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Melbourne—A City That Did Not Give Up on Its Electric Railway System

Melbourne, Australia's second-largest urban area with a population of 3.5 million, is situated on the shores of Port Phillip Bay, on the south coast. It has one of the largest light rail/tram systems in the world. Currently it has a track network of about 240 km (150 mi), almost all double-track. Most lines are radial, but there are four cross-suburban routes. On some of the radial lines, there is through-running from the north to the south of the city center. The system has very little coverage of the western suburbs, which developed later than the northern and southeastern ones.

Extensive Early Cable-Operated System

The first cable tram, which ran from Spencer Street in the central business district to Richmond, opened in November 1885. By 1891, the city had about 70 km (40 mi) of double-track cable tramway powered by 11 winding houses. Around the same time, three horse tram lines were built.

The first electric tram service (Box Hill to Doncaster) operated only until 1896. The second line was opened by the Victorian Railways near Port Phillip Bay from its railway station at St. Kilda to the suburb of Brighton in 1906. This broad-gauge line was replaced by buses in the 1950s.

Development of Coordinated Metropolitan System

The system was first coordinated in 1883 with the Melbourne Tramway and Omnibus Act. The local councils set up the Melbourne Tramways Trust to build tracks and cable winding stations. The system was then to be leased to the Melbourne Tramways and Omnibus Company to operate regular services until 1916.

Two councils set up a trust to operate electric trams in 1910, and by 1920 they were operating more than 100 trams on 56 route-km (35 route-mi). Other councils did the same. When the lease on the cable trams expired, the operation of the cable lines was handed over to the Melbourne Tramways Board, which became the Melbourne and Metropolitan Tramways Board (MMTB) in 1919. MMTB also operated a complementary bus network, and there were private bus services in most outer suburbs. [Separate from these operations was the suburban network of the Victorian Railways, with a 1.6-m (5¼-ft) gauge and 1500-V electrification.]

Melbourne Class B articulated cars, of which 132 are in service today. First ordered in 1983, they are equipped with chopper control and regenerative brakes. ***(Photo courtesy of John Gerofi.)***

Major Portions of System Not Converted to Bus

Conversion of the cable services was almost complete by 1930, but the last line was converted to buses in 1940 and finally back to electric trams in 1955. Melbourne, with a far-sighted MMTB chairman, went against the conventional wisdom of the time. Apart from some relatively short single-track lines mainly in the western suburbs, centered on Footscray, and the lines operated by the railways, the tram system has survived intact and has been extended.

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Extensions and Initial Light Rail Projects—1987

After the opening of the Bourke Street line in 1955, there were no new lines for almost 20 years, after which the East Burwood line was extended. This was followed by the extension of the East Preston line in three stages to Bundoora and by a further extension of the East Burwood line. The Essendon Airport line, originally cut back after the airport was relegated mainly to general aviation, was later extended north to the Airport West shopping center. Two lightly used rail lines, to St. Kilda and Port Melbourne, were converted to light rail in 1987. In this author's view, there are at least two other Melbourne rail lines that would operate far more effectively as light rail services.

Melbourne Transit Facts

114,142,000 passengers (1995–1996)

6 percent increase over prior year

42,700 boardings per employee

41 400 km (25,700 mi) per vehicle

Center City Loop Service Established—1994

In 1994 a city center loop service was established. This required some additional turnouts and about 200 m (650 ft) of double-track in Spring Street. The loop service is operated by W-class cars in a 1920s livery, has a recorded commentary for tourists, and is free of charge.

The last extension to Bundoora, approximately 2.1 km (1.3 mi) long, involved one new substation, widening of the road for about 75 percent of the distance, reconstruction of eight intersections, and installation of four sets of traffic signals. It was opened in 1995 and cost approximately $A 12.6 million ($US 8 million), excluding rolling stock.

Wide Boulevards Important to Smooth Operation; Key Bottlenecks Eliminated

Apart from the far-sighted determination of Major-General Risson, MMTB chairman, the system probably owes its survival to the large number of wide roads in Melbourne. Its center is a generously proportioned Victorian city, and there are a number of elegant boulevards leading to it in the inner suburbs. Although the trams did not have segregated tracks on most of these roads, there was enough road space to minimize conflict between trams and other motor vehicles.

Despite the key sections of wide road, a number of the routes operate in typical 13-m (44-ft) roadways, where all intersections cause potential delays. This is because some local councils did not emulate the style of the city center, or did so only on a limited number of major axes.

Beginning in the 1960s, some of the most serious bottlenecks caused by narrow roads were eliminated, and, at the same time, trams were given segregated right-of-way. The most extensive example was the widening of the Nepean Highway and Dandenong Road, in which trams were grade-separated from the intersection of these two major roads.

New Traffic Regulations Create "Fairways"

In the early 1980s, new traffic regulations were introduced to give trams exclusive use of the lanes (fairways) they occupied on sections of narrow road where the trams were held up by traffic jams. This has improved travel times and on-time running. Nonetheless, some of the longest and most used lines still have to pass through areas where delays are considerable. On the longest, Route 86, a short diversion involving about 1 km (0.6 mi) of additional track along a former rail reservation would allow the long-distance services to travel more quickly.

There are still operational problems at some termini where there is insufficient capacity at single-line stubs or mid-route crossovers, and trams must wait for the preceding one to clear the terminus before entering. The most notable problem is probably at Acland Street, St. Kilda, where the previously existing Route 16 service must now share the terminus with the light rail service along the former railway. Double-stub termini with scissors crossovers are rare in Melbourne. There are no turning loops, but some sidings have been installed.

Public Transport Commission

In 1983 the administration of the system was transferred from MMTB to the newly formed Public Transport Corporation, and it now operates under the banner of the Metropolitan Transit Authority.

Until recently, labor unions were very powerful in Melbourne public transport, and all trams continued to operate with two-person crews until the early 1990s. Eventually, the whole state had a debt crisis, and there was a change of government. As a result, a number of public utilities were sold, including most of the public bus network. The unions eventually agreed to one-person operation of the trams, which, for the moment, remain in government hands. In fact, conductors have remained on many of the trams, especially in peak hours, until early 1998.

New Ticketing System Introduced

The ticketing system is integrated over the trams, trains, and buses. There are short-ride tickets, 2-h tickets, and day tickets. An automated ticket-selling system was due to come into operation in mid-January 1998, but it was delayed because of technical difficulties. The new ticketing system, involving machines on trams and railway platforms and cancelers on the buses, is privately owned. Some seating was removed to accommodate the ticket machines.

Creation of Two Companies—Prelude to Privatization

Late in 1997, the government divided the tram system into two companies, Yarra Trams and Swanston Trams. Swanston Trams operates all the services that run north-south through the central business district, and Yarra Trams operates the east-west services. The division leaves only one section of shared running, in St. Kilda. Ownership of the infrastructure, including the central workshops, part of which is operated by contract already, remains to be worked out. Allocation of power usage and other issues were also unresolved 6 months after the division. The division is a prelude to privatization of the two companies.

—John Gerofi, Enersol

Dialogue: LRT Project Pricing

In the preceding issue (Vol. 13, No. 1, July 1998), Thomas F. Larwin, Chairman of the Committee on Light Rail Transit, invited readers to respond to his message, "Are New LRT Projects Pricing Themselves Beyond Cost-Effectiveness?" Two comments were received and are published below, along with the chairman's observations.

Placing LRT in Median of Arterial Streets May Be Less Expensive

Thank you for your thoughtful article in *LRT News*. You ask for comments, so here is one:

You say "the era of cheap projects has pretty well been exhausted in San Diego and throughout North America." Depending on the definition of "cheap," this may or may not be true. There are certainly opportunities for "less expensive" projects, where "less expensive" would be less than the $22 million per kilometer cost of the Mission Valley extension; one category is placing LRT in the median of a newly rebuilt cross section of existing arterial streets.

You might ask Peter Straus what the MUNI extensions recently opened or still under construction along the Embarcadero cost. The use of existing arterial streets can lower costs even if the street must be rebuilt in the process. Requirements of the Americans with Disabilities Act will drive costs up somewhat. But even then, the surface part of the Embarcadero project is probably "less expensive." The next project south will utilize another arterial street in a similar manner.

Other cities have also recently opened extensions of this type (e.g., along the waterfront in Toronto), and I would bet that some of the projects in the planning stages in North America are also for street-running LRT. So we may still be able to add to LRT networks without using HRT specifications.

—*Wolfgang S. Homburger, Berkeley, California*

Light Rail Is More Expensive Than Enlarged Highway

Thomas Larwin in his chairman's message (*LRT News,* July 1998, Vol. 13, No. 1) asked for comment on his view that despite growing costs (from an average of $12 million per kilometer to $22 million per kilometer on the newest segment in San Diego, to $34 million per kilometer for the next planned), light rail is the best way to grow. He says "the alternative of building expanded freeways is even more expensive."

To the contrary, light rail is vastly more expensive than enlarged highway. The U.S. Department of Transportation's last HPMS database ("Status of the Nation's Surface Transportation Systems Condition and Performance," p. 289) shows new highway costs as $0.9 million to $2.3 million per lane-kilometer. What DOT calls "high-cost additions" average up to $3.2 million per lane-kilometer. Route 91 Express, a recent major highway enhancement in Southern California, cost $125 million and consists of 65 lane-km, so it cost about $2 million per lane-kilometer. Eighty lane-km of HOT lanes in the median of US-101 in Sonoma County, California, has been estimated to cost $128 million, or about $1.6 million per lane-kilometer (*Toll Roads Newsletter,* No. 28, June 1998, p. l). In San Diego's I-15, plans for expansion and lengthening of the current HOT lanes involve an additional 72 lane-km to form 32 km of three-lane with a moveable barrier. The project director expects the work to cost $200 million to $300 million, so there's a maximum of $4 million per lane-kilometer in Mr. Larwin's backyard (*Toll Roads Newsletter,* No. 25, March 1998, p. 1).

Not only is highway expansion usually a fraction of the cost of light rail, but it is far more flexible, since its vehicles can peel off the mainline and go into local streets closer to people's origins and destinations, reducing the need for feeder services and transfer stations. Moreover, surplus capacity after bus and other HOV can be sold off to single-occupant motorists, so that many such rubber-tire projects will be self-financing, rather than constituting a continual year-by-year tax burden on communities like the albatross of rail, light or heavy.

Unfortunately, gross misconceptions like Mr. Larwin's becloud the policy debate.

—*Peter Samuel, Editor,* Toll Roads Newsletter,
Frederick, Maryland

Chairman Responds

My "message" in the July 1998 *LRT News* was meant to stimulate thinking concerning the cost of new LRT projects and, for that matter, all new transportation projects located within urbanized areas. As such, it was meant to express my feelings and to offer some insight with regard to these higher price tags, on the basis of actual San Diego experience.

Wolfgang S. Homburger challenged whether we are exhausting our less expensive opportunities for LRT development. He brings up some good examples showing how reuse of urban street space can still offer lower-cost projects. He's right. And those of us responsible for LRT planning and development should continue to aggressively pursue lower-cost opportunities that are found to be cost-effective. The "message's" point was more related to the fact that San Diego's original price tag of $3.2 million per kilometer should *not* be used as a unit cost for LRT. Rather, it is more accurate to recognize that San Diego's LRT system has been developed at a unit cost of $12 million per kilometer, with some LRT segments costing more than that and others less.

Mr. Samuel's response indicates that the message provoked the age-old highway versus rail transit debate. I did not mean to do this and firmly believe that the best transportation improvement must be decided on a corridor-by-corridor basis. His use of lane-kilometer unit costs can be misleading, too. Even so, I agree with Mr. Samuel that there will be some major urban freeway enhancements that will be cost-effective. The particular example I cited is within the Mission Valley corridor in San Diego, where space precludes freeway expansion without either decking or purchasing built-up right-of-way. In this case, the LRT alternative proved to be a significantly more cost-effective approach.

—*Thomas F. Larwin*

Cordless LRT, Chapter 3

DLRV: If you thought the definition of "light rail" caused professionals within the industry problems, you can guess the fun we are going to have with this subject.

Railroading began in Europe. The term "light rail" goes back to English law. Many will say that leadership in the transit field is in Europe. Therefore, when looking for guidance in the area of terminology, why not research transit periodicals from Europe? Some will say that your editor subscribes to nearly every such publication. One way to learn how a term is being used is to turn the pages of all of the issues of eight different sources for the past 4 years. This is how they use the following terms:

EMU—electric multiple unit: Single-deck, double-deck, even-tilting; England, Germany, Japan, South Africa; this applies to cars operating on the standard nationwide railroad.

DMU—diesel multiple unit: Thirty-six references were located, and all referred to vehicles operating on the standard railroad system. One mentioned a speed of 125 mph.

Diesel rail car: Twelve references were located, sometimes preceded by "lightweight," sometimes using only the singular "car," indicating lack of multiple unit control.

Rail bus: Sometimes preceded by the words "diesel," "two-car," or "twin-unit," but always a very light vehicle. Although in common use in past years, only two uses of the term were found in the 1998 periodicals. Could it be that this term is being phased out?

LRV—light rail vehicle: Thirty-five references—many different types and places.

DLRV—diesel light rail vehicle: not even one reference. It is not yet in the vocabulary in European professional circles.

Fear not, DLRV advocates! This could be one case where the United States leads the way. Many in the planning community still do not really understand LRV. Besides, the term DLRV is certainly better than "Cordless LRT."
—Editor

First low-floor light rail vehicle for the Hudson-Bergen Light Rail Transit System and the Newark subway was inspected by New Jersey Transit officials at the Kinki Sharyo test track in Osaka on October 30, 1998. *(Photo courtesy of Clive Thornes.)*

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