Market for Light Rail Cars in the United States

William H. Frost
Arlington County Office of Technology and Information Systems
Arlington County, Virginia

The electric railway industry began in this country with Frank Sprague's successful demonstration of electric traction in Richmond in 1888. During the next 30 years, there was a rapid expansion of the street railway industry. By 1902 there were 60,290 trolleycars operating over 21,902 mi of track (1).

Two basic types of electric service were offered: street railways and interurbans. The former consisted of converted horsecar and cable routes with extensions; they generally operated within the city limits and provided local transit service. The latter were higher speed intercity trolley operations, which connected nearby towns to the larger cities, using city streets for local access.

The early market for rolling stock was heavily inclined toward city streetcars. The Electric Railway Journal, in its annual survey of rolling stock acquisitions, published the following figures in January 1915 (2).

Year	City Cars	Interurban Cars
1910	3,571	990
1911	2,884	626
1912	4,531	783
1913	3,820	547
1914	2,147	384
Total	16,953	3,330
Percentage of total	84	16

By the late 1920s the rail transit industry was faced with financial difficulties, and new car orders fell off considerably. The interurban industry had collapsed, a victim of the automobile and the "good roads" movement. An industry group, the Electric Railway Presidents' Conference Committee, began development of a new generation of streetcar, which became known as the PCC car. With the failure of the interurban industry, the PCC car became essentially the only street electric railway vehicle purchased, and the streetcar market became highly standardized.

PCC REPLACEMENT WITH LIGHT RAIL VEHICLES

From 1940 to 1952, 3,734 streetcars were delivered, almost all of them PCCs (3). At that point, there was a 24-year hiatus until the first new generation light rail vehicle was delivered to a U.S. transit operator. During these years there was a substantial market in used PCCs, as streetcar lines were abandoned in the 1940s and 1950s. The number of cars owned and leased fell from 26,630 in 1940 to 1,061 in 1975 (3). As systems were abandoned, the best of the cars were purchased by others. The longevity of the PCC car was helped because it was a standardized unit built to serve the needs of any streetcar operator.

On the basis of the 25-year design life, these 3,700 PCCs should have been replaced between 1965 and 1977. It is a tribute to the designers and builders of the cars that the first replacements did not take place until 1976 and that many are still in service today.

The actual replacement of the fleet of PCC cars has been occurring during the last 8 years. Table 1 gives the light rail transit (LRT) fleets as of 1976 and the operators' rolling stock as of January 1984.

TABLE 1 LRT Fleets and Rolling Stock

Operator	1976 Fleet	1984 Fleet
Boston (MBTA)	294 PCC	142 Boeing 92 PCC
Cleveland (GCRTA)	57 PCC	48 Breda 20 PCC (rehab)
Newark (NJT)	30 PCC	24 PCC
Philadelphia (SEPTA)		
City Transit Division	364 PCC	112 Kawasaki 210 PCC
Red Arrow Division	9 Brill Bullet 10 Brill Strafford 10 Brill 80 9 Brill Brilliner 12 St. Louis	9 Brill Bullet 10 Brill Strafford 29 Kawasaki
Pittsburgh (PAAC)	98 PCC	83 PCC
San Francisco (Muni)	110 PCC	130 Boeing

Two things should be noted: First, most of the replacement of the 35-year-old cars is complete, and there is no longer a large market for PCC car replacement. Second, with the exception of Boston and San Francisco, no two cities have bought the same car. The standardization of LRT car design that began with the PCC has not been continued. The opportunity that existed in the early 1970s to standardize the U.S. light rail fleet has apparently been lost.

There are two orders now in progress for Boston and Pittsburgh that will change the 1984 fleet in the near future. Boston is replacing its remaining PCCs with six-axle cars built by Kinki Sharyo. Pittsburgh is now receiving 55 Siemens-Duewag six-axle cars and rehabilitating 45 PCCs to last another

20 years. Philadelphia will replace its remaining Brill cars on the Red Arrow lines with an order of 25 four-axle LRVs, and will finish its rehabilitation of 112 PCCs for the North Philadelphia lines of the City Transit Division.

These orders are included in Table 2, which gives the age distribution for these fleets along with a replacement schedule. To renew the fleet as it ages, without considering expansion, the cars should be replaced at the end of their design life, which is usually 30 years.

TABLE 2 Age Distribution of LRT Fleets

Operator	Planned Fleet	Year Built	Replacement Year
Boston (MBTA)	142 Boeing	1975	2005
	50 Kinki Sharyo	1987	2017
Cleveland (GCRTA)	48 Breda	1981	2011
Newark (NJT)	24 PCC (rehab)	1950	1990
Philadelphia (SEPTA)			
City Transit Division	112 Kawasaki	1980	2010
	112 PCC (rehab)	1985	1995
Red Arrow Division	29 Kawasaki	1980	2010
	25 LRV	1988	2018
Pittsburgh (PAAC)	55 Siemens	1985	2015
	45 PCC (rehab)	1987	2007
San Francisco (Muni)	130 Boeing	1978	2008

SYSTEMS UNDER CONSTRUCTION

In addition to the six cities with LRT systems that date back to the PCC, there are five others where service has recently begun or LRT systems are being built. The roster of cars for these operators is given in Table 3.

TABLE 3 1984 and Planned Fleets

Operator	1984 Fleet	Planned Fleet
San Diego (SD Trolley)	24 Siemens-Duewag six-axle	30 Siemens-Duewag six-axle
Buffalo (NFTA)	26 Tokyu four-axle	26 Tokyu four-axle
Portland (Tri-Met)	26 Bombardier six-axle	33 Bombardier six-axle
San Jose (SCCTD)	30 UTDC six-axle	50 UTDC six-axle
Sacramento (SDTA)	26 Siemens-Allis six-axle	26 Siemens-Allis six-axle

The San Diego fleet of 30 cars takes into account the order for the East line construction, which is funded. Again, using a 30-year design life and the age distribution of the cars, a replacement schedule can be generated (Table 4).

PROPOSED SYSTEMS

A number of cities are analyzing alternatives and locating funding for light rail systems and may begin construction in the next 5 years. One of these projects, to be built by the Los Angeles County Transportation Commission (LACTC), will be funded through a sales tax that has already been passed. Planning for the line to Long Beach is complete, and another line to the airport is under study. Best estimates for the fleet requirements give a total of 170 cars to be purchased during the next 20 years (conversation with W.J. Diewald, N.D. Lea & Associates, Inc., August 1985).

Houston has completed an alternatives analysis of three busway-light rail systems ranging from a 4.5-mi system that would need 40 cars to a 75-mi system that would need 296 cars. A middle-level alternative would include a 28-mi rail loop with a requirement for 243 cars (4).

TABLE 4 Replacement Schedule

Operator	Planned Fleet	Year Built	Replacement Date
San Diego (SD Trolley)	24 Siemens-Duewag	1980	2010
	6 Siemens-Duewag	1987	2017
Buffalo (NFTA)	26 Tokyu	1984	2014
Portland (Tri-Met)	26 Bombardier	1983	2013
	7 Bombardier	1985	2015
San Jose (SCCTD)	50 UTDC	1987	2017
Sacramento (SDTA)	26 Siemens-Allis	1987	2017

Dallas is planning a 143-mi system with a fleet requirement of 318 cars to be completed in 2010 (5).

Several other cities and regions are exploring light rail transit. Among them are Orange County, California; Columbus, Ohio; Denver, Colorado; Milwaukee, Wisconsin; Minneapolis, Minnesota; and St. Louis, Missouri. None of these projects is sufficiently advanced to allow an estimate, which would be solid enough for market analysis, of the number of cars required. The best estimate of the proposed new market is given in Table 5.

OVERALL MARKET

The overall replacement and expansion market, based on the current fleet makeup, is given in Table 6, summed by 5-year intervals. Cars already ordered are not included, even though they may not have been delivered yet. The recent replacement of PCC cars shows as a surge in the market in 2010 through 2014, as the replacements will be retired. Also contributing to the surge are the new systems in Buffalo, Portland, and San Diego, which will be replacing their original fleets. The near-term market will be sustained by proposed systems in Dallas, Houston, and Los Angeles.

The market for LRT cars in this country is small, averaging about 50 cars per year. This is roughly half the capacity of a single production line of a typical manufacturer. The value of the market is also small. At an average price of $950,000 each, the LRT car market is worth about $48 million annually. In comparison, the automobile market is worth approximately $100 billion per year, or 2000 times as much.

MARKET CONSEQUENCES

Given the size, shape, and value of the market for LRT cars, what are the consequences for railcar suppliers and light rail operators? First, for both parties, the benefits of standardized cars are lost, in part because of the small market. Standardization is most feasible when there are a few manufacturers serving a large market. In the case of LRT cars, there are more than enough suppliers and few buyers.

Suppliers lose the opportunity to sell the same car to different purchasers, thus their investment in tooling and skills cannot be spread over many orders. As a result, operators pay higher prices, both on the original order and on spare parts purchases and inventory. Sources of spares may be limited, and if a foreign railcar is bought, they may be available only from a foreign manufacturer with a long lead time for delivery.

TABLE 5 New Market Estimate

Operator	Year Built				
	1985-1989	1990-1994	1995-1999	2000-2004	2005-2009
Los Angeles (LACTC)	54	28	44	44	
Houston (MTA)	23	75	75	70	
Dallas (DART)	18	75	75	75	75

TABLE 6 Replacement and Expansion Market

	1985-1989	1990-1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019
Boston (MBTA)					142		50
Buffalo (NFTA)						26	
Cleveland (GCRTA)						48	
Dallas (DART)	14	75	75	75	75		18
Houston (MTA)	23	75	75	70			23
Los Angeles (LACTC)	54	28	44	44			54
Newark (NJ Transit)		24					
Philadelphia (SEPTA)							
City Transit			112			112	
Red Arrow	25					29	25
Pittsburgh (PAAC)					45		55
Portland (Tri-Met)						26	7
Sacramento (SDTA)							26
San Diego (SD Trolley)						24	6
San Francisco (Muni)						130	
San Jose (SCCTD)							50
Total	120	202	306	189	262	395	314

There are other consequences for the suppliers. The market is too small to support even one car builder dedicated to supplying cars for U.S. light rail systems. Therefore, the potential builder will have to diversify either by building other types of equipment or by selling to the export market.

Because, at the present time, there are no domestic car builders supplying light rail cars, the question is somewhat moot. The Budd Company, a member of the Thyssen group, offers a car design licensed from a German manufacturer, Waggon Union, but to date has not made any sales. Bombardier, a Canadian car builder with a Vermont assembly plant, also offers a light rail car licensed from a European car builder. Both Budd and Bombardier concentrate on other rail equipment and sell light rail as a minor part of their product lines.

Duewag is one of the few suppliers worldwide selling only LRT cars. Diversification is the rule not the exception in this field.

The U.S. market is currently being supplied by foreign car builders as an adjunct to larger markets in their home countries. There is no single car builder that makes the majority of its sales in this country.

Thus the major consequence of the market is to discourage participation by firms that can neither diversify nor sell internationally. It is a market to be pursued only as a sideline to other, steadier work. Because of this, car builders and component suppliers are not expected to develop specialized technology for the U.S. light rail car market. In the future, more commonality between rapid rail and light rail car subsystems and designs can be expected.

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