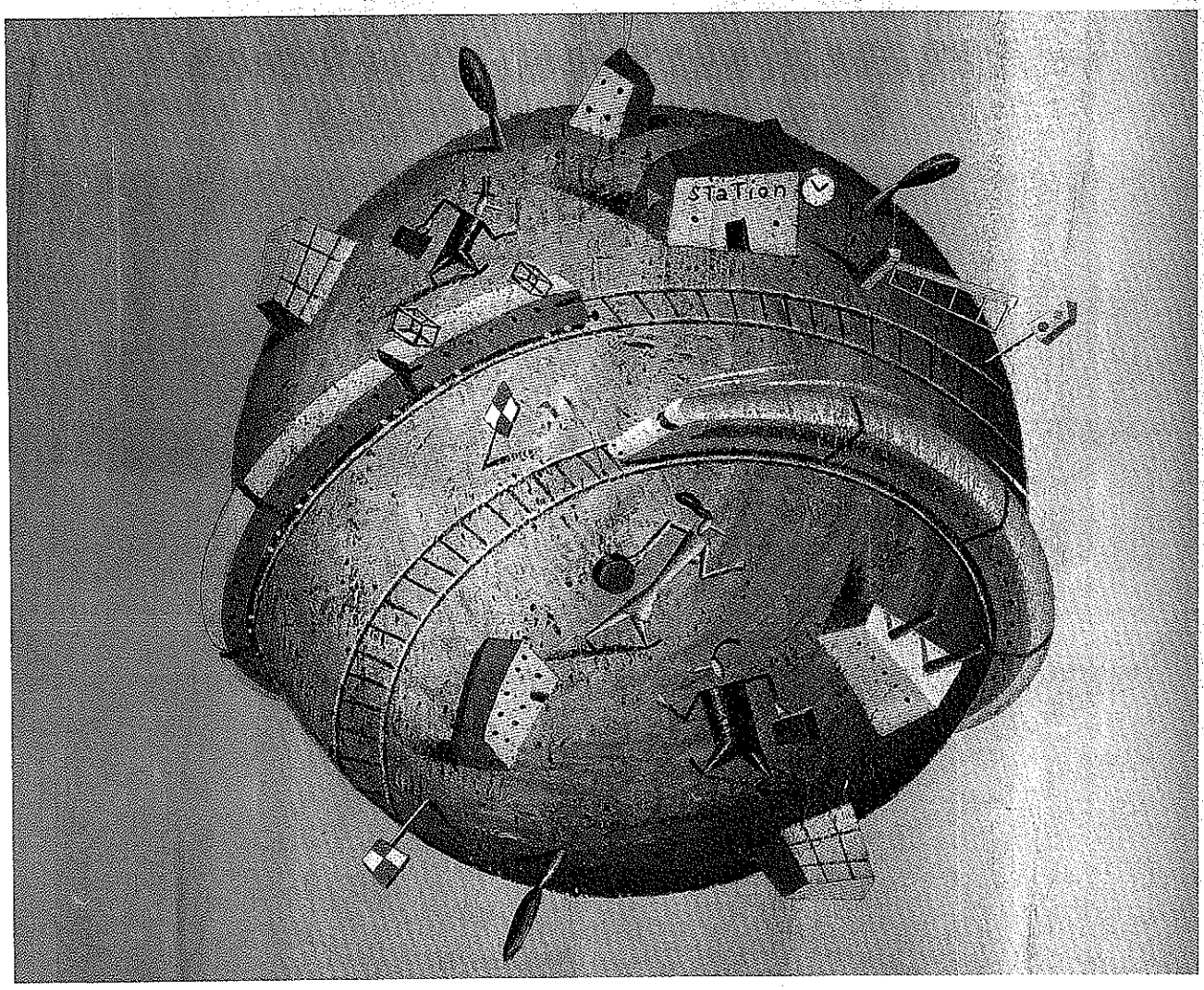

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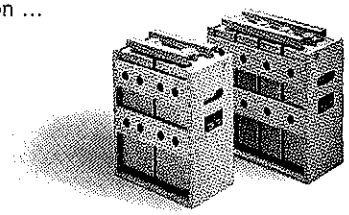

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Trials Underway On Monterrey's Line 2

Monterrey, the capital of the Mexican province of Nuevo Leon, has a population in excess of 3.5 million, and is the third largest city in the country. Public service began in June 1991 on the first line of a planned 74km three-line light metro, which is being built and managed by the Sistema de Transporte Colectivo Metrorrey.

THE 17.5km long Line 1 has 17 stations and was built entirely on elevated structures at a cost $US 10.5 million/km (including 50% of the purchase price of the rolling stock). Engineering parameters enable maximum passenger flows of 47,000 hour/direction to be handled using six-car trains. A five-minute interval service is generally operated, with an end-to-end running time of 28 minutes. Track is standard gauge and power is supplied from a 1.5kV dc overhead power supply system.

The 25 six-axle cars which provide services were built by Concarril—the Mexican subsidiary of Bombardier—with Duewag bogies and a Siemens polyphase ac drive based on the Stadtbahn B80 design. Each unit comprises two cars, one of which has a driving cab. These are coupled back-to-back with similar units to enable bi-directional working. Anticipated high passenger flows led to the adoption of three lateral doors on each side of the cars. There is seating for 52 passengers and standing room for 254 in a standard two-car set. Maximum speed is 70km/h.

It was thought that initial patronage would be in the order of 10,000 passengers/hour, although the daily figure soon rose to 83,000 passengers/day, with exceptional flows of over 100,000 being recorded.

However, while Line 1 serves the northern edge of the central business district, Metrorrey was keen to begin construction of the north-south Line 2, which would follow Avenida Cuauhtemoc right into the heart of this very important area. Construction work on a 4.8km first section, costing $US 250 million, began on February 14 1993 and a month later bids were called for the supply of 22 six-axle trains. GEC-Alsthom, Mitsui Engineering, Duewag, Concarril, and CAF, Spain, all tendered for the work, with the latter's price of $US 35 million beating Concarril's offer of $US 38.1 million. The contract was awarded in record time on April 15 1993.

Maximum passenger flows of 47,000/h/d are possible with six-car trains

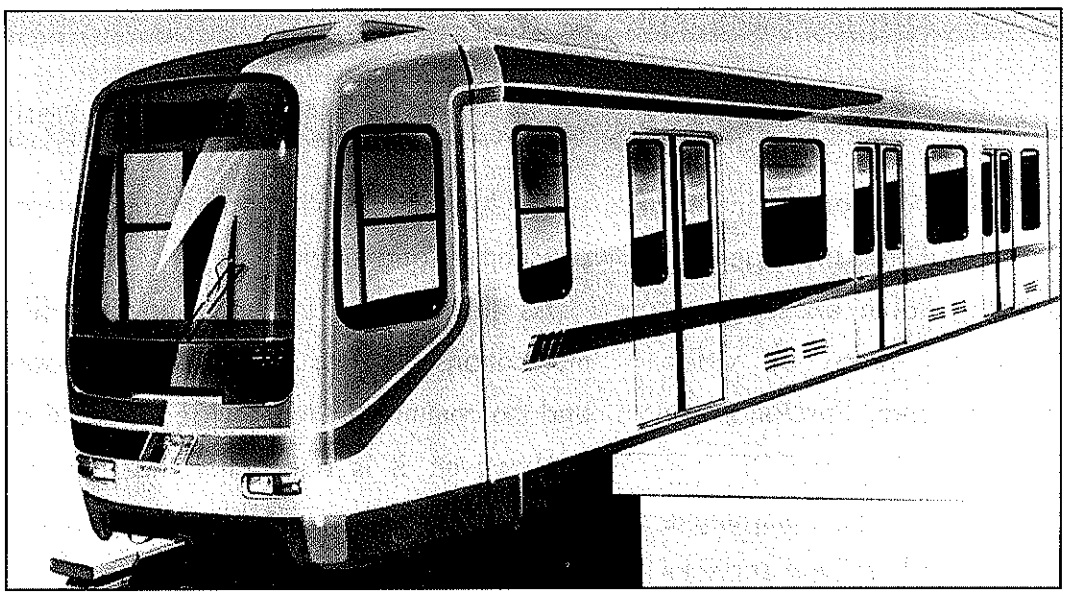
Construction of the trains is being undertaken at CAF's Zaragoza works in Spain, with electrical equipment supplied from the Siemens factory near Barcelona. The first two units were delivered in August and were due to undergo trials on Metrorrey's Line 2 from September.

These new units are similar in design to the earlier Concarril cars, though they offer six more seats and reduced standing capacity (222 passengers at 6m^2). A two-car set is 29.56m long, 2.65m wide, and 3.3m high, and weighs 47 tonnes. Each set has a continuous rating of 698kW and can reach a maximum speed of 80km/h. Commercial speed will be about 35km/h. Only the leading and trailing bogies are powered, with the centre bogie supporting the articulation. Automatic couplers have been fitted to permit train formations of up to four two-car sets to be operated. Other features include resilient wheels and a steel body.

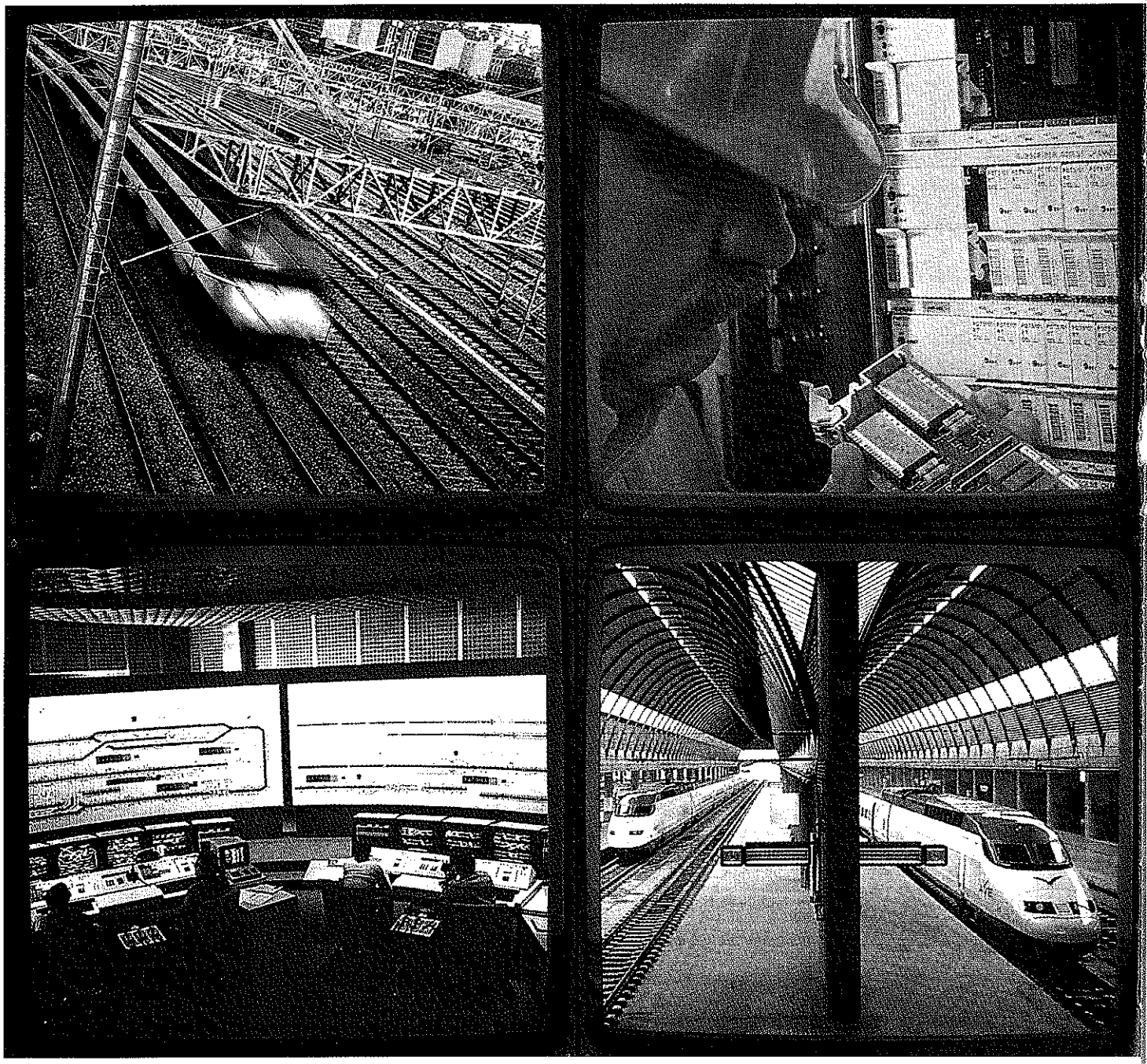
Vehicle interiors have been fitted with fire-resistant materials, while seating is arranged in longitudinal banks of either two or five seats, with a bank of four seats arranged across the back of the trailing car in the position occupied by the driving cab in the leading vehicle.

Large anti-glare windows and predominant white tones result in a spacious interior feel to the cars, with illumination being provided by a double strip of ceiling-mounted fluorescent lights. Roof-mounted air-conditioning from Stone Iberica is also fitted, while horizontally and vertically-mounted grab bars are available to standing passengers.

Entrance to the driving compartment is via the passenger area, from which it is segregated by a glass screen. The cab has been ergonomically designed and also contains electronic and electrical equipment cabinets. The driver has access to a public address system, over which music and station announcements can also be conveyed, while passengers can also communicate with the driver using an emergency alarm circuit. **IRJ**



CAF, Spain, has delivered the first two Line 2 trains for testing in Monterrey.



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Manila Plans LRT Expansion

Manila's Light Rail Transit Authority (LRTA) is planning a large-scale expansion of its LRT network. It intends to order a fleet of new LRVs for the Philippine capital's existing Line 1, and hopes to build a further five new lines by 2000.

POLITICAL problems have so far hampered proposals to extend the LRT network in Manila. A plan to build a new light rail line along Epifanio de los Santos Avenue has been killed off and revived on several occasions, while other new construction schemes put forward by LRTA are likely to require private investment before they are given the go-ahead by the Philippine government.

The saga of the planned LRT Line 3—designed to relieve traffic congestion on Manila's busiest highway route—typifies the difficulties facing the planners. This new line should connect with both ends of the existing elevated Line 1, completing a circular route which will include the key eastern section along the length of Epifanio de los Santos Avenue.

A $US 400 million bid to build and operate the important 17.8km section of line from North Avenue to EDSA, submitted by the Edsa consortium—led by ICF Kaiser Engineers, United States, and CKD Tatra, Czech Republic—was accepted in April 1992 by the former Philippine president, Mrs Corazon Aquino. However, the contract was annulled and the plan reviewed when she was replaced by Mr Fidel Ramos (IRJ February 1993 p60).

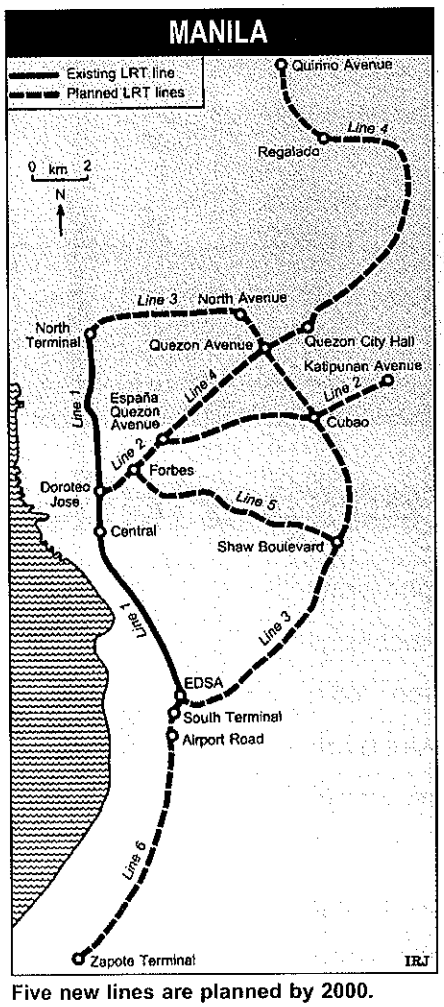
A dispute followed over whether the government should provide financial guarantees for investors and whether the consortium, for its part, should offer guarantees of revenue. Eventually, ICF Kaiser Engineers was awarded a $US 20.6 million contract to manage the design and construction of the line, with the stipulation that the building cost would be met by the private sector (IRJ August 1993 p54).

It was hoped that the link could be completed within four years, and would carry an estimated 450,000 passengers/day. This timetable is under threat, though, because the contract which was agreed between the government's Department of Transportation and Communications and Edsa is now being reviewed by the Philippines Supreme Court.

When it is built, the line will comprise a mixture of elevated and at-grade sections, with a total of 18 stations, and a depot at North Triangle, Quezon City. Commercial developments planned at or above stations on the route, as well as at the depot, will be financed through loans and joint undertakings with the developers. Edsa will make annual payments to the Department of Transportation and Communications to secure the commercial rights to exploit these developments.

Meanwhile, plans to order 32 LRVs to increase capacity on Line 1 have also been delayed as the tenderers' technical specifications have not yet been approved by the government's funding body, OECF. LRTA intends to increase passenger capacity by transforming its existing two-car articulated sets, built by BN, and ACEC, Belgium, into three-car sets, with the addition of the new LRVs due to be built by CKD Tatra.

Representing phase one of the LRT expansion programme, this project was scheduled for completion by 1997. The main concern is that of compatibility, according to LRTA's officer-in-charge, Evangeline Razon, who said: "Detailed design has not begun because OECF's acceptance of our evaluation of the technical proposals is still awaited. We are determined to make sure there is equipment compatibility between the old and new vehicles."



Five new lines are planned by 2000.

The fleet expansion should increase line capacity from the present 18,000 to 27,000 passengers/h/direction, at 2min 30sec headways during peak periods. LRTA believes it might also be possible to reduce peak-time headways to a minimum 1min 30sec in the future.

A further stage of the new LRT network programme involves the planned construction of Line 2, running 11.3km from Doroteo Jose station on Line 1, eastwards to Katipunan Avenue, via Forbes, España Quezon Avenue, and Cubao. Line 2 is expected to be technically and operationally compatible with Line 1, enabling LRVs to run on both lines.

Concessional Finance

LRTA has failed to find a private investor willing to enter into a build-operate-transfer (BOT) agreement for Line 2, and, as a result, the government is considering implementing the project through a concessional financing scheme. As well as paying for the new rolling stock for Line 1, OECF might also provide the initial finance required for the construction of Line 2. It is already funding detailed design and engineering work, which is due for completion by July next year.

LRTA says that building of Line 2 could go ahead before 1997, with passenger services underway within a further two to three years. Proposed routes for lines 4, 5, and 6 are also being studied, and the addition of these lines, together with lines 2 and 3, would complete a new 55km network at an estimated total cost of $US 1.6 billion.

Plans to develop lines 4, 5, and 6 are not likely to be pursued seriously, unless they can attract offers from private consortia on a BOT, build-operate-own (BOO), or build-lease-transfer (BLT) basis. But Razon remains optimistic, adding: "Given the right private sector financing environment, these projects can be completed at the turn of the century. Privatisation is still an issue, because the government at this time cannot afford to allocate funds to such highly capital-intensive mass transit projects."

Line 4 will run north from España Quezon Avenue to Quirino Avenue. The 18.3km line, elevated in sections, will have 20 stations including Quezon Avenue, where it will connect with Line 3. Line 5 will be fully elevated, linking Forbes to Shaw Boulevard, with a length of 7.5km.

Line 6 is another fully-elevated scheme which will run southwards from South Terminal on Line 1 to Zapote Terminal, incorporating eight intermediate stations. Effectively, the 11km line would serve as an extension of Line 1. **IRJ**

LA Moves Towards Green Line Opening

Los Angeles will open its Green Line light metro for commercial passenger services on July 1 1995. Delivery of a new fleet of LRVs for operation on the line is already nearing completion. The design of the vehicles will allow conversion to automatic train operation (ATO), though this is unlikely to be needed in the near future.

THE LATEST line to be added to the expanding LRT network in Los Angeles, United States, will be operated by eight existing Blue Line vehicles, plus 15 new LRVs supplied by Sumitomo, and built by Nippon Sharyo, Japan. Most of these six-axle articulated bi-directional vehicles, each costing $US 3 million, have now been delivered to Los Angeles Metropolitan Transportation Authority (MTA).

MTA had planned to open the Green Line earlier this year, but it has been forced to delay the start of services following earthquakes, civil disturbances, and a funding crisis which led to a $US 300 million reduction in its LRT construction budget for 1994. The final cost of building the Green Line is expected to be about $US 734 million (IRJ June 1993 p45).

Segregation

The 37km dedicated line from Norwalk to El Segundo includes 14 stations, and it runs mainly along the centre of the I-105 Freeway. It is segregated from highway traffic by a Jersey Barrier/K-Rail barrier comprising a cement base and wire mesh fencing. A sensor system detects any significant movement of the wire where a person might attempt to climb it, and transmits an alarm signal to the metro control centre.

MTA plans to offer free travel on the line during the first few days of operation to "familiarise" passengers. MTA confirmed that no steps have yet been taken to introduce ATO, despite the fact that the new LRVs incorporate technology for full automatic operation, developed by Union Switch & Signal, United States.

The lightweight steel vehicles, fitted with two motor bogies and a trailer beneath the central articulated section, can operate at speeds of up to 88km/h. There are three types of braking on each vehicle—dynamic and disc, as well as magnetic track braking for emergencies. The vehicle sections can accommodate 76 passengers seated, or 233 at crush load standing capacity, taking into account space reserved for two wheelchairs. **IRJ**

Dublin Plans Three-Line LRT Network

THE Irish government is backing a plan to build a 40km three-line light rail network in Dublin at an estimated cost of £I 300 million ($US 480 million). However, there are only sufficient funds at present to build two lines totalling about 25km. This would cost about £I 200 million, of which 60% would be funded through the European Union (EU) structure fund.

CIE, the Irish public transport holding company, has been appointed agent for phase 1 and will be responsible for conducting a public enquiry into the project. The government plans to introduce new legislation which will exempt the project from the normal planning procedures but make a public enquiry mandatory.

It is hoped to start work on the project in late 1995 or early 1996, and to complete phase 1 by 1999. The first two lines would run south from the city centre. The priority line runs southwest to Tallagt, and the other line would run southeast, partly using a former rail alignment, to Sandiford. No decision has been made on whether to have 1600mm-gauge tracks in common with Irish Rail (IE), or standard gauge.

Traffic is forecast at 3000 passengers/h/direction/line during peak periods, but Mr Michael Sheedy, LRT project engineer with IE, told IRJ that this was a conservative estimate.

About 25 LRVs would be needed for phase 1. "We may buy the LRVs early, so as to get a fix on a major part of the cost of the project, and many design aspects depend on the vehicle design," Sheedy revealed. "We will issue as broad a spec as possible to keep costs down. The length of the vehicle will not be as important as the swept path. We could invite tenders for both gauges."

There would be two other major contracts for the project: one for the civil engineering and track laying, and the other for the power supply and communications.

Sheedy expects the LRT network to be operated by a new subsidiary of CIE, which has yet to be formed. The third line would run north from the city centre to Ballymun and possibly beyond there to the airport.

Wellington Signs Agreement

CITYRAIL suburban passenger rail services in Wellington, New Zealand, have had their immediate future secured by an agreement reached between Wellington Regional Council and NZ Rail.

The council is to continue funding the loss-making commuter service, and it will sign a further three-year contract with the railway on July 1 1995. In addition, NZ Rail's fleet of 42 two-car emus is to be refurbished at its Hutt Workshops, with the first of the refurbished trains due to be reintroduced in July.

Another aspect of the deal is the setting up of a joint study into proposals to upgrade the urban rail network. This will include evaluation of an option to build a light rail link which would replace the existing Wellington-Jacksonville heavy rail commuter line. The topography and narrow clearances on this line mean that it would be difficult to find suitable new trains in the future to replace the present rolling stock.

Portland Buys More LRVs

OREGON's Tri-Met metropolitan transport authority has increased its order for a fleet of new low-floor LRVs, and awarded an electrification contract for its planned 28.5km Westside light rail line extension in Portland, United States.

Siemens Duewag, United States, will build seven LRVs under the latest contract worth $US 15 million. These will be supplied in addition to the fleet of 39 low-floor vehicles already ordered for operation on the existing network, as well as on the first 18.6km section of the extension currently being built to Beaverton.

Portland was the first-ever US city to opt for a low-floor fleet (IRJ July 1993 p60). Initially, Siemens Duewag was awarded a $US 90 million contract for 37 LRVs, and this was later increased to 39. The extra seven vehicles will now be required following Tri-Met's decision to further extend the line as far as Hillsboro.

Siemens Transportation Systems (STS) will provide the electrification, valued at $US 10.7 million, for the full extension. This work is due to be completed by June 1997. The completed line will incorporate a 2km tunnel section between Jefferson Street and 76th Avenue, via Washington Park, and a short elevated section across the West Hills. It will connect with the existing Eastside light rail line to provide a passenger interchange at Hillsboro.

The new LRVs will allow easier street-level access, with entrances 355mm above the rail, and a low floor covering 70% of the passenger area. The fleet, due to be delivered before the extension opens, will be compatible with Portland's existing 26 standard vehicles. This will enable Tri-Met to couple low-floor and standard vehicles, so that every consist on the network includes at least one low-floor vehicle.

These LRVs feature two ac traction motors in each powered end car, enclosed to make them virtually maintenance-free, while the inverter system uses Insulated Gate Bipolar Transistors (IGBT).

The traction electrification project to be undertaken by STS includes the provision, installation, and testing of 14 power substations and the overhead contact system. Maintenance and operations catenary control panels will also be installed by L K Comstock, United States, in the Tri-Met operations centre, which will be located at Washington Park.

South African Cities Study LR

TWO South African cities, Johannesburg and Cape Town, are drawing up plans for light rail lines. Johannesburg has made the most progress and is to implement what it calls a bus rapid transit line as a precursor to LRT.

The 7.2km starter line will open early next year between Johannesburg Westgate station and the suburb of Hillbrow. It will be used to gauge the ridership potential in the corridor.

The bus rapid transit will be evaluated for about a year, before deciding whether to build a light rail line along the corridor. This would cost about Rand 286 million ($US 82 million).

Cape Town was due to have a technical task force in place by the end of last month to develop a light rail line of between 2.5 and 3km to link the main station with the waterfront. The objective is to complete plans by the end of 1997 in time for Cape Town's bid to host the 2004 Olympic Games.

A lot of the accommodation for athletes would be provided along the waterfront, and a major commercial development is planned on the route. The line is seen as the first phase of a 30km light rail network.

Amsterdam Ring Line Progresses

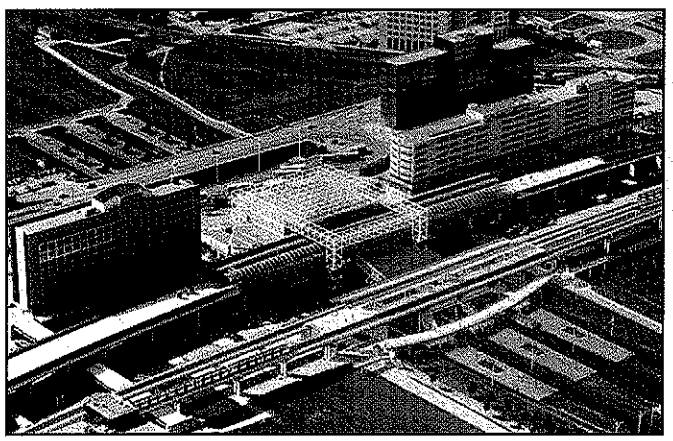
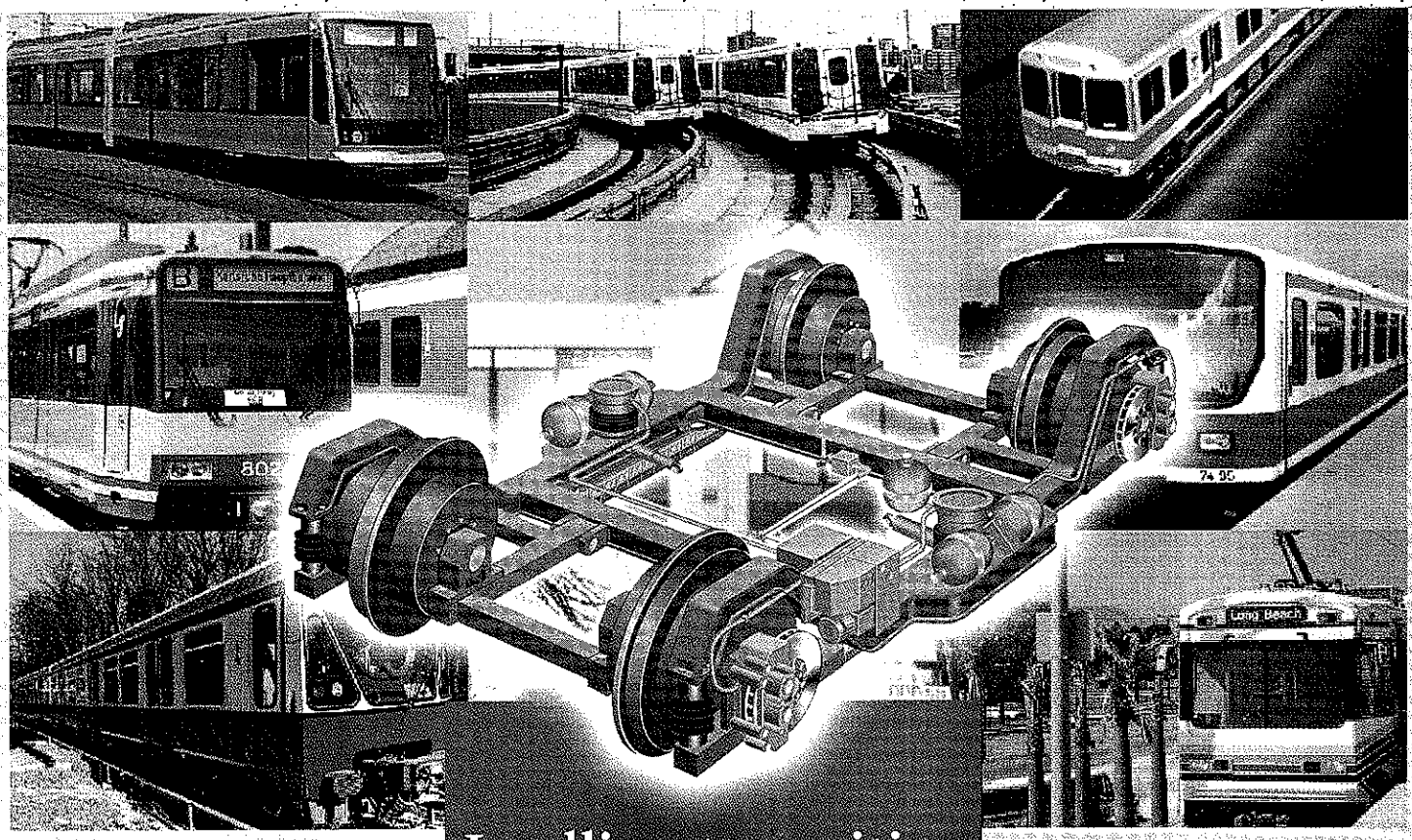


Photo montage of the Ring Line interchange at Sloterdijk.

CONSTRUCTION work is progressing on Amsterdam's new metro Ring Line between Isolatorweg and Gein, which is due to open in 1997. The 20.5km line will include a new 11km northern section of track, with nine stations, being built from Isolatorweg to Zuid-World Trade Centre (WTC). The remaining section in the south will incorporate sections of the existing metro as far as Gein.

The Ring Line is designed to provide a faster link for commuters between residential and business districts, serving key commercial areas such as Teleport at Sloterdijk, Amsterdam's Fashion Centre, WTC, RAI, Overamstel, and Bullewijk. It will also interchange with Netherlands Railways' (NS) network at six stations—Sloterdijk, Lelylaan, Zuid-WTC, RAI, Duivendrecht, and Bijlmer.

Amsterdam Municipal Transport (GVB) has ordered 37 new trains, similar to those already operated on its Amstelveen line, for passenger services on the Ring Line. The trains will operate at a peak frequency of 7min 30sec, and frequencies of 10 or 15 minutes at other times. The completed line is expected to attract 80,000 passengers/day.



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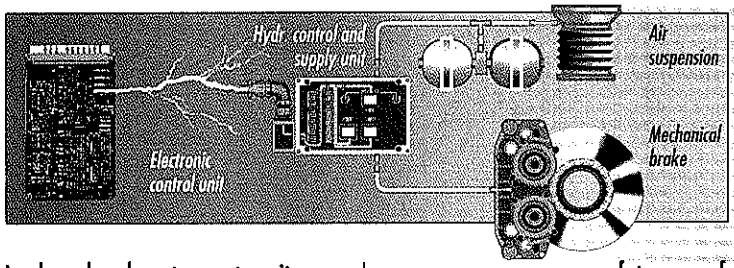

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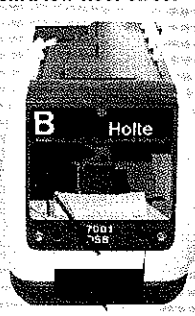

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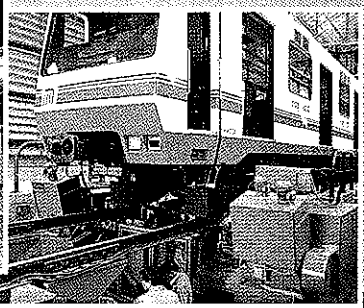

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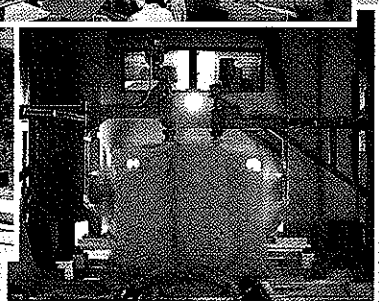

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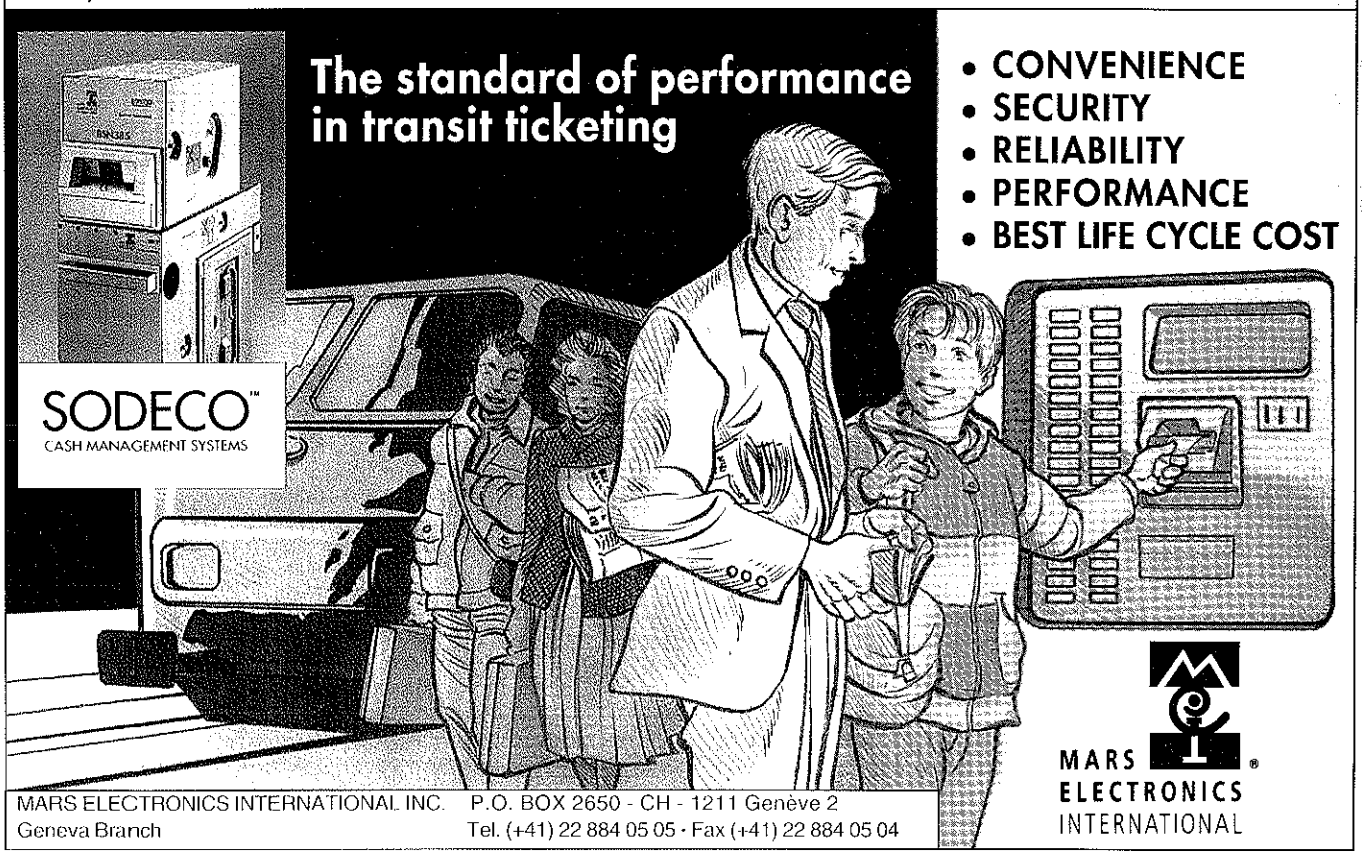

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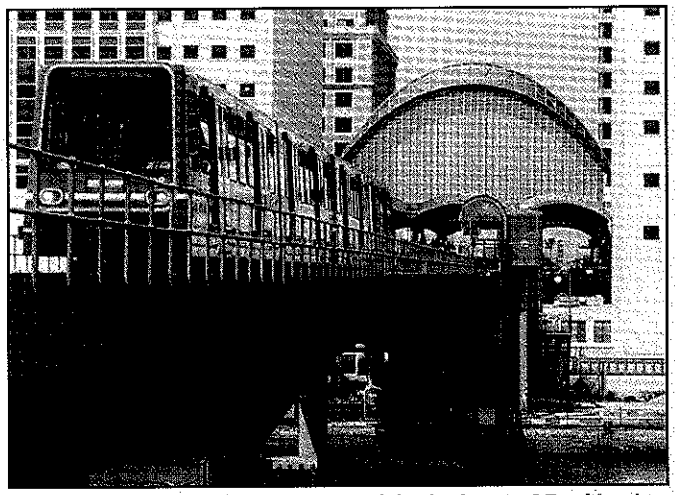
Docklands Light Railway To Be Franchised



DLR train heads out of Canary Wharf, in the heart of Docklands.

LONDON's Docklands Light Railway (DLR) is to be franchised to a private-sector operator in 1996, and it will be sold off completely by 2003. The British government has also invited bids from private consortia to finance and build the proposed 4.2km DLR extension from Island Gardens beneath the Thames to Greenwich and Lewisham.

DLR will be franchised at the outset because it is still making heavy losses. It anticipates revenue of £7 million during 1994, compared with estimated operating costs of £18 million. However, it expects to move into profit within the seven-year franchise period, after which an outright buyer will be able to take full control of infrastructure and passenger services on the existing network as well as services on the planned extension, due to be completed in 1999.

Pre-qualified bids to build the Lewisham extension, likely to cost between £100 million and £130 million, will be selected next month, and the winner will be announced in a further year. The successful bidder will be given a 25-year concession to finance, design, build, and maintain the extension. Construction should start in 1996.

A new station at Cutty Sark, near Greenwich, could also be included in the development, depending upon whether a firm commitment is made by pre-qualified bidders or other private investors to contribute towards its estimated £14 million cost. Otherwise the extension will incorporate only four stations—Greenwich, Deptford Bridge, Elverson Road, and Lewisham.

The future private owner of DLR will operate train services on the extension, paying the construction consortium for the use of the track on a performance basis. These payments would take into account track availability and the level of passenger traffic on the link.

Beijing Bonds To Fund Line

CHINA's Beijing Subway Corporation has issued corporate bonds worth Yuan 25 million ($US 2.9 million) to finance the construction of a 12km underground extension to metro Line 1 between the districts of Xidan and Bawangfen in eastern Beijing.

The shares issue has been underwritten by the Trust and Investment Corporation of the government-owned People's Construction Bank of China, and investors have been promised an annual interest rate of 14%. The project itself is regarded as particularly important because it will help to ease growing highway congestion in the city.

Adelaide Rail Privatisation

THE SOUTH Australian state government is planning to privatise the rail network in Adelaide in 1997. The network comprises four main suburban routes, currently operated by TransAdelaide, which says it will be among the bidders when the infrastructure together with emu-operated passenger services is put up for sale.

The network, plus the city's 11km tram line, will be put out to tender in March 1997. This is being preceded by privatisation of the city's bus services from March 1995. State transport minister, Diana Laidlaw, said: "The operation of the rail and tram network is obviously more difficult, due to the need to manage rail infrastructure and because there are few experienced private operators available in this field. However, there is a range of options which we will review before March 1997."

System-wide ticketing and transferability will be retained, using an integrated fares structure.

Canberra:

The Australian Capital Territory government has ordered a detailed study into the costs and benefits of a proposed light rail system, which could replace previous plans for a dedicated bus route in the city. Consultant, Booz, Allen and Hamilton, Australia, has been asked to provide a report which will recommend appropriate technology and identify the best potential routes for light rail lines.

Geneva:

Swiss Federal Railways (SBB) has launched its new Rhone Express Regional (RER) passenger service on the line between Geneva and La Plaine, which is electrified at 1500V in contrast to the rest of SBB's 15kV network. The service is operated by five 100km/h series Bem 550 six-axle articulated trains, supplied by Vevey, Switzerland, and ABB. These trains, each worth SFr 4.8 million ($US 3.8 million), have two three-phase motors, and they are equipped with auxiliary diesel drive to allow shunting under 15kV catenary in Geneva.

Helsinki:

Helsinki City Transport plans to order up to 20 low-floor LRVs for introduction in 1997-98. It has specified vehicles with a minimum seated capacity of 45 passengers, and a total capacity of about 120, and says it would prefer designs with a 100% low floor.

Jerusalem:

Jerusalem Municipality has drawn up a plan to construct an electrified street-running LRT system, which would provide two lines linking the city centre to the outskirts.

London:

The first works wagons built for the construction phase of London Underground's (LUL) Jubilee Line extension project have been handed over by Bombardier Prorail, Britain. The company received a £2 million order for 23 vehicles of three different types, all of which are scheduled for delivery by the end of this month.

Singapore:

The Mass Rapid Transit Corporation (MRTC) has commissioned a study into plans for a new light rail network, which would include a line from Dhoby Ghaut metro station to the Marina Centre. This route would also serve the new Suntec City commercial and leisure complex currently under development. Another LRT line is proposed to serve major facilities such as the National Stadium, Singapore Indoor Stadium, Singapore Arts Centre, and the Sheraton Way offices complex. Consultant, Oscar Faber, Britain, will carry out the study during the next six months.

Taipei:

Insurers have threatened to scrap insurance policies for the troubled mass rapid transit system, which is still suffering from delays in construction and commissioning. Since a train caught fire during tests on the automated Mucha Line (Brown Line) in May 1993, a catalogue of incidents has forced insurers to pay out large sums in compensation—including $NT 100 million alone for damage to vehicles.

United States:

Congress has approved federal funding of $US 4.6 billion towards the cost of rapid transit in the US for the year up to October 1 1995. This represents an increase of $US 32 million, and it was welcomed by the chairman of the American Public Transit Association (APTA), Mr Rick Simonetta, who described the allocation as "an extraordinary achievement in a very tight federal budget environment." The biggest increase is in capital grants for the replacement of vehicles and equipment, but operating subsidies have been cut by $US 92 million. **IRJ**

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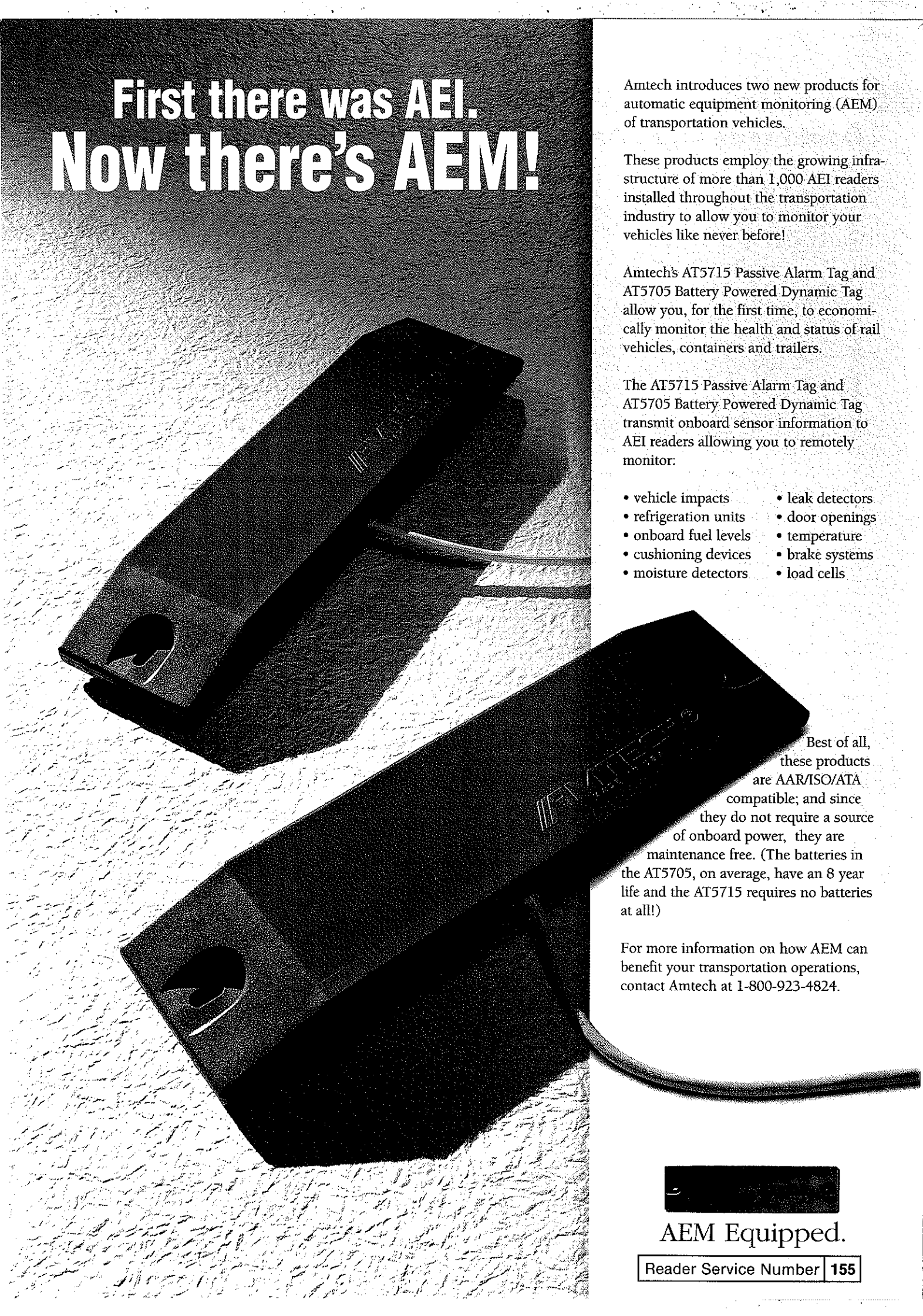

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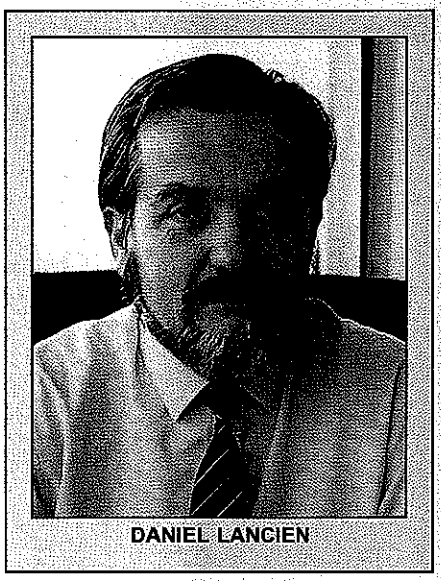
Astrée Trials Live Up To Expectations


DANIEL LANCIEN

French National Railways (SNCF) has been developing Astrée, a new railway command and control system for a number of years. A demonstrator is now operational. The principles underpinning Astrée are also being applied to the upper levels of the European Train Control System.

Daniel Lancien
Astrée project manager, SNCF Planning and Research Department

ASTREE is based on the moving block concept, and the project has been doggedly pursued for a number of years because we feel it offers considerable benefits in terms of increasing line capacity at low investment and operating costs.

Following feasibility studies and a small-scale preliminary test, two pre-operational technology demonstrators were developed to test overall system architecture and validate the safety modules. At the same time, we have been deeply involved in the development of the European Train Control System (ETCS), notably through some very active cooperation with German Rail (DB) in the framework of the Deufrako-M project.

The preliminary trials implemented on the Bondy–Aulnay test line in 1990 demonstrated the reliability of Astrée which is based on the following main features:

- an autonomous train position monitoring device
- a database which can describe network operation in real time, notably that of train positions and switch status
- management data processing centres to support the database and manage all traffic
- a combined microwave and wire-based data transmission network to enable the management centres to communicate with wayside equipment and trains, and
- maximum recourse to off-the-shelf components such as computers, transmission equipment, and sensors.

Now that the basic principle and the overall architecture have been validated on the preliminary demonstrator, two further issues need to be addressed. One involves a basic question about the robustness of the new system to handle operations involving the movement of a very large number of trains, especially concerning the data transmission network.

The system involves considerable centralisation of decision-making in the management centres of which there will be about 30 throughout France. We therefore need to ensure that the response time—the time for the system to prepare and transmit authority to proceed—is sufficiently short to enable SNCF to achieve its goal of higher throughput.

The second questions is: do most innovative modules, especially those designed reliably to measure train speed, check orders before they are transmitted to switches and trains, and monitor train speed and train integrity, pose any technical realisation problems given the extremely demanding safety levels required?

Rather than carrying out operating simulations to assess system loads and doing technical studies on paper involving the main components, we decided to address these issues by building full-scale technology demonstrators.


Three experimental trains are being equipped with Astrée.

The programme we adopted involved developing a highly-available distributed data transmission network architecture, developing a large-scale functional technology demonstrator based on this architecture, developing prototypes of the most critical components, especially those involved in safety aspects, and integrating all components and modules involved in safety aspects into a technology demonstrator.

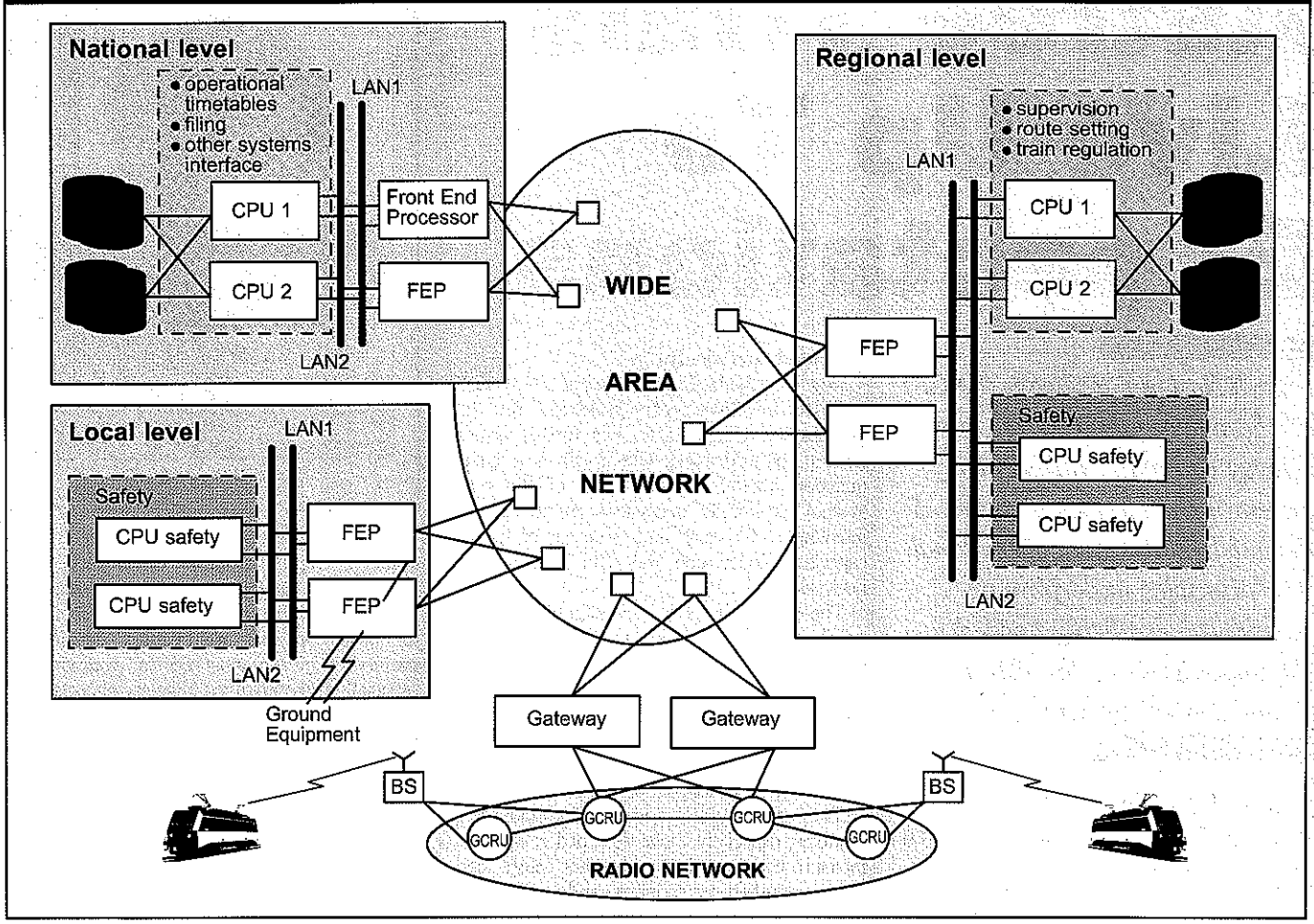
A modular three-layer architecture (Fig 1) has been adopted to achieve the desired availability and succeed in fitting the safety software packages to a number of machines:

- a national level draws up the traffic forecast and manages the database describing infrastructure and trains
- a regional level manages the traffic forecast on the one hand, and monitors and regulates trains in real time on the other; it also enables the database to be safely updated, and
- a local level guarantees train safety by safely allocating the resource requested at regional level; it also continuously monitors wayside equipment such as switches.

The various sites where these three levels are located are equipped with several computers in redundant configuration connected by a local area network (LAN). These sites are interconnected via a single nationwide wide area network (WAN), which itself has gateways to the radio communication network.

In principle, the idea here is to extend the preliminary test on the Bondy–Aulnay line while at the same time improving it to take past experience into

FIG 1: MODULAR THREE-LAYER ARCHITECTURE OF ASTREE



account (IRJ November 1990 p21). We also decided to explore the problems of the simultaneous management of mixed Astrée-equipped and non-Astrée-equipped trains, whose presence will continue to be detected by ground track circuits and whose authority to proceed is transmitted by wayside signalling.

Obviously in this case, trains which are not Astrée-equipped will not be able to benefit from the moving block logic, and will therefore limit throughput. Trains which are Astrée-equipped, on the other hand, will benefit from this functionality when they follow one another.

Great care has gone into demonstrator design to enable it to test all full-scale operating configurations

Finally, great care has gone into demonstrator design to enable it to test all full-scale operating configurations. Thus two regional management centres have been set up with the twin goals of dealing with the problem of data interchange and continuous operation, on one hand, and to cope with the switchover from one management centre to the nearest adjacent centre in the event of a failure. This is a highly unlikely situation, however, due to the high levels of built-in redundancy.

SNCF's eastern Paris region has been selected for implementing this demonstrator which corresponds to about 500km of fully-equipped single-track railway on which about 50 trains are travelling at peak times. This involves equipping about 80 traction units with Astrée components. The tests will be superimposed on normal operations and will be entirely functional, since the trains will continue to respect existing signalling in the first place.

The demonstrator is now operational and the first trials are underway. Preliminary test results have come up to expectations.

The safety aspects of Astrée are based on a limited number of computer modules which are being designed with the most compact footprint possible to enable them to be cleared for safety. Functions offered by these modules are:

- preparation of switching orders, and information concerning target speed and distance transmitted to the trains
- train integrity monitoring, based on continuous monitoring of pneumatic impedance of overall braking procedures, calculated using data from throughput and pressure sensors
- measurement of train speed and distance covered, and
- monitoring of train speed.

The first three of these modules are completely new, and it was essential to develop prototypes, particularly for the odometric monitoring device which is probably the most innovative module of the whole Astrée package.

Five prototype odometric devices have been undergoing tests for several months and have allowed us to validate expected accuracy and safety performance of plus or minus 10m with an error rate of less than 10^{-9} per operating hour and per equipment.

The prototypes for the sub-systems for preparing commands regarding target speed and distance, train integrity monitoring and speed control have also been successfully tested individually.

Finally, we must point out that transmissions, especially radio transmissions, do not need to meet security requirements since the transmitter module encrypts the data, and the receiving module decrypts it.

All these basic safety modules, together with the modules required for operation, have been integrated into a complete safety technology demonstrator. This is why the Bondy–Aulnay line will be fully equipped with Astrée modules, as will three experimental trains.

Modules whose safety features need validat-

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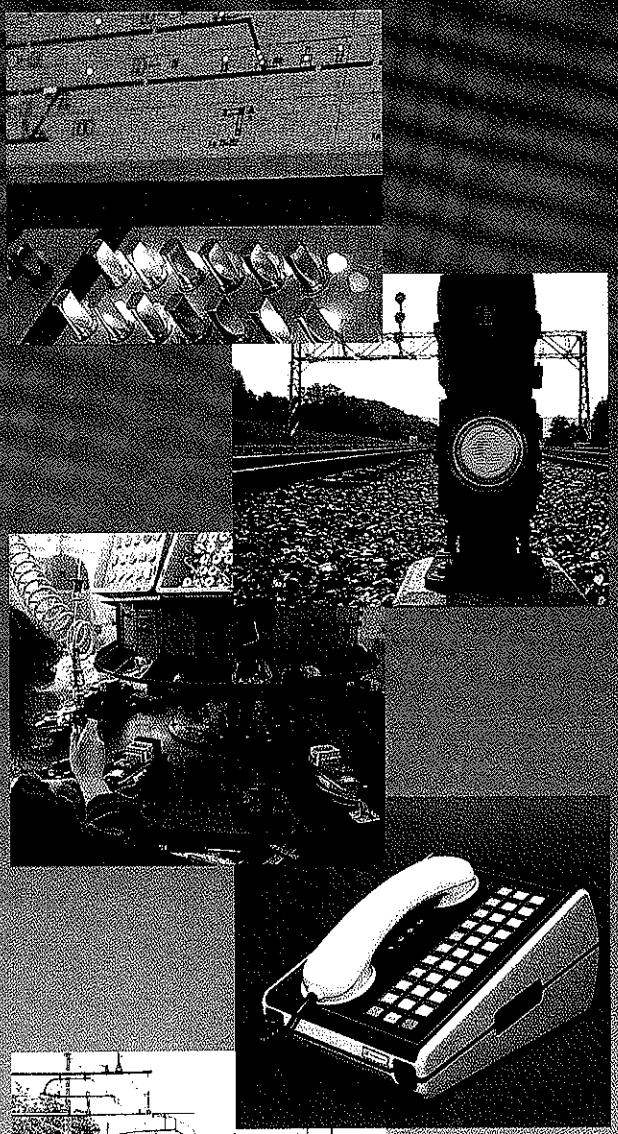

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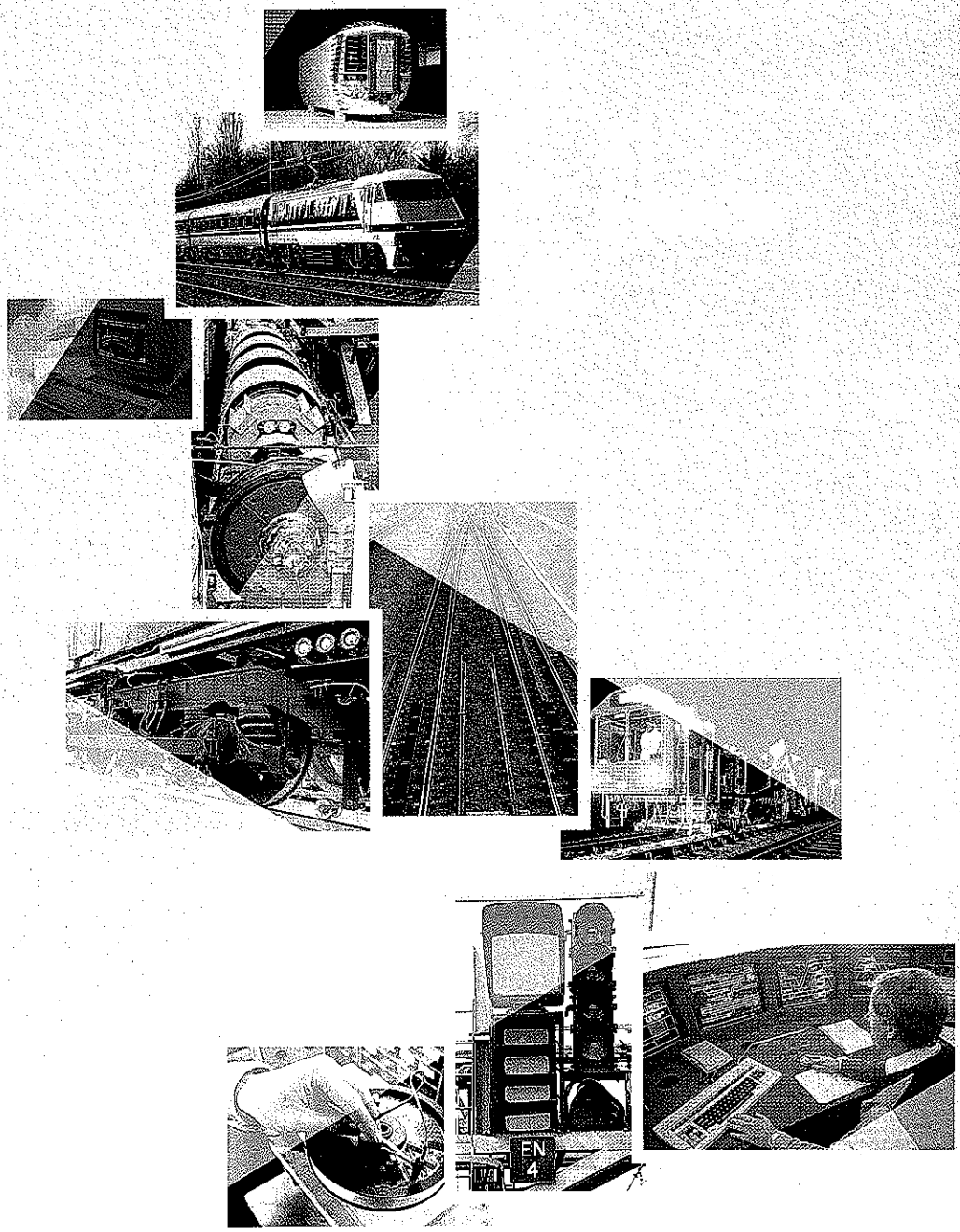

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ing have already been validated. Outside times of revenue operation, therefore, wayside signalling systems will be disabled and the line will be operated entirely under Astrée under normal safety conditions. This demonstrator was recently brought on stream.

The main idea behind the moving block concept in Astrée is to reduce the distance between trains to the minimum in relation to their operating speeds and braking capacities. To achieve this result, data concerning target speed and distance are displayed to the driver.

These data actually refer to the stretch of track along which the train has authority to travel. A full-scale simulation testbed over which six trains can travel one behind the other has been built to assess any difficulties that this approach to operation might pose.

The simulator has been functioning since 1993, and has enabled us to obtain more data on user-friendly ways of presenting driving commands to train drivers. These are displayed on a screen combining analogue with digital data.

Under the aegis both of the European Union and the UIC, structures have been set up in industry (for example the Eurosig consortium) and among railways (for example the ERRI A200 group) to develop the core of the ETCS for rail network inter-operability.

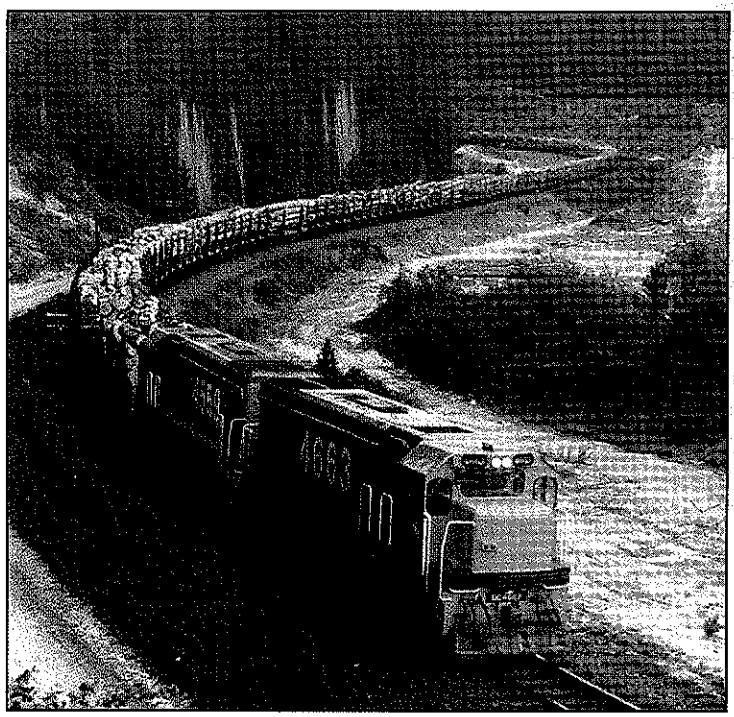
This system contains a number of functional layers, from the simple level of speed monitoring via wayside signalling to the sophisticated moving block concept used in Astrée. The various layers must be compatible both functionally (that is, downwardly), and technically (that is, upwardly).

Finally, the new system must be compatible with existing systems. DB and SNCF have recognised their mutual interest in a high-level system and have set up a structure called Deufrako-M to foster cooperation. This has twin goals:

- actively contributing to European research, especially in the area of the general specification, and the specification of mission-critical inter-operability modules such as radio telephony transmissions based on the GSM standard, one-off communications, odometry, and onboard information systems architecture, and
- preparing for actual installation of the new European system on high-speed lines in 2000 or 2001. **IRJ**

Railways Need More Affordable Signalling

While the trend has been towards the development of highly-advanced signalling for high-speed rail projects and automated metros, there is a great need for simple, affordable signalling for secondary and branch lines.



NZ Rail has replaced lineside signals with track warrants issued by radio.

CONTINUING technical development by European signalling equipment manufacturers has tended to focus on the twin markets of automated mass transit systems and high speed mainline railways. While the resulting advanced technology has been exported for such major projects as the new or upgraded metros in Asia and mainline electrification schemes in a number of countries, for many operators in world markets it represents an uneconomic level of sophistication both in terms of investment and maintenance costs.

Similar considerations exist in the new technologies' home markets, where the gap in operational requirements between rural and mainline services continues to widen. The common fundamental issue is the extent to which traditional signalling and communications standards applied to intensively-used lines are necessary where traffic is light.

In the new-generation, new technology, train control systems, such as the European ETCS and the United States ATCS, modular concepts have been developed, so that the same basic technology is upwardly-compatible from the lightly used branch line to the heavily trafficked main line.

However, upwards compatibility in effect imposes standards downward and it is clear from developments on recently commercialised railways in a number of countries that simplified signalling is a key factor in creating a viable business.

In its most sophisticated form, radio electronic token block uses an electronic interlocking at the control centre to prevent the issue of conflicting instructions to drivers. Such a system involves a complex safety protocol.

First the driver and controller agree the procedure verbally by radio. The system then checks that the train's number is valid and that the token requested correlates with the train's position. All radio transmissions are encoded and security is enhanced by the use of handshake procedures at the start of each coded message before data are exchanged.

Even though the introduction of radio electronic token block has resulted in substantial cost savings compared with manual token block operation using cabled telephone circuits, it introduces safety standards and vital technology which, in terms of cost and complexity, are often disproportionate to the requirements and economics of the traffic on the line being signalled.

For example, in common with many operators, Spoornet in South Africa identified opportunities in replacing physical token equipment on secondary lines and branch lines with a radio-based token system. While a variety of systems were available on the international market, the exchange rate at the time (1990) made a local solution imperative. In addition, most of the systems on offer were

UNE SIGNALISATION A UN PRIX ABORDABLE

LES fabricants européens d'équipement de signalisation qui poursuivent leurs développements techniques, ont eu tendance à se concentrer sur le double marché des systèmes automatisés de transport en masse et des chemins de fer à grande vitesse sur les grandes lignes. Tandis que la technologie qui en a résulté, a été exportée dans le cadre d'importants projets comme les nouveaux métros ou les métros modernisés d'Asie ou encore dans le cadre des projets d'électrification des grandes lignes dans plusieurs pays, pour de nombreux exploitants cette technologie représente un niveau de sophistication non économique tant en terme d'investissement que de coût d'entretien. La question fondamentale est ici de savoir à quel degré les normes traditionnelles de signalisation et de communication appliquées aux lignes à utilisation intense, sont nécessaires sur des lignes à faible trafic.

ERSCHWINGLICHE SIGNALEINRICHTUNGEN

DIE kontinuierliche technische Entwicklung durch europäische Signaleinrichtungshersteller tendierte dazu, sich auf die Doppelmärkte "automatisierte Massenbeförderungssysteme" und "Hochgeschwindigkeitshauptbahnen" zu konzentrieren. Zwar wurde die daraus resultierende fortschrittliche Technologie für große Projekte wie die neuen bzw. modernisierten U-Bahnen in Asien und für Hauptstrecken-Elektrifizierungsprojekte in einer Reihe von Ländern exportiert, doch stellt sie für viele Betreiber ein unwirtschaftliches Maß an Komplexität hinsichtlich Investitions- und Instandhaltungskosten dar. Grundsätzlich stellt sich die Frage, in welchem Maß herkömmliche Richtwerte für Signaleinrichtungen und Fernmeldeverbindungen auf verkehrsreichen Strecken in verkehrsärmeren Gebieten notwendig sind.

SEÑALIZACION ASEQUIBLE

LOS continuos avances técnicos que han conseguido los fabricantes europeos de equipos de señalización se han centrado hasta ahora en dos mercados muy similares: el de las redes automatizadas de transporte de masas y el de las líneas principales de alta velocidad. Aunque estas tecnologías avanzadas se han utilizado en proyectos tan importantes como los nuevos o mejorados metros de Asia, y en proyectos de electrificación de líneas principales en varios países, para muchos explotadores de ferrocarriles estas tecnologías son muy refinadas pero resultan poco rentables, tanto desde el punto de vista de las inversiones como de los costes de mantenimiento. La cuestión fundamental es hasta qué punto los sistemas tradicionales de señalización y comunicaciones que se utilizan en líneas con un alto volumen de tráficos son válidos cuando los tráficos son débiles.

based on fail-safe data transmission for the issue and return of electronic tokens.

It was considerations such as these that resulted in Spoornet deciding to develop a system based on non-vital communications systems, protected by verbal procedures. The issue of tokens is controlled by a latched relay interlocking for each block section, but the interchange of tokens relies on non-vital microprocessors and this is considered acceptably safe.

A simple method of reinforcing safety in such radio based non-vital systems is to print out details of the movement authorised, both in the central control and in the train's cab. Such hard copy reduces the risk of errors which can occur when the authorisation is simply written down and read back or shown on a display in the cab.

Operational Flexibility

Spoornet provides operational flexibility by using three types of token. In addition to 'running tokens' covering one or more clear sections ahead, there is also an 'occupation token' for work requiring a line possession and a 'restrictive token' which supplements a running token and allows a train to work through an occupation. A restrictive token can also warn of train movements at the next station.

Some operators think that even the use of a hard copy print-out could be considered as over-engineering. Given that air traffic control can path aircraft safely into the busiest airports at 90-second headways through a three dimensional space purely by voice and data transmission, why should a railway, with trains constrained in one dimension need anything more than a radio telephone?

This has been the philosophy behind the revival of a number of railways where renewal, or continuing operation, of existing labour intensive signalling systems was uneconomic.

In Argentina, Fepsa adopted Union Pacific's Track Warrant system when it took over the 5200 route-km Rosario–Puerto Belgrano and Huinca Renanco–Bahía Blanca main lines. The key to such telecommunications-based control is a reliable radio network and this was provided by a series of microwave links serving a computer-aided dispatching centre at Bahía Blanca. The cost was $US 5 million for the complete system.

If air traffic control can path aircraft safely into the busiest airports purely by voice and data transmission, why should a railway need anything more than a radio telephone?

A similar policy was adopted in New Zealand as part of the railways' drive for profitability. Here, too, track warrants issued by radio replaced conventional lineside signalling.

Again, when the war in Angola ended, the fighting had destroyed the existing signalling and telecommunications infrastructure and the rehabilitation of the railway was based on the use of radio dispatch. Interestingly, the exception to this policy was the section of line which had previously been equipped with a radio token block based on microwave communications links.

Microwave, with its absence of fixed infrastructure other than the towers needed for line of sight transmission, is resistant to damage. As a result, the token block could be restored by rebuilding the towers.

Global Positioning

For such radio block systems to maximise line capacity, the centralised traffic control requires real time accurate information on train location. A significant innovation is the development of Global Positioning Systems (GPS) which use navigation satellites to calculate a location on the earth's surface to within a few metres—and provide an alternative to track circuits.

Commercially available units, designed for walkers and other leisure users retail for under $US 1000. Because these hand-held units use military technology, and might be of use to potential enemies, their performance is derated to give an accuracy within 100 to 200m.

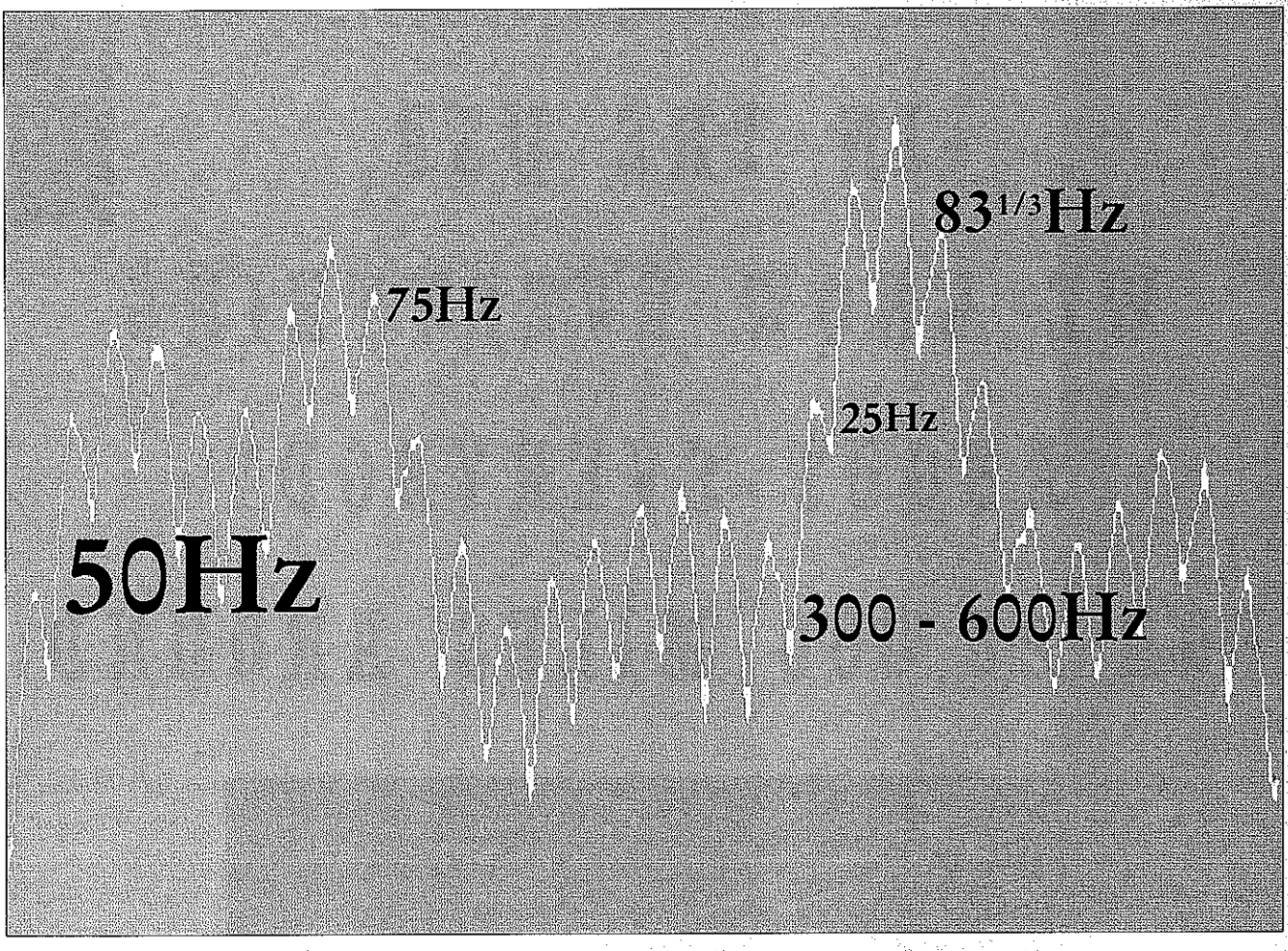
However, the technology is already in use providing position data for the control of on-train passenger information systems and, with non-derated performance, would be able to indicate accurately the relative positions of trains, for example at passing loops.

GPS provides accurate location without the need for a physical contact between train and track. However, the need remains for train integrity to be monitored.

Various techniques have been used, notably tail magnets which are detected by a receiver between the rails, but with the advent of secure low-cost communications the axle counter has become a reliable means of indicating that a section is clear.

As traffic density increases, remote interlockings become necessary and here advanced technology can minimise the added complexity resulting from such an upgrade. Developments in processing power and safety validation techniques for both hardware and software have made interlockings based on single processors suitable for vital safety functions. Such interlockings use a combination of multiple parallel processes, known as diversity and internal checking using codewords and check-sums, to ensure safety.

While the examples of simplified signalling quoted in this article have come from Africa, South America and the Pacific, the continuing pressure to reduce the operating costs of unremunerative passenger services in Europe could lead to more examples of business-led signalling. Recent work on the development of quantified safety cases for railway operations could encourage this process. **IRJ**



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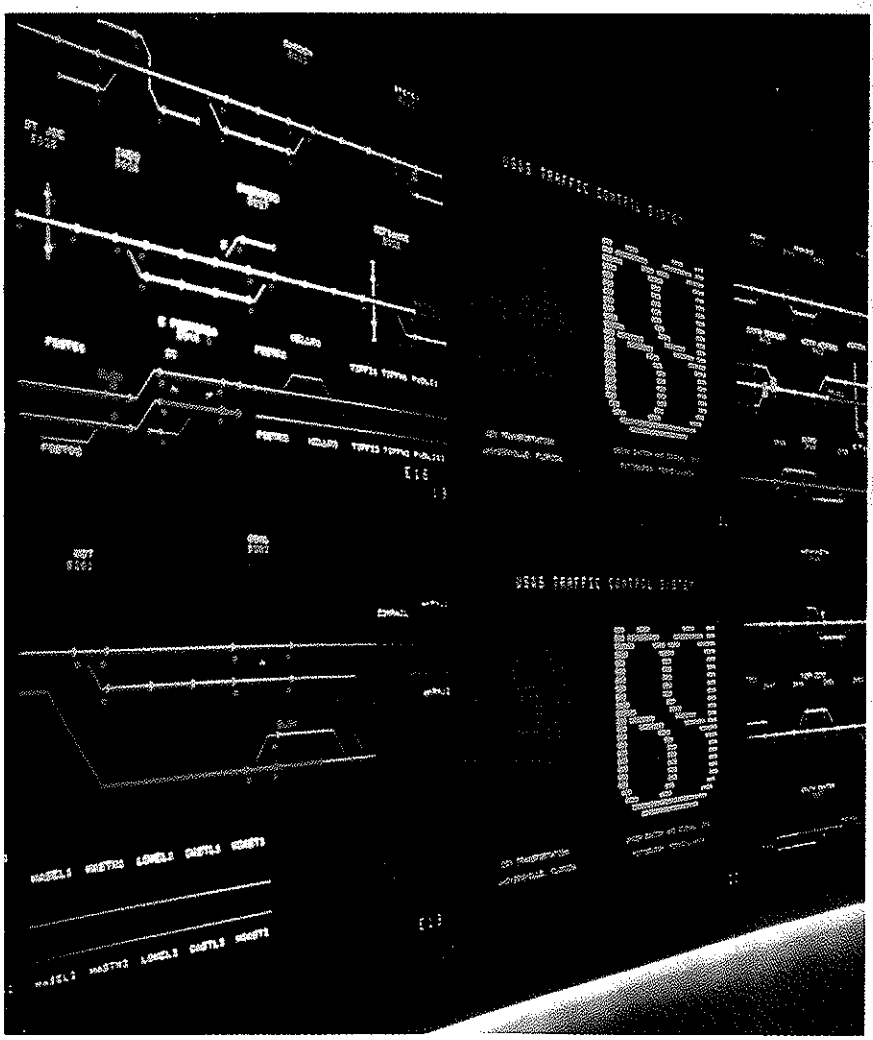

■ *Ansaldo Trasporti is part of Ansaldo, a multinational group with a century and a half of experience, over 20,000 employees and its own organizations in 30 different countries. And it can boast significant achievements in over 70 countries worldwide. Of course, all this results from business vision based on the mastery of technology and flexible strategies. But most of all, it comes from knowing the value of people and ideas.*

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FINMECCANICA GROUP

DB Starts Project To Raise Capacity

German Rail (DB) is embarking on a project called CIR-ELKE which is designed to raise capacity on the core network by about 40% and improve operating efficiency. A pilot project on the 125km Offenburg–Basle main line should be in service by early 1997.

Roland Heinisch
German Rail (DB) Board Member for Research and Technology, and Freight Traffic

THE establishment of DB as a joint stock company has created the framework for DB to be run as a competitive business which takes the needs of the market into account. We are striving towards getting more out of the railway, and our expectations are great: a more profitable, competitive railway. To achieve this, two aspects are most important:

- positioning the railway in the market through quality, and taking into account fully the needs of customers, especially in terms of information, and
- precise, but at the same time, more flexible planning of operations either to provide simple and economic solutions for lines where only a small income can be earned, or to develop high-efficiency systems where capacity is at a premium and where everything must mesh together in an optimum way.

The systematic application of computer technology, or telematics, with the aid of modern information processing will be realised on DB through our Computer Integrated Railroading (CIR) master plan. In the short term, this will improve quality and efficiency by expanding existing data systems. In the medium term, the plan will be applied to new and where possible existing projects, and in the long term, CIR will make it possible to take advantage of innovations in data processing technology.

A priority for DB is the better use of lines and junctions so as to be able to offer more services at a lower cost. This will be achieved through a sub-project called CIR-ELKE, where ELKE stands for increasing the performance of the core network. Our objectives are ambitious but concrete:

- to raise the capacity of the core network by 40%—for which about half the increase will come from making better use of the operating performance of trains (with additional requirements from the sales and control systems), and half from running more trains on the main lines, and
- to improve operating efficiency on main lines by having greater leeway between trains.

The main focus of attack for CIR-ELKE is to make our conventional fixed block signalling more flexible. To achieve this we will use our LZB ATC system, which has only been used to achieve higher speeds up to now, in combination with the high-performance block (HBL).

This makes it possible to adjust the block interval flexibly to meet local conditions and train dynamics, by running trains on electronic sight with a margin for safety.

The capacity of a line or junction will be increased essentially in two ways. The need for fast trains to overtake slower ones will be reduced through an increase in the average speed of freight trains with the aid of LZB. The interval between trains will be cut by having more flexible block sections as a result of abolishing many block signals (Fig 1), introducing LZB, and the sub-division of departure and arrival tracks using LZB block indications.

In addition to the improvements in train operation, CIR-ELKE will make it possible to plan ahead which should reduce the need for trains to brake and accelerate as much as they do today, which will thereby save energy.


ROLAND HEINISCH

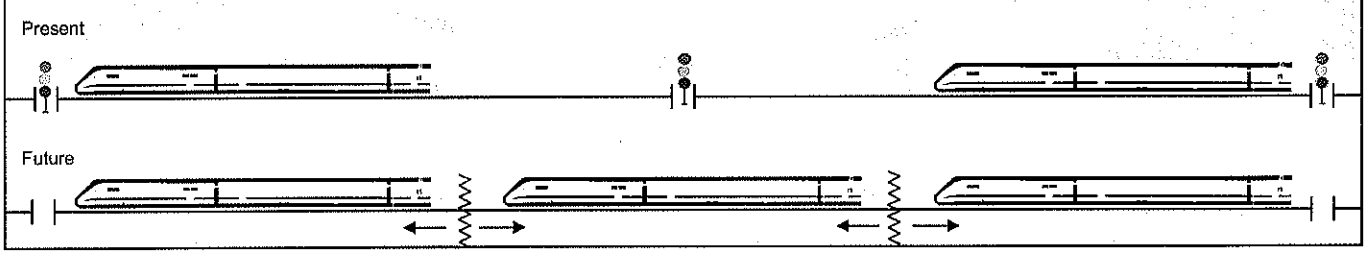
The CIR-ELKE project involves a number of other components. These include computerised train monitoring from regional operating centres, which are to be extended to all main lines and junctions. This is supplemented by inter-regional planning centres, the operating centres which should in future recognise conflicts automatically in good time and make computer-generated proposals for solutions or exercise direct control.

There will also be:

- systems to control and monitor the safety of train operations on very busy lines, as high-capacity operation up to running on electronic sight
- train control through junctions and computerised route management (pathing)
- train control with improvement of such things as journey times, punctuality, operating fluidity, energy consumption, and train dynamics—this is more than just safety-related headway control, and
- control of the normal operation of trains by radio, particularly on lightly-used secondary lines.

Essential changes and new developments are necessary for these applications. There must be reliable and continuous location of trains through distance and time measurement, supported by static beacons or satellite com-

FIG 1: CIR-ELKE WILL HELP TO INCREASE LINE CAPACITY



The interval between trains will be cut by having more flexible block sections as a result of abolishing many block signals.

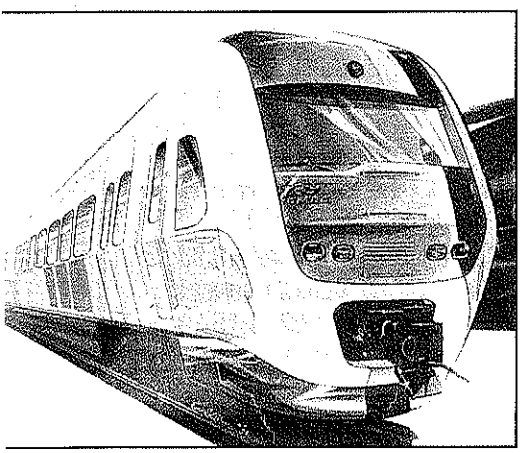
Technical Innovations Outlined At Comprail

New developments in signalling and communications were prominent among the presentations at Comprail '94, the bi-annual conference on computer-aided design, manufacture, and operations, held recently in Madrid, Spain.

COMPRAIL '94, which was organised by the British-based Wessex Institute of Technology—and co-sponsored by IRJ—provided a diverse array of proposals, technical improvements, and innovations from engineers, consultants, and designers within the railway industry, as well as contributions from specialists in computer technology. The conference included several sessions devoted to signalling, communications, and advanced train control systems.

Among the latest developments featured was a new automatic train protection (ATP) system which has been designed by experts at the Northern Jiaotung University, Beijing, for future installation on the Chinese rail network. This form of ATP, based on multi-microprocessors in a distributed configuration, should increase safety on the existing mainline network which presently relies on an automatic block system. Real-time static and dynamic parameters are used in the calculations for service braking.

China considers its railway is not yet ready for conversion to ATC or ATO because of the mixture of passenger and freight traffic operated on many lines, as well as other inhibiting factors such as the layout of stations, the frequent requirement for shunting at stations, and the significant differences in braking performance between various types of locomotives and rolling stock. Therefore, ATP represents the first logical step in increasing safety and efficiency.



Artist's impression of a DM90 for NS which will be fitted with ATBNG equipment.

The ATP hardware comprises a central processor which links with eight microprocessor sub-systems. These control functions such as cab signalling, train parameters input, the measurement of speed, distance and pressure, intermittent information, train operation recording, instrument indication and audio warning for the driver, automatic braking, and dual-redundancy ring communication channels.

The system's software has a hierarchical structure covering five main functions—application, diagnosis, communication management and processing, data acquisition and processing for sub-systems, and dispatching and management.

Although the designers admit that further study is necessary before the system can be introduced, they are confident it will eventually be adopted nationwide. The technical paper presented to the conference concluded: "This multi-microprocessor distributed ATP system has been proved to be suitable for Chinese rail transport. By means of its fault-tolerant design and fault-diagnosis methods, it is reliable and fail-safe.

"Due to the dispersity of the parameters, particularly for freight trains, the calculation and the control accuracy of service braking still needs to be improved. In this respect, there are many things to be explored.

"But the application of this ATP for conventional-speed operation on the Chinese network, together with the automatic block system, will be a leap in the history of train control in terms of reliability, safety, and efficiency. It will also lay the foundation for ATC and ATO to be installed in the future."

Another railway which has opted for an advanced version of ATP is Netherlands Railways (NS). NS has already begun testing its new generation ATP system (ATBNG) in commercial passenger operation on a 24km section of line. A total of nine dmus have been fitted with ATBNG-compatible phase four trainborne equipment, developed by ACEC, Belgium, which translates the information transmitted from trackside beacons and loops via a 100kHz carrier signal.

This trainborne equipment is due to be installed in 53, DM90 two-car diesel-hydraulic trains ordered by NS from Duewag, Germany (IRJ March 1993 p10). It has an open structure so that new ATP modules can be added to incorporate ATBNG functions.

The new fleet will operate on the Zevenaar–Winterswijk and Nijmegen–Roermond lines, covering about 100km of track, which will each be fitted with ATBNG trackside equipment before the scheduled start of DM90 passenger services during the second half of 1996.

Trainborne equipment consists of a two-out-of-three computer, a data entry unit, and a cab display. Speed and distance are computed on the basis of speed sensor pulses, with a speed sensor mounted on an axle. The system supervises the speed/distance profile decoded from the track-to-train message, while the cab display gives information to the driver in such a way that the maximum speed can be reached without breaching safety limits.

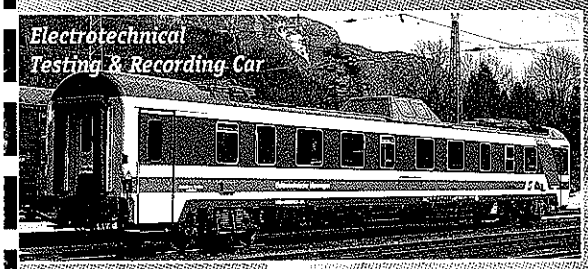
The application of ATP on the Chinese rail network, together with automatic block, will be a leap in the history of train control in terms of reliability, safety, and efficiency

Main operational features of ATBNG include the supervision of braking on the basis of individual train technical data, supervision of train speed in steps of 10km/h, and protection at junctions where it is overlaid on the existing ATP system. The speed/distance profile transmitted by the beacons contains redundant information to ensure there is no disruption or loss of safety resulting from the failure of a beacon. Similarly, there is redundancy built into trainborne equipment to prevent the need for trains to operate without the benefit of ATBNG.

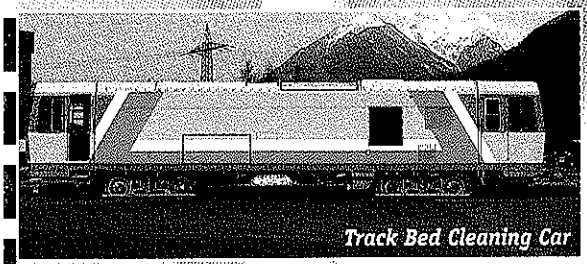
An improved ATC system is being planned for introduction on new and extended Shinkansen lines in Japan. Three high-speed lines—Hokuriku, the Tohoku extension, and the new Kyusyuu–Kagoshima link—are already under construction, while two more projected lines—Hokkaido and Kyusyuu–Nagasaki—are due to go ahead soon.

All five of these lines should incorporate the modernised ATC, which will have train head-

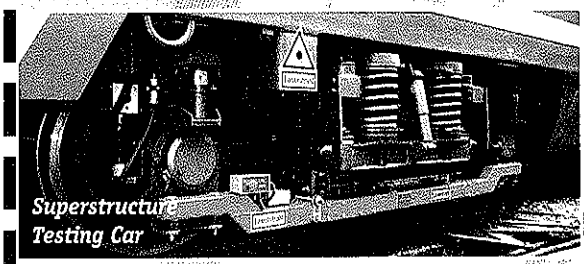
It's all about riding comfort



Electrotechnical Testing & Recording Car

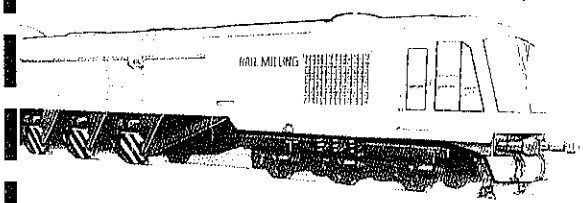


Track Bed Cleaning Car



Superstructure Testing Car

Rail Milling Car



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Improved ATC could be installed on existing Shinkansen lines.

ways calculated by a new computer-aided block signalling arrangement system being developed by the Railway Technical Research Institute (RTRI) signalling laboratory, in partnership with the Japan Railway Construction Public Corporation.

Specialists from these organisations jointly presented a paper at Comprail '94, outlining the block signalling arrangement system, and announcing the results of a test simulation programme carried out using the Speedy train performance computation system.

According to data from initial tests, which simulated high-speed passenger train operations on the planned new Shinkansen lines, the use of the system will give railways greater operational flexibility and allow reduced headways in comparison with those possible on existing lines. The developers say it could also be integrated into ATC on the existing high-speed lines operated by JR Central, JR West, and JR East, as well as applied, with modifications, to other national railways.

The conference paper stated: "When we plan ATC on new lines, the minimum train headway is decided in advance, and we arrange block signalling to adapt to it. The characteristic of this system is that it can plan the block signalling arrangement on new lines without the need for a long period of evaluation and examination by experts. We can try many simulations in different conditions in a short time.

"High reliability is achieved because this system checks and re-checks its own results. Basic specifications have already been completed, and it will continue to evolve in the future."

Transit Developments

Signalling developments in rapid transit networks also figured prominently at Comprail. GEC Alsthom provided an overview of its new Sacem ATP system, installed on RER Line A in Paris, France, and another key paper was presented by CMW Equipment, Brazil, which detailed its new Communication-Based ATC system (CBATC) being developed for installation on the east-west metro line in São Paulo, Brazil, next year.

Another technological advance put under the conference spotlight was the high-capacity radio-transmission-based moving block signalling system (TBS) due to be installed on London's Jubilee Line. London Underground (LUL) claims this will be the first signalling system of its kind to be employed on a heavy metro (IRJ March p15).

TBS has a design capacity of 36 trains/h/direction, though it will operate initially at a maximum 27 trains/h/direction. The system will incorporate ATP and ATO. Signalling information will be displayed in the driver's cab, with trackside signals installed as a back-up in case of breakdown.

LUL's Mr George Clark, presenting the paper, said: "High passenger demand on metros has stretched conventional fixed block signalling systems to their limits. TBS is a signalling system in which the safe distance between trains is achieved by the continuous transmission of high resolution positional data from trains to a control processor where it is converted into target points for following trains.

"Data received from the control processor is used by the trains to enforce a dynamic safety distance. Train location is given by the on-board processor (OBP), and the use of the bi-directional radio link, via the train control processor, provides train location data to the following train. The OBP continually calculates its safety distance, based upon its own speed.

"TBS provides more than just high capacity. The benefits of such a system for LUL include:

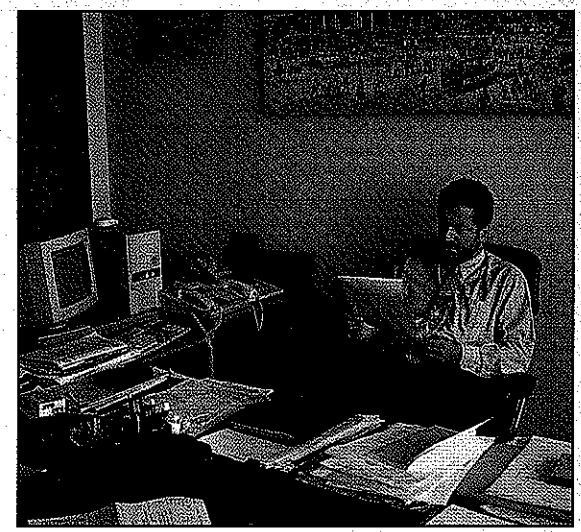
- virtually no trackside equipment, which is especially important in tunnels
- flexible line capacity to meet demand
- TBS can be overlaid on an existing signalling system, allowing dual running of trains and minimal disruption during installation and commissioning
- the train service can recover quickly after a delay as the gap between trains can be "closed up," and
- bi-directional signalling can be introduced at little cost.

There are also disadvantages to TBS. These are perceived as follows:

- the loss of the train control processor (TCP) could have a high impact: all trains in its area would need to be driven manually on sight, with no ATP, increasing the safety risk to passengers and staff, and causing significant delays to the service
- the radio system coverage must be continuous—the occasional fading of voice radio in a harsh environment would not be acceptable
- a service recovery strategy is required following a TCP failure, to guard against the potential loss of an "unregistered" train by the system, and
- the extensive use of safety critical software systems requires a considerable change in approach to safety assurance." **IRJ**

EFE Seeks More Cash For Intercity Rail

The only place in South America where railway managers and the government are both seriously interested in promoting and developing intercity passenger trains is Chile.



Méndez is only interested in services beneficial to EFE.

CHILEAN State Railways (EFE) is currently investing $US 80 million in a three-year programme to improve infrastructure and upgrade rolling stock. A more ambitious plan, costing up to $US 384 million, has recently been presented to President Eduardo Frei. IRJ spoke to EFE's general manager, Mr Enrique Méndez, in Santiago to find out more.

During the second half of the 1980s, the service quality offered by EFE's interurban passenger trains fell significantly. Has the rot been stopped?
Yes, but so far the improvements have been only marginal. There are two reasons for this: the amount of money available for investment is limited, and our track upgrading project and upgrading our saloon-class (first-class) emus cannot be carried out on a consistent day-to-day basis.

The benefits of our current investment of $US 80 million will really start to show in 1995. You can already see a difference in some areas such as onboard toilets, general vehicle cleanliness, punctuality, and staff training.

We are also thinking about buying some second-hand sleeping cars and other coaches from European railways. Until we have enough 'new' sleeping cars, our present 65-year-old vehicles will remain in regular service. However, they are becoming a tourist attraction in their own right, and we may be able to take advantage of that in future.

Right now, do passenger trains cover their operating costs? Let's deal separately with the medium-distance trains from Santiago to Chillán and Concepción, longer-distance trains, the Metrotren in Santiago, and the summer and off-peak periods.
Demand is very seasonal. The trains are profitable in summer but, particularly in the case of long-distance services, they fail to cover operating costs in the winter. We do not think it is feasible to run services only in the summer, but we do cut back on frequencies during the low season, and merge trains to cut costs.

We beef up ridership by special promotions. Another thing we have done is to concentrate the metro-like services we run between Valparaíso and neighbouring towns on the shorter legs only as far as Peña Blanca rather than destinations further afield. This has had good results. The Metrotren local service in the Santiago area, like the service to Chillán, has a more even demand pattern, so it is easier to manage the routes.

Does EFE run some trains that it does not want to, due to political pressure?
I would say that more than anything else, the pressures are for us to start up new services that we do not run at present. EFE's position has been clear and consistent on this point: we do not yield to such pressure if the services would not be beneficial to us.

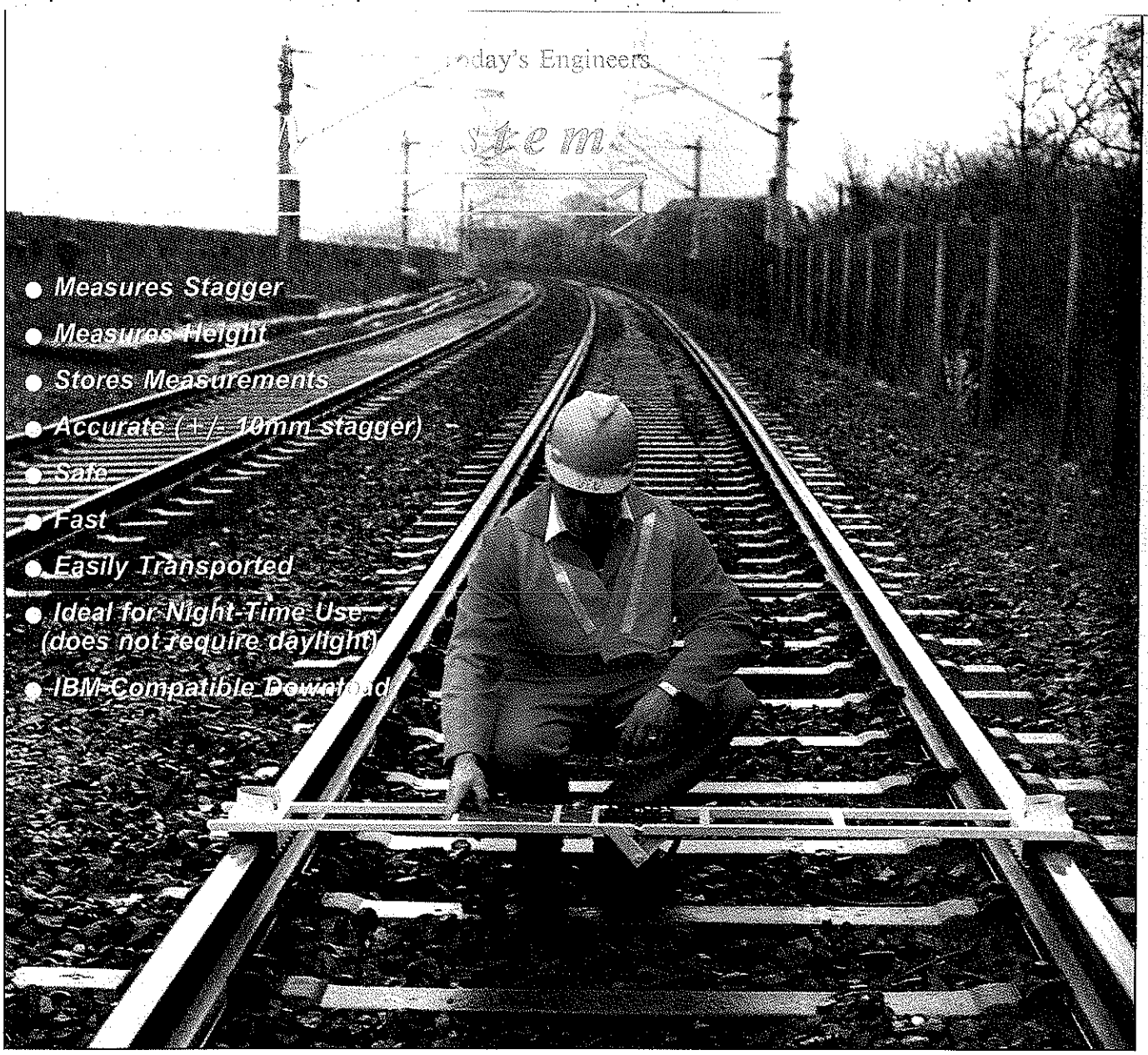
What sort of improvements in passenger services do you expect during the next two years from projects already approved and funded?
EFE's current 1994-96 plan will bring about some real improvements. Our six, saloon-class emus are being completely overhauled and upgraded to a higher standard of comfort. The section of welded track from Santiago to Cabrero (450km) is being extended a further 110km to Concepción. Locomotives and trains are being equipped with new cab-control communications, and the Metrotren service is being reinforced.

Some trains are inevitably more profitable than others. Is there a danger that non-profitable services could soak up scarce resources to the detriment of other services?
EFE wishes, for strategic and commercial reasons, to maintain a presence throughout its mainline network (Santiago–Concepción, Santiago–Puerto Montt, and around Valparaíso). We vary the service frequency to match the potential profitability of the different routes.

Mr Ignacio Echevarria, president of EFE's board of directors, made a specific reference recently to the possibility of a new railway between Santiago and Valparaíso. Are there any new moves in this area? What about squeezing more from the existing route, by running tilting trains for example?
We are now revising studies made a few years ago. Technological progress made since the last studies mean that the investment required for a new line may be lower than once thought. It is certainly true that the transport demand in the corridor is far higher than that forecast in the original studies.

If the track is improved south from Santiago, will Fepasa (the soon-to-be-privatised railfreight operating company) contribute either through direct investment or higher track-access fees?
The rates Fepasa pays are set out in its contract with EFE. If Fepasa should want to upgrade or otherwise change track standards on some part of the network, it will present EFE with the project. If EFE approves the project, then Fepasa will carry it out at its own cost.

If EFE wishes to upgrade the track over and above its obligations to Fepasa—as it may do to improve passenger services—then it is EFE which pays. **IRJ**



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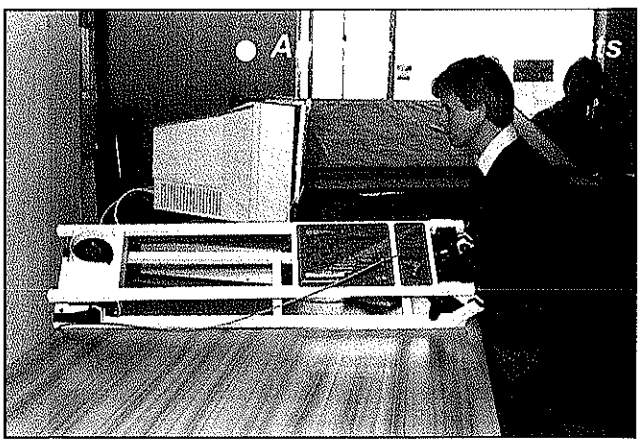

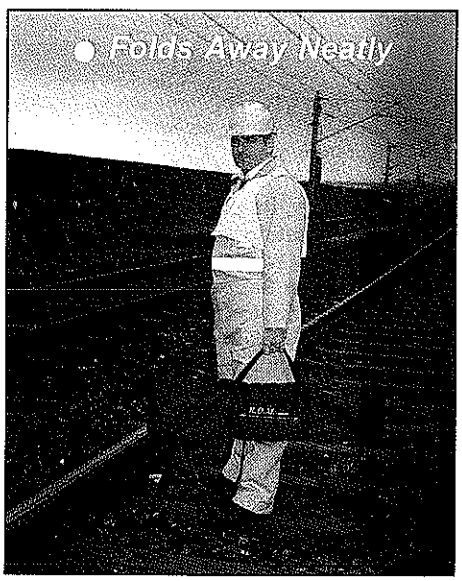

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