Chapter 7

U.S. PASSENGER RAILCAR MANUFACTURING

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SUMMARY

It is unlikely that a U.S. manufacturer will decide to manufacture railcars, or be able to compete against foreign manufacturers, unless the United States, like other industrialized countries with rail systems and rail manufacturing industries, has a stable, predictable, and planned rail equipment market, one in which orders are spread out in time and in manageable sizes. *

OTA's analysis suggests the following reasons for the decline and demise of the U.S. passenger railcar manufacturing industry:

- the steep drop over the past 50 years in the size of the U.S. intercity passenger railcar market, and in passenger rail's share of the growing travel market, as passengers increasingly chose other modes—particularly air and auto;
- the continuing erratic nature of U.S. urban rail transit orders, exacerbated by the sudden infusion, and later subsidence, of Federal funds for mass transit between the late 1960's and the present;
- the entrance in the late 1960's and early *1970's* of new U.S. aerospace manufacturers drawn in by the dramatic increase in Federal funds, the prospect of a growing mass transit market and by Federal encouragement. This market turned out to be too small to support all the suppliers;
- inflation, sophisticated equipment requirements, and technical difficulties resulted in heavy financial losses for most manufacturers as they sought to fill the large orders generated in the last decade under fixed price contracts with no escalation clauses; and
- the lack of standardized equipment among various transit agencies plus the diverse special features required by them.

The U.S. manufacturing industry was not destroyed by foreign competition. Foreign manufacturers did not enter the U.S. market until most U.S. manufacturers had announced plans to leave the market.

Without exception, the passenger railcar manufacturing industries in Europe and Japan export a small proportion of their production, and most of that goes to countries that do not have production facilities of their own such as Third World countries. The bulk of foreign production is geared to meeting the basic demand for passenger railcars within their home countries.

In practice the market for passenger railcars in the other nations with extensive nationalized systems is closed to outside manufacturers. The national railways, with the approval of the various governments, normally expect to buy equipment from suppliers within the home country, and only buy abroad when the home industry cannot supply what is needed. The governments in those countries have invested heavily in passenger rail networks according to a clear and consistent policy and policy implementation. Thus, the manufacturers in those countries are assured of a stable, predictable market that is effectively closed to outsiders. Manufacturers abroad typically also have a close and continuing relationship with the railways, jointly conducting research and development with them and developing the basic designs.

Few U.S. passenger car orders are expected for the rest of this decade. A recent report shows that, for the 1980's, most of the light railcar purchases have been made, and only orders for 438 rapid railcars have not been placed. * The effect of recent tax increases for urban rail transit purchases, to date, is unknown.

Intercity railcar fleet additions are not anticipated for at least the next 8 years. Today, Amtrak operates some 1,600 cars, 1,000 of which

● **The section of this chapter on U.S. railcars encompasses all passenger rail manufacturing markets including intercity, commuter, rapid rail, and light rail vehicles. Typically the term "railcar" has referred to transit cars. In this report, it includes all vehicle categories. The section on EEC countries pertains to intercity cars and also to transit cars. However, full information on transit cars was not obtained.**

● **Several additional light railcar orders not included in the N. D. Lea report have been or are being placed, according to participants in the OTA Workshop on Railcar Manufacturing.**

were purchased in the 1970's. The remaining 600 have been rebuilt at Amtrak's Beech Grove, Ind., facility.

Between 1990 and 2000, the total average annual rail transit orders in the United States are expected to be between 450 and 550, and in the first decade of the next century, the average annual car order is predicted to be no more than approximately *550.*[1] Transit accounts for nearly 63 percent of the total current railcar market in the United States. The New York Metropolitan Transportation Authority accounts for 65 percent and the Chicago Transit Authority for 12 percent of the total transit market. Together, New York and Chicago dominate with 77 percent of the total transit market, and more than **40** percent of the total railcar market. Between them, they utilize at least six different irreducible railcar designs. Their plans, or lack of plans, for fleet replacement or expansion and size of order are an important factor in determining the size and shape of any new railcar market in this country.

The construction of several advanced high-speed intercity rail corridors would not add significantly to the fleet. Although this would create *a small surge in orders with construction spread over several years, it would have no major long-term impact on the railcar market.*

[1] **N. D. Lea Associates,** *Survey of the* ***Railcar Equipment Market, June*** *1982.*

DISCUSSION

The passenger rail equipment market covers a variety of locomotive and railcar types for a wide range of services. For purposes of this chapter, the passenger rail services are divided into the four broad categories of intercity, commuter, rapid transit, and light rail. Equipment for providing these services includes conventional diesel and electric locomotive-hauled passenger car trains as well as self-propelled cars for intercity, subway, and street railway use. The light rail vehicle (LRV, once referred to as the street or trolley car) also is included in the transit equipment category.

Following is a discussion of the main trends and changes in travel markets, service and supply industries, and institutions that led to the demise of the U.S. passenger railcar industry.

Trends in Travel Demand and Equipment Use

The single most important factor that led to the decline in the passenger railcar manufacturing industry was the widespread introduction and use of automobile and airplane. As people could afford increasingly to purchase and travel by these alternative modes, the demand for intercity travel by rail fell, as did the demand for transit services. Although intercity passenger travel increased by *550* percent from 1929 to the present (table 12), the demand for intercity passenger travel by rail decreased by *65* percent over that same time period. Transit demand decreased 43 percent from 1940 to 1975 as shown in table 13. Changes in reporting occurred in 1975 for transit. A 13-percent increase in originated transit trips has occurred from 1976 to 1980.

The decline in rail travel demand meant a decline in demand for passenger rail equipment as well. At least 10 times as many railcars were in service in 1929 as there are today (fig. 11). New equipment was added to the fleets during the 1930's to replace old railcars and provide high-quality service. This practice continued until World War II when a number of older railcars were brought out of retirement to provide essential cross-country transport. These *were* retired again at the end of the war.

In 1946, the railroads began to modernize their fleets, and railcar building reached its peak in 1950, although the total number of cars in service continued to decline. The construction of intercity passenger and commuter railcars remained at a low level after the final building surge in the 1940's and 1950's. Thereafter, few intercity cars were built until the Amtrak orders of the 1970's.

Table 12.-Volume of U.S. Intercity Passenger Traffic
(millions of revenue passenger.miies and percentage of totai (except private))

Year	Railroads[a]	Percentage	Buses	Percentage	Air carriers	Percentage	Inland waterways	Percentage	Total (except private)	Private automobiles	Private airplanes	Total (including private)
1929,	33,965	77.1	6,800	15.4	—	—	3,300	7.5	44,065	175,000	–	219,065
1939,	23,669	67.7	9,100	26.0	683	2.0	1,486	4.3	34,938	275,000	–	309,938
1944,	97,705	75.7	26,920	20.9	2,177	1.7	2,187	1.7	128,989	181,000	1	309,990
1950	32,481	47.2	26,436	38.4	8,773	12.7	1,190	1.7	68,880	438,293	1,299	508,472
1960,	21,574	28.6	19,327	25.7	31,730	42.1	2,688	3.6	75,319	706,079	2,228	783,626
1970	10,903	5.7	25,300	14.3	109,499	77.7	4,000	2.3	149,702	1,026,000	9,101	1,184,803
1974	10,475	5.9	26,700	15.1	135,469	76.7	4,000	2.3	178,644	1,143,440	11,000	1,331,044
1980p	11,500	4.6	27,700	11.2	204,400	82.6	4,000	1.6	247,600	1,300,400	15,000	1,583,000
19811.)	11,800	4.8	27,200	11.1	201,300	82.5	4,000	1.6	244,300	1,344,000	14,700	1,603,000

NOTE Am carrier data from reports of CAB and TAA; Great Lakes and rivers and canals from Corps of Engineers and TAA; ail 1980 and 1981 figures are from TAA data, except rail freight traffic Is by the AAR
[a]Railroads of all classes including electric railways, Amtrak and AUtO-Train
[p]These are preliminary estimates and are subject to frequent subsequent adjustments

SOURCE *Yearbook of Railroad Facts, 1982,* p 33

Table 13.—Trend of Originating Transit Passenger Trips

Calendar year	Railway: Light rail (millions)	Railway: Heavy rail (millions)	Railway: Total rail[a] (millions)	Trolley coach (millions)	Motor bus (millions)	All modes passenger rides/trips (millions)
Revenue passenger rides:[b]						
1940	4,182	2,282	5,464	419	3,620	10,504
1945	7,081	2,555	9,636	1,001	8,335	18,982
1950	2,790	2,213	4,903	1,261	7,681	13,845
1955	845	1,741	2,586	889	5,734	9,189
1980	335	1,670	2,005	447	5,069	7,521
1965	204	1,678	1,882	186	4,730	6,798
1970	172	1,574	1,746	128	4,058	5,932
1971	155	1,494	1,649	113	3,735	5,497
1972	147	1,446	1,593	100	3,561	5,253
1973	144	1,424	1,567	**74**	3,653	5,294
1974	114	1,435	1,549	**60**	3,998	5,606
1975		1,388	1,492	**56**	4,095	5,643
1976	86	1,353	1,450	**54**	4,168	5,673
Linked transit passenger trips:[b]						
1977	79	1,335	1,425	51	**4,246**	**5,723**
1978	80	1,415	1,506	51	**4,406**	**5,983**
1979	83	1,474	1,569	55	**4,746**	**6,370**
1980p	81	1,420	1,513	71	**4,774**	**6,358**

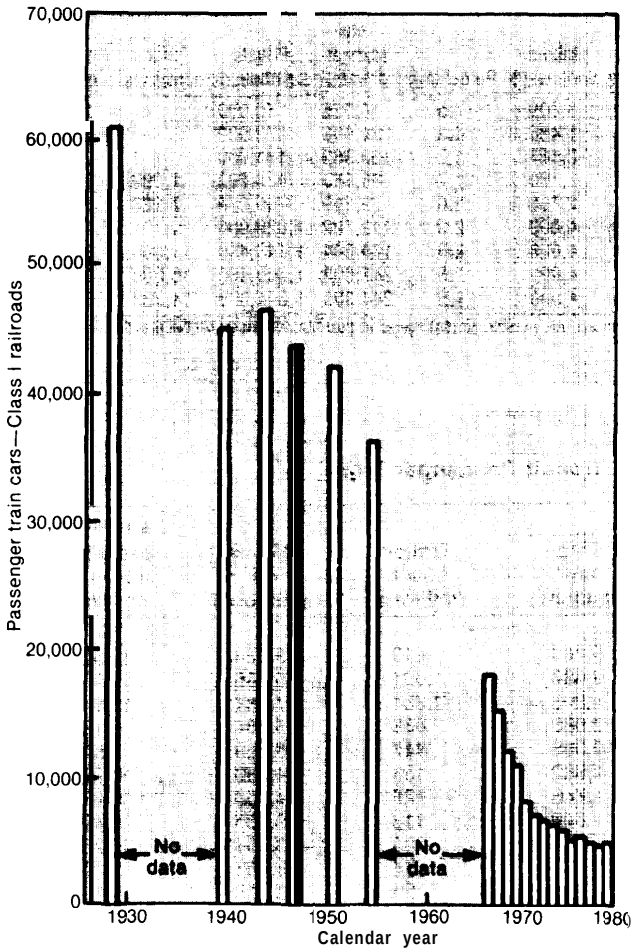
NOTE: Table excludes automated guideway transit, commuter railroad, and urban ferryboat,
[a]Includes cable car and inclined plane beginning in 1975.
[b]"Revenue passenger rides" from 1940 through 1976; "Linked transit passenger trips" beginning in 1977.
[p]These are preliminary estimates andare subject to frequent subsequent adjustments.

SOURCE: *Transit Fact Book* (Washington, D.C.: American Public Transit Association, 1981)

To accommodate the decrease in demand in the 1950's, railcar builders began to shift production to transit cars. Figure 12 charts the trends and numbers of intercity and commuter railcars delivered from 1960 to 1982. As the figure shows, few commuter cars were delivered in the 1960's, and a small number of intercity cars were delivered compared to car requirements of the previous railroad era.

The U.S. railcar market has always been erratic. The fluctuations generally stemmed from the fact that the rail systems, going into operation at different times, initially ordered entire fleets, or large portions of fleets, all at once. Since the average car historically was used up to 30 years before being replaced or overhauled, the only additional orders these companies placed in the interim were those required for any expansion of service. Since

Figure 11 .—Long-Term Trend for Passenger Car Use in Railroad Service



NOTE: All cars, including commuter cars and cars retained by railroads after the formation of Amtrak (excludes urban transit cars) '

SOURCE, AAR Yearbook of Railroad Facts, 1982 Data and chart compiled by John Bachman

the lines opened at different times with relatively large orders, replacement orders occurred at different times. As will be explained later, however, the phenomenon of huge orders—such as the New York City Transit orders for 1,250 cars did not occur until the infusion of Federal funds, starting in the 1960's enabled transit operators to undertake wholesale and often long deferred modernization of their fleets.

Prior to the 1960's, subway (rapid transit) service operated in five major cities: Boston, Chicago, Cleveland, New York, and Philadelphia. Light rail electric streetcar service flourished for years. Streetcar building, resumed after World War II, remained high as transit companies, then privately owned, reequipped their fleets with the new PCC (President's Conference Committee) type streetcars. However, with the public's growing use of automobiles, and the transition of transit companies to motor bus operations, the production of streetcars was suspended between 1952 and 1972. Heavy railcar deliveries, however, went through a replacement cycle in the early 1970's partly due to increases in Federal funding. Table 14 shows the trends in light rail and heavy rail vehicles owned and leased from 1940 to 1980. Figure 13 shows historical trends in light rail and heavy rail vehicle deliveries from 1960 to 1980. New York City accounts for approximately 6,500 of the 9,500 transit cars in the total existing rapid rail fleet.

Institutional Shifts

As the operations of transit and intercity services suffered growing financial losses after World War II, Federal financial assistance was sought and eventually secured, and ownership passed from private to public hands.

Federal loans for transit cars began in 1961, with $5o million made available for capital needs

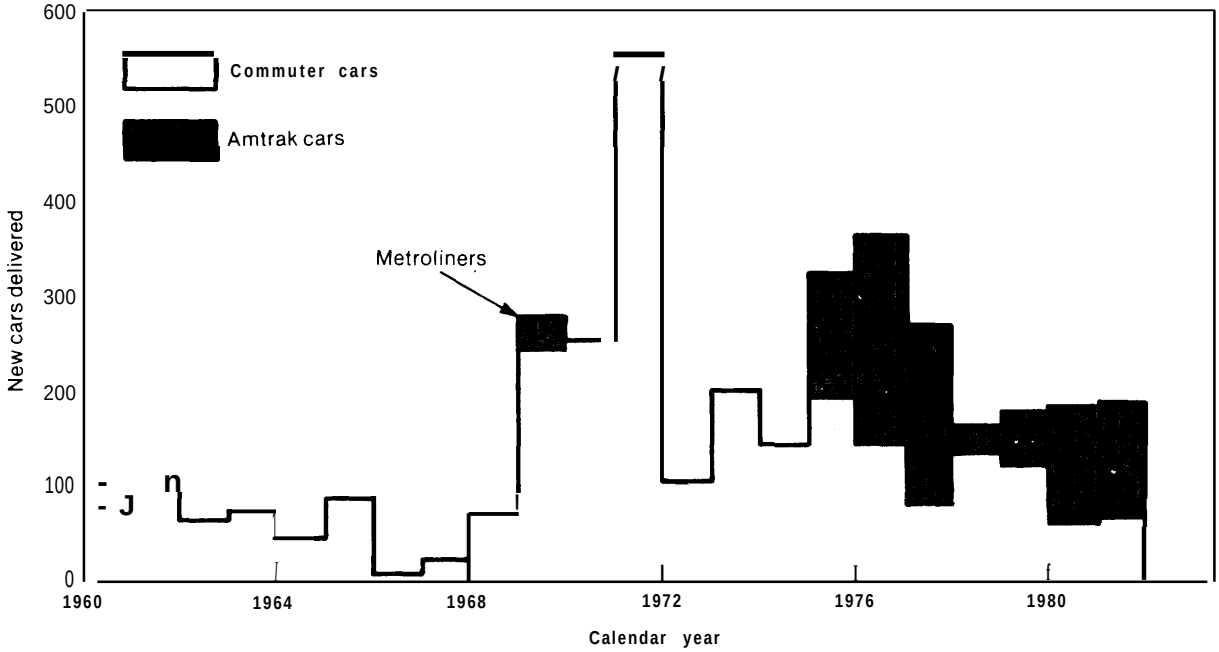
Table 14.—Transit Passenger Vehicles Owned and Leased

Calendar year	Light rail	Heavy rail	Total rail[a]
1940	26,630	11,032	37,662
1945	26,160	10,217	36,377
1950	13,228	9,758	22,986
1955	5,300	9,232	14,532
1960	2,856	9,010	11,866
1985	1,549	9,115	10,664
1970	1,262	9,338	10,800
1971	1,225	9,325	10,550
1972	1,176	9,423	10,599
1973	1,123	9,387	10,510
1974	1,068	9,403	10,471
1975	1,061	9,608	10,712
1976	963	9,714	10,720
1977	992	9,639	10,674
1978	944	9,567	10,556
1979	959	9,522	10,524
1980 (preliminary)	1,013	9,693	10,749

NOTE: Table excludes automated guideway transit commuter railroad and urban ferry boat.
[a]Includes cable cars and inclined plane cars beginning in 1975.

SOURCE: *Transit* Fact Book (Washington, D. C.: American Public Transit Association, 1981).

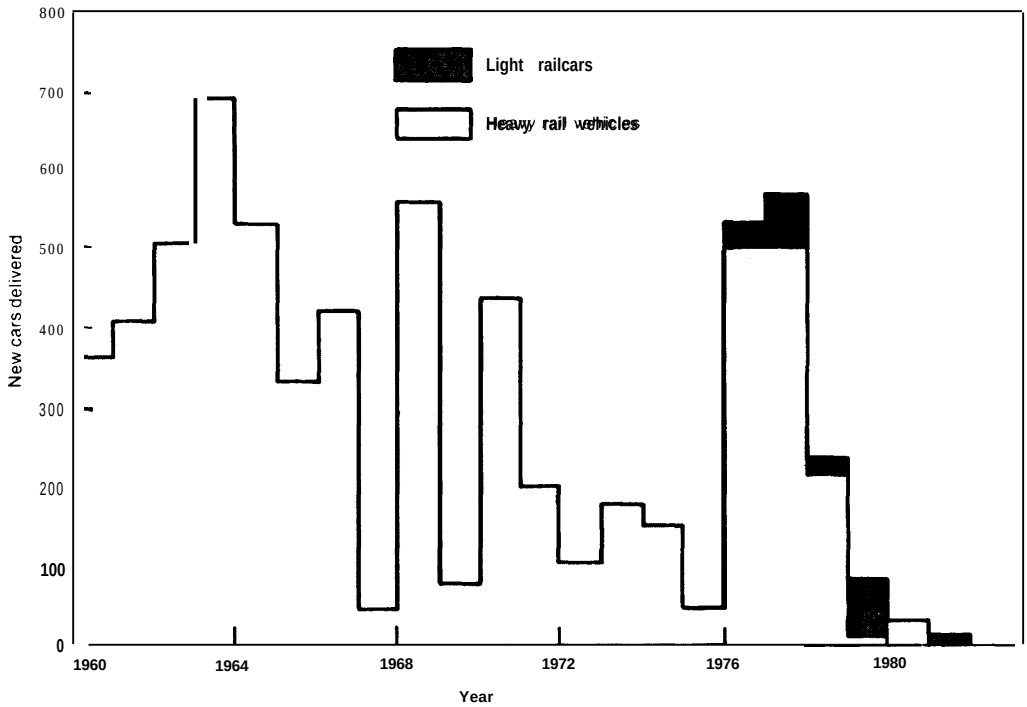
Figure 12.—New Passenger Railroad Cars Delivered From U.S. Manufacturers[a]



[a]French turbo trains, built in the 1970's were not included in the calculations

SOURCE Compiled by John Bachman

Figure 13.—New Transit Passenger Vehicle Deliveries From U.S. Carbuilders



SOURCE Compiled by John Bachman

and $25 million for demonstration projects. However, the initial loan program was not sufficient to meet the needs of the ailing transit industry and, by 1964, the Federal Government passed the Urban Mass Transportation Act (UMTA), which became the basis for Federal financial assistance to transit operators.

Commuter lines were consolidated into regional operating authorities funded by various local governments and the communities served. Before 1965, eight cities were served by 24 different railroads providing commuter services. Between 1965 and 1982, 15 new operating authorities were formed to serve those eight cities. Conrail's relinquishment of commuter responsibility in 1982 is the most recent institutional change in commuter rail service.

Intercity passenger rail services, initially provided by the Class I carriers, * also experienced significant changes in the late *1950's* and 1960's. Routes were abandoned to the maximum extent permitted by the Interstate Commerce Commission or operated at losses. Concerned about the bankrupt New Haven Railroad, increased population projections along the Northeast Corridor (NEC), and airport congestion, Congress enacted the High Speed Ground Transportation Act (HSGTA) in 1965.[2] Funding and development and demonstration of two types of cars, the Metroliner cars and the turbotrains, for intercity service along the corridor were provided by the act. However, the remainder of the Nation's passenger rail services continued to decline to the point that Congress created the National Railroad Passenger Corp. (Amtrak) in 1970 to maintain an essential core of intercity passenger rail services. Original equipment for Amtrak operations came from the railroads that had discontinued services and joined Amtrak.

The shift from private to public sector passenger rail operations, together with the infusion of Federal funds, had significant implications for the passenger railcar manufacturing industry. Through UMTA legislation, large capital resources became available for buying transit equipment and for financing major extensions to existing systems and construction of new systems. For intercity passenger services, the new funds allowed the rebuilding and replacement of much of the aging car fleet. Table 15 shows the federally financed purchases for rail transit and commuter equipment between 1965 and 1982. Intercity railcar purchases by Amtrak have totaled approximately 1,000 cars and some *320* locomotives.[3]

Federal legislation also made funds available for the construction of several new transit systems, and the entry of new manufacturers from tile aerospace industries was encouraged.[4] According to a General Accounting Office report, "U.S. manufacturers anticipated a boom and entered the market amid forecasts of large, profitable railcar orders. However, the market turned out to be far smaller and more erratic than the companies anticipated. "[5] Entry of new manufacturers into an already small and unsteady market altered the competitive market structure. Figure 14 shows a chronology of major suppliers for the passenger railcar market from *1960* to the present, their market entry and exit dates, and the approximate annual production capacity of each manufacturer. Art R. J. Barber Associates report in **1978** notes that both U.S. and world passenger railcar manufacturers were operating below plant capacity. According to that report, between 1971 and **1977 U.S. passenger railcar deliveries averaged just under 600,** when the capacity of the Pullman plant alone was *700.* [b] According to data provided in a study by N. D. Lea Associates, total foreign railcar orders by U.S. transit agencies between **1970** and **1982** were for approximately *2,300* railcars of which only 19 percent were ordered by 1979. Table *16* shows U.S. and foreign railcar deliveries to the United States from *1971* to *1982.*

***Class I rail carriers are currently defined as line haul railroads with annual operating revenues of $50 million or more effective January 1978. Prior to 1956, the carriers were defined as Class I if they had operating revenues of** *over $1* **million. The revenue level was raised several times between 1956 and 1978.**

[1] *Second Report on the High Speed Ground Transportation Act of 1965* **(Washington, D. C.: U.S. Department of Transportation, September 1967), p. 1.**

[3] **"Amtrak's Second Decade, " draft paper, pp. 10-11.**

[4] **UMTA Legislative Record.**

[5] **U.S. General Accounting Office, "Problems Confronting the U.S. Urban Railcar Manufacturers in the International Markets," July 1979, p. 5.**

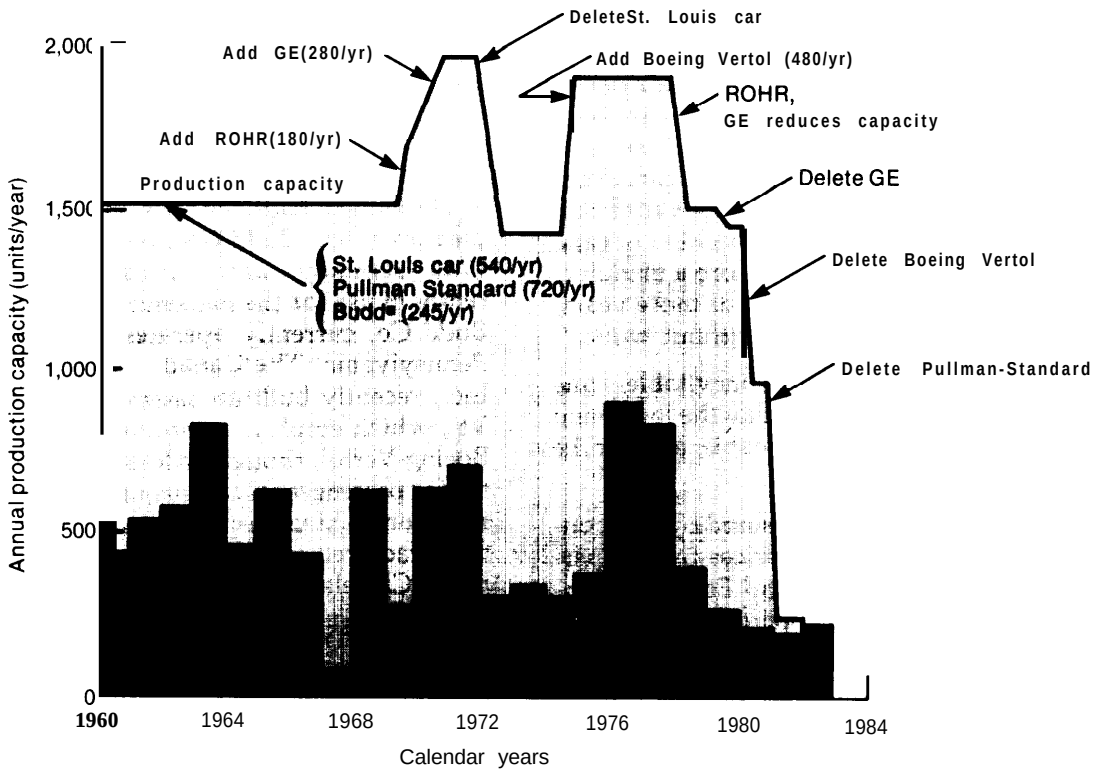
[6] **R. J. Barber Associates, Inc., "The United States and the International Market for Rail Equipment, " prepared for UMTA, March 1978, pp. 19-21.**

Table 15.—Federal Transit Commitments (new railcars, by type and fiscal year) (commuter, transit)

Fiscal year	Total	Rapid transit	Light rail	Commuter electric	Commuter diesel	Diesel locomotives[a]
1965	64	64	—	—	—	—
1966	400	400	—	—	—	—
1967	35	—	—	35	—	—
1968	370	226	—	144	—	—
1969	383	260	—	123	—	—
1970	309	—	—	309	—	—
1971	317	—	80	237	—	—
1972	509[b]	420	—	64[b]	25	—
1973	851	650	150	15	36	13
1974	420	200	45	170	5	2
1975	320	140	—	160	20	—
1976	108	—	—	58	50	22
Transition quarter	71	71	—	—	—	8
1977	420	320	48	50	2	9
1978	356	125	141	—	90	23
1979	417	326	—	—	91	19
1980	78	16	26	36		—
1981	310	204	26	—	80	7
1982	538	414	55	21	48	24
Total	6,276	3,836	571	1,422	447	127

[a] For commuter service.
[b] Does not include 21 cars funded in fiscal year 1972 which were subsequently canceled.
SOURCE: information provided by Robert Abrams, Urban Mass Transportation Administration.

Figure 14.—Annual U.S. Production Capacity and Output of All Types of Passenger Railcars



[a] Although not reflected in GAO report, the Budd Co. indicated additions to their capacity from 245 to 465 after 1980.

SOURCE: Compiled by John Bachman. U.S. General Accounting Office, "Problems Confronting the U.S. Urban Railcar Manufacturers in the International Markets," July 1979.

Table 16.-U.S. Passenger Railcar Deliveries, 1971-82 (foreign company deliveries in parentheses)

Year	Light rail	Rapid transit	Commuter rail	Intercity	Total
1982	1 (118)	118 (16)	o (86)	**97**	216 (220)
1981	O (87)	14 (158)	36	100	150 (245)
1980	30 (16)	O (127)		134	239 (392)
1979	71	10 (60)	126 (40)	61	268 (loo)
1978	16	170 (lo)	131	1	318 (lo)
1977	61	500	165 (36)	113	839 (36)
1976	30	500	128	409	1,067
1975		145	127	132 (20)	404 ***(20)***
1974		101	167	—	268
1973		254	169	10 (lo)	433 ***(lo)***
1972	—	34& (46)	376	—	716 **(46)**
1971	—		319	—	405

1971-79 U.S. average annual delivery = 524

SOURCE: Railway *Age, Passenger Car-Market at* ***a Glance.***

The shift to Federal funds brought changes in procurement procedures. More parties were involved in the development and approval of specifications, and financial procedures for obtaining funds.[7]

Lack of escalation clauses in the fixed-price contracts, lack of progress payments, and technical problems which occurred on many railcar orders, compounded by large order sizes, resulted in heavy financial losses for most manufacturers.

Federal funding enabled transit authorities to replace very large numbers of similar cars over a very short time. Thus instead of a series of orders for a relatively small number of cars every year, the pattern changed to one of a very small number of orders each for a large number of cars. This meant that success would absorb a manufacturer's complete capacity for one or more years, while failure would leave him without work.*

What happened perhaps was inevitable—one by one, manufacturers decided that the losses and risks in continuing were unacceptable, and left the industry.

Since 1967, inflation, as measuredly the Consumer Price Index, increased prices by 250 percent. However, the General Rail Equipment Index showed industry prices increasing over 330 percent.[8] Table 17 illustrates the type and number of changes in rail orders that occurred over the past 20 years. Many resulted in initial and sometimes persistent technical difficulties for railcar builders and transit agencies, leading to increases in warranty and protection provisions and car costs. The innovations were developed to improve car performance, increase ridership, and reduce maintenance. However, the innovations were not standardized. All of the reasons listed finally brought about the virtual demise of the domestic passenger railcar manufacturing industry in the late 1970's—at a time when several large new orders were about to be placed.

Current Industrial Base

The United States now has only one prime manufacturer—the Budd Co., owned by Thyssen of West Germany—and four assembly plants currently in use for the passenger rail industry. The Budd Co. currently operates its railcar plant in Pennsylvania. The Canadian firm, Bombardier, Inc., recently built an assembly plant in Barre, Vt., which employs approximately *250* people. Boeing-Vertol, though no longer a prime contractor for passenger railcar manufacturing, maintains a subcontracting business for assembly of foreign manufactured railcars. The General Electric Co. has a Cleveland facility for assembly.

Amtrak maintains its own railcar repair and rebuilding facilities at Beech Grove, Ind., with approximately **1,000** employees. According to Amtrak President, W. Graham Claytor, Jr., Amtrak is bidding competitively with other railcar manufacturers and assemblers only when Amtrak equipment repair needs have been met by the

'U.S. General Accounting Office, op. cit.

***Car prices currently average about $1 million each.**

'Jeffrey Mora, "Factors Affecting Railcar Costs," presented at the *Third National Conference on Light Rail Transit,* **March 1982, p. 2.**

Table 17.-Innovation Matrix for Railcars

	New truck	Air hyd or hyd brakes	Regenerative braking	Solid-state motor control	Cab signals	Automatic operation	Air-conditioning	Nonstandard voltage	Total number of innovations	New carbuilder	Carbuilder without experience in North America
MARTA—Franco Beige		X	X	X	x	X	x	X	7		x
Miama/Baltimore- Budd			X	X	x	X	x	X	6		
MBTA—Boeing LRV	X	X		X			x		4	X	
San Francisco—Boeing LRV	X	X		X	x				4	X	
MBTA—Hawker Siddeley							x		1		
MBTA—Pullman Standard					x		x		1		
San Diego—Duwag U2									0		x
CTA—Pullman Standard					x		x		2		
CTA—Budd					x		x		2		
CTA—Boeing					x		x		2	X	
GCRTA—Pullman Standard					x		x		2		
GCRTA—Breda			X	X	x		x		4		x
PATH—Hawker Siddeley							x		1		
PATH—St. Louis Car							x		1		
NYCTA R46 Pullman Standard	X				x	X	x		4		
NYCTA R44 St. Louis Car					x	X	x		3		
NYCTA R42 St. Louis Car							x		1		
NYCTA R38 & R40 St. Louis Car									0		
PATH—Budd					x	X	x	X	4		
WMATA—Rohr		X			x	X	x	X	5		
BART—Rohr	X	X	X	X		X	x	X	7	X	

SOURCE" N. D. Lea Associates, Benefits *of Railcar Standardization,* February 198

Beech Grove facility. Amtrak seeks to maintain the existing employment level at Beech Grove and hopes to increase overall revenues. It does not anticipate expanding Beech Grove, nor bidding on assembly projects that offer no profit margin.[9] Amtrak currently is assembling the Washington Metropolitan Area Transit Authority order for Breda of Italy. Private sector suppliers argue that Amtrak is competing with them by using Beech Grove.

In addition to passenger car manufacturers and assembly facilities, both the General Motors Corp. and the General Electric Co. manufacture locomotives for passenger as well as freight service. Both manufacturers have a history of foreign export of motive power equipment for freight and passenger service. According to the Barber study, the **United States was the world's leading exporter** of diesel locomotives in **1975,** capturing **72** percent of the world market. Most exports were to Third World countries. However, U.S. exported locomotives accounted for **85** percent of Canadian, 60 percent of Italian, 35 percent of Swedish, and 31 percent of Belgian and Luxembourg imports of diesel locomotives.[10]

Projected Demand

A recent report by N. D. Lea Associates outlines projected U.S. demand for transit (light and heavy rail) and commuter cars from 1980 to 2010. Table 18 shows the results of this market survey. Fleet replacement projections assume a life expectancy of 25 years; however, many railcars in the past have exceeded that life expectancy by as much as **25** years, although rebuilding was required. According to the Lea report, for the 1980's most of the light railcar bids have been awarded, and only orders for 438 heavy railcars remain to be placed. Between 1990 and 2000, the total aver-

[9]Interview **with W. Graham Claytor, Jr., President of Amtrak, Feb. 10, 1983.**

[10]R. J. Barber Associates, Inc., op. cit., p. 7.

Table 18.—Projected Passenger Railcar Demand

Car type	1980	1985	1990	1995	2000	2005	2010
Transit:							
Light rail.	497 (76)	233 (35)	–	45	230	274 (74)	233 (35)
Heavy rail	1,450 (242)	1,175 (200)	804	2,717	1,806	1,042	1,609
Commuter	696	323	135	421	515	1,099	869
Total replacement (new starts)	2,643 (318)	1,731 (235)	939	3,183	2,551	2,435 (74)	2,711 (59)
Annual average	528 (63)	346 (47)	187	636	510	483 (15)	542 (10)

NOTE: Parentheses Indicate fleet expansion and new starts. All other numbers indicate replacements.

SOURCE: N. D. Lea Associates, Survey *of U.S.* ***Railcar*** *Market* ***1967,*** **June 19S2.**

age annual car building orders are estimated to be approximately 470; in the first decade of the 21st century, the average annual car order will be approximately **560.**

Participants in OTA's workshop indicated that the assumptions underlying the Lea report may be overly conservative. Several additional small light railcar orders are expected in California. These projections, it should be stressed, assume current funding levels and practices. For example, New York—according to a workshop participant-could, in the next 10 years, replace another 1,000 cars but does not have the money to buy them. A number of transit agencies that are not planning now to order new cars would do so if they had the funds. Thus, according to transit operators, the potential market could be larger than the market actually projected.

Some experts in the field estimate that with a rational procurement system and a reasonable allocation of orders among manufacturers, the market of 470 cars per year projected for the 1990's could sustain several medium- or small-sized manufacturers.

Additions to the intercity railcar fleet are not anticipated for at least 8 years, since much of the current fleet was replaced in the *1970's.* At its inception, Amtrak acquired 2,000 cars. Today it operates 1,600 cars, 1,000 of which have been purchased in the last decade. The remaining 600 have been rebuilt at Amtrak's Beech Grove facility or by contractors. For the near term, Amtrak plans undertaking prototype development of new cars for their eventual fleet replacement. To minimize annual capital requirements, replacement is planned at 40 to 60 cars per year, with a typical 40-year lifecycle for the fleet. According to Amtrak officials, their plans are sensitive to changes in market conditions and technology .11

At current levels of demand, the market for railcars in this country could support a $400 million to $500 million per year industry for the 1990's, with perhaps a $100 million annual increase in the next century, assuming prices remain constant. The addition of several high-speed corridors would add cars to the demand base, with construction spread over several years though it is unlikely that such additions would change the overall market structure significantly.

Foreign Passenger Railcar Manufacturing

The European and Japanese railway equipment construction industries historically focused nearly all their efforts on meeting domestic needs. Until recently, with few exceptions, they have exported rail equipment only to those countries with no manufacturing capacity of their own. Foreign exports of rail equipment continue to account for only a small share of foreign production. Their entrance in the U.S. market occurred primarily when U.S. manufacturers were announcing plans to leave in the late 1970's.

The national railway systems, which the foreign manufacturing industries support, are subsidized in accordance with explicit and consistent national policies that regard passenger rail service as a vital part of the national transportation system. In these countries, the passenger rail service and the rail equipment manufacturing industry function not as separate industries, but rather as two closely related and mutually supporting elements of

"Questions raised for Amtrak response, Feb. 10, 1983.

what is, essentially, a single national passenger rail enterprise.

Japan

Five major companies supply the needs of the railways in Japan for locomotives and passenger cars. The major exporting companies are Hitachi, Kawasaki, Mitsubishi, and Tokyu.

It is the practice in Japan for the purchaser to have a list of suppliers who have shown that they can meet the specifications and production rates likely to be desired. Procurement is then by competitive tender from the list of authorized suppliers. However, in recent years orders have been allocated among the available Japanese suppliers so that they all have been able to maintain an economic production rate. Japanese National Railways (JNR) has been a major buyer in the last 5 years, requiring an average of **330** commuter cars and **94o** intercity vehicles per year (table **19).** [12]

Between **1979** and 1982, U.S. transit agencies have ordered **625** cars from Japanese firms. '3 In addition the Japanese Rail Technology Corp., a subsidiary of JNR, is conducting preliminary engineering feasibility studies of several U.S. corridors for provision of high-speed intercity rail service similar to that provided in Japan.

The European Economic Community (EEC)

Over the period **1972-75,** exports represented about one-fifth of total equipment production of EEC countries (see table **20).** Only 5 percent of production was exported to other EEC countries, usually to those without manufacturing capability. The remainder of exports (14 percent of total railcar production) went to countries outside the EEC. Clearly, internal demand for equipment during that period was satisfied by national suppliers; exports were a relatively small proportion of production and were concentrated on markets outside the EEC.

Within the EEC, certain firms specialize exclusively in the production of one type of railway equipment while others produce the entire range. Many firms are diversified and active in areas outside the railway industry. Especially in the traction sector, the larger firms are subsidiaries of major national consortia. On the other hand, many of the firms are private, particularly those concerned with hauled vehicles. In Italy and in Great Britain, the largest firms are State owned.[14]

In the construction of intercity passenger vehicles, the majority of the work in the EEC is carried out by small- and medium-sized firms. In 1975, there was substantial and sustained demand for passenger cars in EEC countries (see table 21). Exports were generally around 3 percent of production, although France built up exports from **4** to **32** percent by **1975.** The major part of railcar construction was commissioned by the national railways, but a substantial part of the self-propelled vehicles were needed to replace worn out equipment on transit systems and for limited construction of new systems. Table 22 shows the construction of railway passenger vehicles for EEC countries between 1965 and 1975.

In West Germany, most of the firms are incorporated in major industrial groups, including four

[12] Discussions with Japanese National Railways, January 1983.
[13] N.D. Lea Associates, *Railcar Market 1967-1982.*
[14] *Report on th, Railway Rolling Steel Industry* (Brussels: Commission of the European Communities, 1977).

Table 19.—JNR's Purchase of Rolling Stocks (number of cars)

	1974	1975	1976	1977	1978	1979	1980	1981	Average per year
Electric MU cars:									
Commuter 72	175	247	177	165	183	190	200	176	
Intercity	645	512	282	558	891	322	430	520	520
Shinkansen	462	96	211	190	127	120	156	296	208
Diesel MU cars	34	2	32	20	111	322	217	204	118
Coaches	100	60	151	285	356	300	307	224	223
Total	1,313	845	923	1,230	1,650	1,247	1,300	1,444	1,244

SOURCE: Ichiroh Mitsui, Japanese National Railway representative, Washington, D.C.

Table 20.-Community Exports and Intra-Community Trade

Stock	1972 Value x.u.a.	1972 Percent exports Tot. Wed.	1973 Value x.u. a.	1973 Percent exports Tot. prod.	1974 Value x.u.a.	1974 Percent exports Tot. prod.	1975 Value x.u.a.	1975 Percent exports Tot. prod.
Locomotives:								
Total	72.1	6.1 %	**57.8**	**4.7%0**	**64.7**	**4.80/o**	**44.8**	3.0
Intra CEE	3.4	0.3	7.0	0.6	4.8	0.4	3.9	0.3
Extra CEE	68.7	5.8	50.8	4.1	59,9	4.4	40.9	2.7
Multiple units railcars:								
Total	14.3	1.2	34.8	2.8	42.1	3.1	52.7	3.5
Intra CEE	8.4	0.7	16.9	1.4	21.1	1.6	24.1	1.6
Extra CEE	5.9	0.5	27.9	1.4	21.0	1.5	28.6	1.9
Vans, carriages, and luggage etc.:								
Total	2.3	0.2	17.0	**1.4**	**18.2**	**1.3**	**29.8**	2.0
Intra CEE	0.2	0.02	4.7	0.4	4.5	0.3	1.8	0.1
Extra CEE	2.1	0.18	12.3	1.0	13.7	1.0	28.0	1.9
Wagons:								
Total	187.1	15.8	86.3	7.0	108.0	8.0	152.3	10.2
Intra CEE	53.5	4.5	30.8	2.5	40.0	2.9	38.2	2.6
Extra CEE	133.6	11.3	55.5	4,5	68.0	5.1	114.1	7.7
Total:								
Total	275.8	23.3	195.8	16.0	232.9	17.2	279.5	18.8
Intra CEE	65.5	5.5	59.4	4.8	70.4	5.2	68.0	4.6
Extra CEE	210.2	17.8	135.4	11.2	162.5	12.0	211.5	14.2
Production total EEC	1,185.7		**1,227.7**		1,358.0		1,487.9	

Key = x.u.a. = ? ; Tot. prod, = total productivity.

SOURCE: Nisexe 1975—analytical tables of foreign trade.

Table 21.-Passenger Car Production, 1975 (value: million U.A.[a])

	Self-propelled	Hauled	Total	Export	Percentage
Belgium	9.3	1.0	10.3	—	—
West Germany	91.5	52.4	143.9	3.6	3
France	62.4	99.6	162.0	51.4	32
Italy	8.3	24.0	32.3	1.1	3
Great Britain	11.8	14.2	26.0	0.7	3
Total	183.3	191.2	374.5	56.8	15

U. A.–Unit of account for EEC = approximately $1.

SOURCE:

Table 22.—Construction of Railway Passenger Vehicles (including transit)

Year	Self-propelled	Hauled	Total	Index
1963/64 average	NA	2,486	NA	(118)[a]
1965/66 average	401	2,112	2,513	100
1967	879	1,891	2,770	110
1970	674	1,549	2,223	88
1971 0	580	1,648	2,228	89
1972	604	1,609	2,213	88
1973	688	1,809	2,497	99
1974	837	1,538	2,375	95
1975	832	1,816	2,648	105

NA = Not available.
a Breed on hauled cars only.

SOURCE: John G. Smith.

that are part of iron and steel groups. In Belgium and Denmark, only one manufacturer produces passenger rolling stock. In France, the majority of the 16 manufacturers concentrate either exclusively or primarily on rail rolling stock. The exception is Alsthom Atlantique, where railway activity represents only 15 percent of the group's total sales. In Great Britain, only British Rail Engineering Ltd. (BREL) (a subsidiary of British Railways) manufacturers intercity railway passenger vehicles. One other company specializes in equipment for transit systems. In Italy, 80 percent of the firms operate exclusively in the railway

construction or repair sector. State policy to develop Southern Italy has led to investment by EFIM (a body responsible for State holdings) in the railway equipment construction industry.

For the EEC railway manufacturing industry, of 120 firms involved, 91 employed less than 1,000 people in 1975, and only 12 exceeded 2,000 employees. Of these, only 2 employed more than 5,000 people (Alsthom in France and BREL in Great Britain).

In 1974, the EEC fleet of self-propelled cars was 20,800, and there were 51,400 hauled cars, so that the construction rate represented about a 25-year vehicle life. Very few changes have been made in passenger train service levels since that time. If Government policies regarding the support level for passenger train services do not change, an annual production rate in excess of 2,500 vehicles per year will be required to sustain the fleet.

Under EEC regulations, Governments may support railway systems only in the passenger sector, and then by way of payments to recompense the railway for continuing to run passenger trains that are socially desirable but economically unsound. Each year, the Government and the railway in each EEC country reach agreement on which passenger routes will be supported and on the level of payment. In recent years, there has been virtually no change in the routes to be supported, and argument has centered on the appropriate level of support payment. The payment is based on total costs, including depreciation and interest, and, to the extent that revenues fall short of operating costs, some part of the support payment eventually is used to pay for new passenger vehicles.

Capital investment in passenger vehicles for the railways is controlled by the EEC Governments, but different methods are employed to finance the shortfall between accrued depreciations and purchase price. In the case of British Railways, the Government procures funds and lends directly to the railway, while in France and West Germany the railways raise funds in the open market. To do this, they obtain a Government guarantee of repayment, without which it would be impossible to raise the money.

EEC Governments also aid the railway systems in a variety of other ways that also could be regarded as support payments. In **1980,** such support payments in France totaled **$2.4** billion, an increase of **76** percent from the 1970 level (at 1980 prices).[15] In West Germany in the same year, support payments totaled **$6.2** billion, an increase of $4 billion (175 percent) from the 1970 level (at 1980 prices).[16] In Great Britain, support payments for 1980 totaled $1,2 billion, an increase of $1 billion on the 1970 level (at 1980 prices) .17

Prospects for a U.S. Passenger Railcar Manufacturing Industry

Based on examination of U.S. conditions and foreign markets, reemergence of a U.S. passenger railcar manufacturing industry is not likely to occur unless there is an assured and predictable market. Continued improvements in standardization of U.S. railcars, and continued improvements in procurement procedures also have been suggested as important factors in creating a climate favorable for manufacturer reentry into the U.S. market. However, the first requirement is by far the most critical. Without such a market, which all foreign railcar manufacturers have, no potential American manufacturer is likely to regard making railcars as a profitable line of endeavor.

[15] French National Railways (SNCF), *Report and Accounts.* 1980.
[16] West German National Railways (DB), *Report and Accounts, 1980.*
[17] British Railways (BR), *Report and Accounts,* 1980.