Strategic Planning as a Basis for Capital Investment Programming: Case Study of the Regional Transportation Authority in Chicago

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The Regional Transportation Authority (RTA), emerging from reorganization and refinancing initiatives in 1983, was given a financial management and oversight responsibility separate from the three operating agencies: Chicago Transit Authority, Metra (Commuter Rail Service Board), and Pace (Suburban Bus Service Board). In recognition of the new roles of the public transportation agencies in the six-county Chicago metropolitan region and of the challenges and opportunities faced by the region, the RTA began a strategic planning project in 1985 with consulting assistance from Booz, Allen & Hamilton, Inc. and subcontractors McDonough & Associates and Mundle & Associates. As part of that project, an examination of capital funds availability and "needs" was undertaken to continue to operate the existing services at acceptable levels and quality of service. This paper summarizes some of the key results of that analysis including (a) the formulation of a life-cycle capital asset model to estimate future capital funding requirements based on existing age, expected service lives, maintenance and rehabilitation policies, and management policies on replacement criteria; (b) the results of sensitivity testing of key management and life-cycle assumptions on capital funding levels and priorities; (c) the comparison of historical and probable near-term funding levels against "deferred capital" and "normal annual" capital expenditures; (d) a discussion of market and finance oriented strategies for the RTA, which provide guidance to the formulation of capital programs for each service board and the RTA as a whole; (e) the presentation of basic criteria for capital investment analysis to be used in capital project prioritization and program formulation; and (f) the description of practical impediments to capital program execution in terms of implementation capacity and trade-offs between "optimality" and "equity" in investments.

An understanding of the basic capital needs of the three service boards of the Regional Transportation Authority (RTA) was a prerequisite to the development of alternative strategies. Major factors influencing future transit system development include changing markets, public funding support, and operating efficiency. Markets for public transportation services continue to evolve as the urban area grows and residential and employment patterns shift. Funds for operating support come from both user-paid fares and public tax support. Locally generated nonfarebox funding is derived from a sales tax in the six-county area. The availability of operating "surplus" funding (farebox revenues plus nonfarebox operating support minus operating costs) can be an important source of funding for needed capital investment, particularly in the typical transit agency case where local funds are leveraged by a factor of four to one (75 percent federal funding) or five to one (80 percent federal funding). Recognizing the inescapable fact that facilities and equipment wear out and must be replaced leads to the equally inescapable conclusion that capital funding must be available simply to maintain the "status quo" in transit system service.

Capital funding availability to meet ongoing capital replacement and new investment needs is, therefore, a significant factor in long-term strategy. In particular, the availability of capital resources for discretionary investment clearly influences the options available to the transit agency. As the funds available for discretionary capital programs increase, the number of options available to the agency increases. Funds may be used for meeting one or more objectives:

- Accommodating new growth markets;
- Increasing market share in current markets;
- Adding needed capacity;
- Increasing levels of service on existing systems; and
- Increasing the reliability, performance, and efficiency of existing services through the replacement of capital plant and equipment with superior technology.

On the other hand, as discretionary capital funds decrease, strategies begin to focus on survival. Investments designed to respond to new markets and reduce operating costs through investments in technologically superior assets become severely limited. Over extended periods of capital shortage, assets are not replaced in a timely fashion, service levels deteriorate, operating costs increase, reliability is lowered, and market share is lost. Ultimately, disinvestments may be required. Underused plant and equipment must be eliminated in order to maintain a "normal" condition for the remaining plant and equipment that serve the most important markets. Existing plans for service expansions and initiatives may not be supportable without deferred maintenance and degraded performance on other portions of the transportation system. The situation can evolve to one analogous to the army field doctor faced with more casualties than can be treated. A decision must be made to treat those patients with the best chance for survival while reluctantly leaving those injured with the least probability of survival to be treated later, if at all.

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FORMULATION OF THE CAPITAL ASSET MODEL

Given the importance of capital funding availability and the extensive capital intensity of public transportation services in the Chicago metropolitan area, it is important to establish a perspective on the RTA's capital needs and funding levels. Given the existing age and character of the assets, is the RTA in a favorable or unfavorable position with respect to capital funding? What are the funding levels required to maintain the existing plant and equipment? To answer these questions a capital asset model was developed.

A capital asset model describing the capital costs associated with a spending program that simply replaces assets as they wear out is the starting point in the analysis of capital needs, capital financing requirements, and alternative strategies. The Bedrock Investment Program (BIP) became the title for this model because it describes the minimum level of spending necessary to retain existing services to stay at the same "bedrock" situation, operating the current services under normal conditions.

The model in simplistic terms describes the costs (in 1985 dollars) to replace existing assets at the end of their useful lives given current replacement costs, existing policies on useful lives, and current rehabilitation and maintenance program characteristics.

The BIP relies on development of a base level of physical asset information for each of the service boards. In each case, a physical asset inventory is developed by major line segment and by principal categories used in the current capital budgeting program. Within each budget category, a physical inventory by type of asset is used.

Depending on the asset type, further breakdowns are made to a level that is normally used in cost estimating within each service board. An estimated useful life and the age of the current asset are gathered for each asset type. For example, for each type of asset, the following data are developed:

- Property [e.g., Chicago Transit Authority (CTA) Rail, CTA-Bus, Suburban Bus Division (SBD), and Commuter Rail Division (CRD)];
- Line [e.g., Skokie Swift, Bus Division/Garage, Chicago and Northwestern Railroad (C&NW), etc.];
- Budget class (current budget category);
- Description (e.g., bridge, 95th Street);
- Asset type (e.g., concrete bridge, one span);
- Other asset descriptions (e.g., double track, open deck, walkways);
- Quantity (e.g., units, feet, miles, etc.);
- Unit cost (in dollars per quantity measure);
- Date built (for one-time replacement items);
- Useful life;
- Life description (replaced continuously as ties or all at once);
- Rehabilitation timing and cost (major investments in the asset during its useful life (e.g., locomotive overhaul); and
- Capital share (i.e., percent of the capital cost borne by RTA, including federal, state, and local match).

Analysis of these data permits the estimation of a capital replacement profile for each of the lines and major class of assets (such as rolling stock). The model calculates any "deferred" or postponed capital investments that should have already been made but have been postponed. The results are an estimate of the capital needs of the current system for each year over the next 30 years.

Horizon Date

The BIP model was developed to assess capital needs based on a "snapshot" of the system at a single point in time. The "snapshot" or horizon date selected for the purpose of this study was December 31, 1985. Accompanying this date was an inclusion rule that determined what capital projects actually fell within the stated horizon date. The capital replacement process is a lengthy one, requiring a series of events:

- Suggestion and definition of a capital project,
- Application for project funding,
- Review and award of funds,
- Preliminary design and engineering, and
- Actual construction.

In consultations with RTA and service board staffs, those projects that had actually been awarded for construction funding (whether the construction was under way or not) were included within the horizon date. Thus, a project that was funded for construction prior to the end of 1985 has a "date built" that is the estimated year of completion (e.g., 1987). Future capital need was then determined, taking into account completion of such funded projects at this estimated future point in time.

Basic File Structure

The basic file structure translates the physical description of an asset into a logical descriptor, which is used by the model in the calculation of capital funding requirements. Each asset is considered a record within the data base file and is described by 24 data fields. The linkage between the physical description of an asset and its logical descriptor or field is presented in Table 1.

Basic Assumptions

In ordér to assess future capital funding requirements, assumptions on expected useful life, replacement cost, rehabilitation timing, and rehabilitation costs were made for each asset type. A series of assumptions about the useful lives of assets and their replacement costs were used in the model based on extensive discussion with the RTA and the engineering and capital programming staffs of the service boards. A sample of key assumptions is included in Tables 2 through 5.

Another assumption within the capital asset data base is the RTA share of financial responsibility for an asset. The situation of sharing assets arises most often for Metra, where commuter and freight service run over the same lines. Capital investments for those sections of shared lines are funded by both the public and private sector based on a measure of relative usage. For example, track and structure replacement is usually divided on a gross tonnage basis while signal, interlocker and grade crossing investments are allocated based on total train movements.

TABLE 1 FILE STRUCTURE

Asset Classification	Physical Description
Control number	Numeric code that identifies owner and asset group
Owner	CTA-Rail, CTA-Bus, Pace, Metra, C&NW, etc.
Line	Line or garage where asset is located (Skokie, C&NW-West, Joliet, etc.)
Budget group	Primary budget group designed to fit RTA capital planning categories: Rolling stock Stations Structures Support equipment Support facilities Electric, signal, and communication
Asset description	Physical description of the asset (GMC coach, elevated tangent, etc.)
Budget Group 1	Abbreviation for primary budget group
Budget Group 2	Second level of detail of budget group, for example, 1. Rolling stock 2. Passenger cars 2. Locomotives (Passenger cars or locomotives as subsets of the primary budget group for rolling stock.)
Budget Group 3	Third level of detail of budget group, for example, 1. Electric, signal, and communication 2. Electric 3. Substations (Substations as a subset of the secondary tier of electrical facilities, which are subsets of the primary tier of electric, signal, and communication.)
Quantity used	Amount of an asset that is used by service board
Quantity owned	Amount of an asset that is owned by service board
Units	Units of measure applied to quantity used or owned (e.g., each, miles, foot, lot, etc.)
Replacement cost	1985 estimated replacement cost
Life	Estimated life of asset in years with appropriate rehabilitation actions
Rehabilitation period	Frequency at which asset is rehabilitated
Rehabilitation life	Estimated life of a capitalized rehabilitation
Rehabilitation cost	Estimated cost of a rehabilitation
Major maintenance period	Frequency at which asset undergoes major maintenance
Major maintenance life	Estimated life of a major maintenance event
Major maintenance cost	Major maintenance cost
Cost share	Estimated RTA cost responsibility

Treatment of Continuing Rehabilitation

One of the more powerful aspects of BIP is its flexibility in defining the rehabilitation cost and schedule of any asset. The timing of an assets rehabilitation is handled via three distinct methods (Figure 1):

- Annual rehabilitation,
- Periodic constant rehabilitation, and
- Periodic nonconstant rehabilitation.

Annual rehabilitation occurs when an asset's life is extended indefinitely through annual capitalized rehabilitation actions. Assets that fall under this method include CTA elevated structures and Metra retaining walls and track. Metra track is included in this group to reflect the ongoing track maintenance program and the unavailability of exact ages for all track currently in the Metra system.

Periodic constant rehabilitation occurs at constant intervals over an asset's life, involving a uniform investment usually at midpoint or quarter points. Assets that use this method include all service board rolling stock, various support facilities, and CTA and Metra bridges.

Periodic nonconstant rehabilitation occurs at constant intervals over an asset's life but at different levels of investment, by period. In this method, an asset may require a rehabilitation costing 5 percent of its replacement cost at 5 years and then a 10 percent rehabilitation at 10 years.

Requirements for Model Operation

Operation of the BIP model requires the following:

- dBASE III, Version 3.00, program disk and overlay;
- IBM XT, AT, or compatible computer with at least 512K capacity;
- Two floppy disk drives;
- Hard disk; and
- LOTUS 1-2-3, Version 2.0 or 2.01 program and utility disk (optional).

Computation of Deferred Capital Investment

For assets that should have been replaced prior to 1985 but have not, these replacement costs were simply summarized to indicate the amount of capital funding that has been deferred. For some assets, particularly CTA elevated structures, the capital replacement is complicated by the fact that an ongoing replacement and rehabilitation program is in place that continually upgrades the structure as needed. Evaluating whether the rehabilitation program is on target, "behind schedule" and, therefore, contributing to a deferred capital condition, or "ahead of schedule" and, therefore, reducing the cumulative amount of deferred capital investment required extra analysis. The deferred capital amount for an asset of this type was calculated by subtracting the actual and committed capital renewal funding up to 1985 from the "expected" funding

TABLE 2 BASIC ASSUMPTIONS—CTA-RAIL

		Replacement		Rehabilitation	
Item	Unit	Cost per Unit ($000s)	Normal Life (Yrs.)	Cost per Unit ($000s)	Normal Period (Yrs.)
Rolling Stock					
Rail Cars	Each	1,000/1,200	24/37	500/600/750	12/18
Track					
Elevated Tangent	Mile	1,320	30	0	0
Elevated Curve	Mile	2,110	25	0	0
Surface	Mile	1,580	40	0	0
Subway Tangent	Mile	1,320	40	0	0
Subway Curve	Mile	1,848	30	0	0
Special Work	Each	150	30	0	0
Fencing	Route Mile	132	20	0	0
Structures					
Elevated Structure	Track Mile	26,400	999	352	1
Major Bridge	Track	(400+5L)/T	100	10%	25
Footwalk	Mile	317	25	0	0
Tunnel	Mile	100,000	999	0	0
Elec/Sig/Comm					
Interlocker	Each	-	40	0	0
Distribution	Mile	406	50	100	25
TCS	Lot	-	20	0	0
Substations	Each		50	10%	10
PA System	Each	20	10	0	0
Support Facilities					
Yard Structure	Mile	26,400	999	352	1
Yard Tracks	Lot	-	50	0	0
Yard Buildings	Lot	-	40	10%	10
Support Equipment					
Yard Equipment	Lot	-	20	0	0
Stations					
Stations	Each	-	70	10%	35

based upon replacing the asset over its nominal useful life on a straight-line basis. The nominal useful life is an estimate of the period of time required to completely replace the asset through a program of periodic rehabilitation.

STATUS OF RTA TRANSIT SYSTEM ASSETS

The first result of using the BIP model is the definition of the asset value, based on replacement costs for the region's system. The RTA's service boards operate with assets that have a current replacement value of about $15.4 billion (excluding land) (Figure 2). Of this amount, the service boards are responsible for about $13.6 billion; the balance is the responsibility of the private carriers. Of the RTA's share of replaceable assets, CTA assets comprise 61.4 percent of this value, followed by Metra with 37.5 percent, and Pace with 1.1 percent. Metra's share of total asset value, however, is higher: 44.5 percent compared to 37.5 percent of total assets, if consideration is given to assets owned by rail carriers.

In addition, the current age of the assets of each type and for each service board are produced by the model. This provides a graphic display of the results of past capital investment programs and points to the timing and dollar levels for capital investment in future years (Figures 3 and 4). Exercising the model over a 30-year period (1985 to 2015) yields a capital investment profile for the existing transit infrastructure.

CAPITAL FUNDING NEEDS

The BIP process involved an inventory of physical assets (excluding land) by major line segment and principal budget category for each of the service boards. Within each budget category, a physical inventory, condition review, and rehabilitation and capitalized maintenance requirement were estimated by type of asset. Through identification of asset ages, assumptions of replacement costs, estimates of life-cycle rehabilitation and maintenance costs and of life cycle, calculated with RTA's cost responsibility, 30-year program costs were calculated. Additionally, deferred replacement costs—the costs of missed past replacement cycles—were also computed. Since program costs are highly sensitive to variables such as replacement life, a Stretch Bedrock Investment Program (SBIP) was also calculated. The SBIP is not presented as a viable option, but merely to show the absolute "bare bones" requirement to operate with some concern for safety but no consideration for amenities or reliability of service. The basic replacement lives of major assets for both the BIP and the SBIP are given in Table 6.

TABLE 3 BASIC ASSUMPTIONS—CTA-BUS

		Replacement		Rehabilitation	
Item	Unit	Cost per Unit ($000s)	Normal Life (Yrs.)	Cost per Unit ($000s)	Normal Period (Yrs.)
Rolling Stock					
Bus	Each	150/220	12	10	3
Elec/Sig/Comm					
Bus Radios	Each	5	12	0	0
Support Facilities					
Bus Garage	Each	-	40	10%	10
Shops	Each	-	40	10%	10
Terminals	Each	-	20	0	0
Support Equipment					
Garage Equipment	Each	-	10	0	0
Shop Equipment	Each	-	10	0	0
Stations					
Shelters	Each	3	10	0	0
Signs	Each	.05	5	0	0

Future Needs: BIP, SBIP, and Deferred Expenditures

The total 30-year capital requirement for the three service boards will be $11.3 billion, or $375 million annually in 1985 dollars (Figure 5). Approximately 83 percent of the annual requirement will be for rail, the remaining 17 percent for bus. The consolidated requirement for CTA is $231 million per year, or 62 percent of the total annual requirement. Individually, CTA-Rail's requirement is $181 million per year, while the CTA-Bus need is $50 million per year. Metra's annual need is $129 million per year, while Pace is estimated to require $15 million annually. The predominance of rail capital requirements is an indication of the capital intensity of this mode relative to bus.

The graph on the right in Figure 5 illustrates the SBIP results. By stretching life cycles of selected assets, annual capital requirements are reduced to $296 million, a 21 percent decrease. Bus assets decreased more dramatically than rail assets, declining 38 percent, from $65 million to $40 million per year. Rail requirements declined 17 percent. In general, the shorter-lived assets typical of the bus mode display greater sensitivity to changes in life.

A second part of the asset analysis focused on elements where prior rehabilitation or replacement has been substantially delayed or deferred, creating a "going-in" backlog of capital need that totals $2.24 billion. Primary areas of deferral have been in structures (primarily CTA), electrical and signal system (CTA and Metra), and stations (CTA and Metra).

The total requirement over the next three decades for bedrock improvement purposes and "catch-up" on deferred expenditures is summarized as follows:

	Capital Requirement ($ millions)			
	BIP ($)	*Deferred ($)*	*Total ($)*	*Total (%)*
CTA	6,941.0	1,805.4	8,746.4	64.9
Metra	3,856.2	432.7	4,288.9	31.8
Pace	441.0	0.2	444.2	3.3
Total	11,241.2	2,238.3	13,479.5	

AVAILABLE CAPITAL FUNDING

Capital funding from all sources over the 1980 through 1985 period averaged $233.4 million, though it has varied by more than $100 million from its high and low levels (Figure 6). The federal program (UMTA) has been the largest contributor of funds, averaging 78 percent of RTA's total capital funds received. UMTA funding (excluding Interstate transfer funding) has been supplied through the Section 3 discretionary capital program, Section 5, and Section 9 formula grants. Since 1983, however, federal capital support has declined from $230 million to $180 million. (More recently, the capital budget for RTA increased to $273 million in 1986 and $300 million in 1987.) Capital support from the state has increased moderately overall, though it has decreased in the last three years of the period as some state support has been diverted to Interstate transfer projects. Contributions from the RTA and other sources constitute the smallest, but growing, portion of capital funds, averaging approximately 4 percent of total capital support. In 1984, RTA's capital contribution was $15 million. The 1985 contribution was $37 million excluding approved positive operating budget variances from the service boards. Including $33 million in positive operating budget variances increases the RTA contribution to $70 million. In 1986 it was $70 million

TABLE 4 BASIC ASSUMPTIONS—METRA

		Replacement		Rehabilitation	
Item	Unit	Cost per Unit ($000s)	Normal Life (Yrs.)	Cost per Unit ($000s)	Normal Period (Yrs.)
Rolling Stock					
Rail Car	Each	1,100	40	110	12
Electrified Car	Each	1,500	36	150	12
Locomotive	Each	1,500	30	150	12
Track					
Track	Mile	525	999	23	1
Retaining Wall	Mile	15,000	999	750	50
Grade Crossing	Track	40	12	0	0
Fence	Mile	35	20	0	0
Structures					
Bridges	Track	(400+10L)	100	10%	50
Culverts	Each	10	50	0	0
Ped. PH	Each	250	100	60	50
Elec/Sig/Comm					
Interlocking	Each	5,000/15,000	40	5%	20
Signals (ABS)	Track Mile	150	40	30	10
Signals (CTC)	Track Mile	165	40	33	10
Crossing Signals	Each	165	25	35	12
Substation	Each	-	50	10%	10
D.C. Distribution	Track Mile	300	50	75	25
A.C. Distribution	Route Mile	30	50	8	25
Catenary Support	Each	8/15	100	0	0
Comm. Cable	Each	50	40	0	0
Radios (Misc.)	Lot	4,000	12	0	0
ARCS	Each	5,000	40	0	0
Support Facilities					
Yard	Each	-	40	10%	10%
Support Equipment					
Yard Equipment	Lot	-	25	0	0
Shops	Lot	-	25	0	0
Office Furniture	Lot	-	10	0	0
Computers	Lot	-	8	0	0
Maint. Equipment	Lot	-	10	0	0
Elec. Equipment	Lot	-	10	0	0
Stations					
Station Building	Each	-	50	35%	25
Station Exterior	Each	-	25	25%	12

consisting of $32 million in local matching funds and $38 million in funding from service board positive budget variances.

Capital Funding Needs Compared with Funding Sources

To summarize the major points of this section, the total 30-year capital requirement of the RTA's service boards is $11.3 billion, translating to an average annual need of $375 million per year (Figure 7). However, deferred capital, which represents the accumulated value of missed replacements before 1986, creates an additional $2.2 billion need. Selected asset life extensions achieved a 21 percent reduction in total capital requirements, decreasing average annual needs from $375 million per year to $296 million per year, not including deferred capital.

A review of the 30-year annual needs, segmented by decade, indicates a lower-than-average 1986 through 1995 requirement. Capital requirements during this period average $303 million per year, while requirements of the subsequent two decades rise to $382 million per year from 1996 through 2005, and to $440 million per year during the third decade. However, deferred capital, estimated for amortization during the first 10 years of the BIP, will increase the needs during the first 10 years from $303 million per year to $527 million per year. SBIP requirements by decade follow the same pattern of lower initial needs; requirements of the three decades are $213 million, $275 million, and $403 million per year, respectively. Adding the investment required to "catch up" with deferred capital expenditures increases requirements during the first decade to $376 million per year.

Comparing capital requirements with present levels of funding indicates severe shortfalls. With the exception of the 1986 through 1995 requirements of the SBIP (excluding deferred capital), existing funding falls short of meeting requirements of the BIP and the SBIP. Capital funding averaged $233 million per year from 1980 through 1985. Further, capital requirements are expressed in 1985 dollars; therefore, if present available capital funding does not expand with inflation, the shortfall will be even more dramatic.

Beyond identifying the shortfall between existing funding levels and future capital needs, the more important concern is the availability of future funding absent a concentrated effort by the RTA to secure a new funding source or reduce the

TABLE 5 BASIC ASSUMPTIONS—PACE

		Replacement		Rehabilitation	
Item	Unit	Cost per Unit ($000s)	Normal Life (Yrs.)	Cost per Unit ($000s)	Normal Period (Yrs.)
Rolling Stock					
Bus	Each	145	12	30	8
Paratransit Bus	Each	45	4	5	2
Elec/Sig/Comm					
Vehicle Radio	Each	3	12	0	0
Hand Radio	Each	2	8	0	0
Radio Base Station	Each	20	40	0	0
Support Facilities					
Garage	Each	-	40	10%	10
Office	Each	3,400	40	10%	10
Support Equipment					
Computer	Lot	1,500	8	0	0
Cash Vault	Each	2	12	0	0
Farebox	Each	3	12	0	0
Garage Equipment	Lot	-	10	0	0
Office Furniture	Lot	1,500	10	0	0
Collection Vault	Each	6	12	0	0
Supr. Vehicles	Each	12	4	0	0
Stations					
Shelter	Each	3	10	0	0
Signs	Each	.03	5	0	0
Transportation Center	Each	1,500	50	25%	25

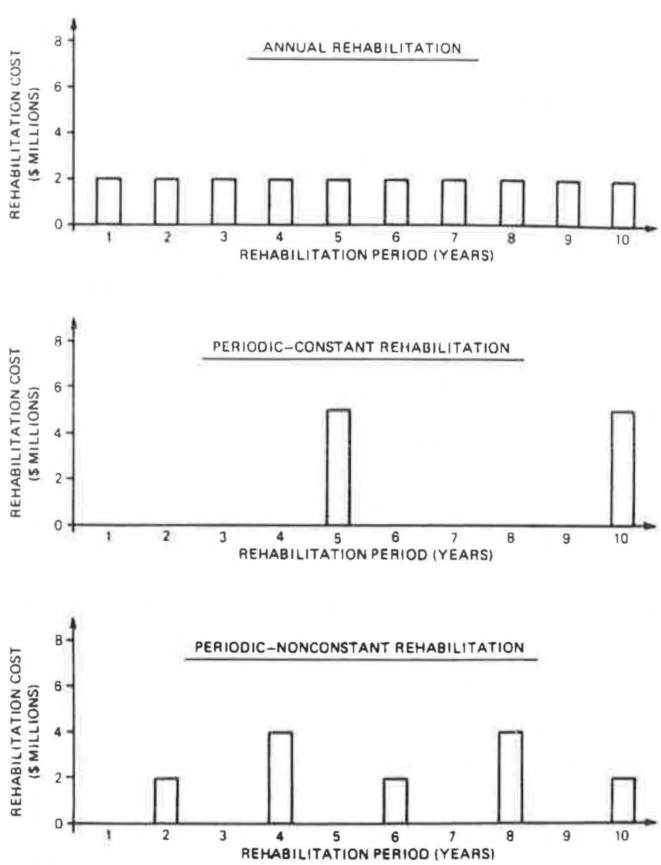


FIGURE 1 Rehabilitation methodology.

capital funding requirement. Critical assumptions for this analysis are the future monies available from UMTA. A series of scenarios were defined based on the expected "steady state" amount of capital funding to be expected in "out" years given current (and assumed to be continuing) funding levels and attitudes by funding jurisdictions. These optimistic, neutral, and pessimistic assumptions were used in a series of financial modeling exercises to examine the impacts of the funding levels. Results of these financial model analyses indicated that funding from even "optimistic" external and internal (RTA) sources was insufficient to meet capital needs.

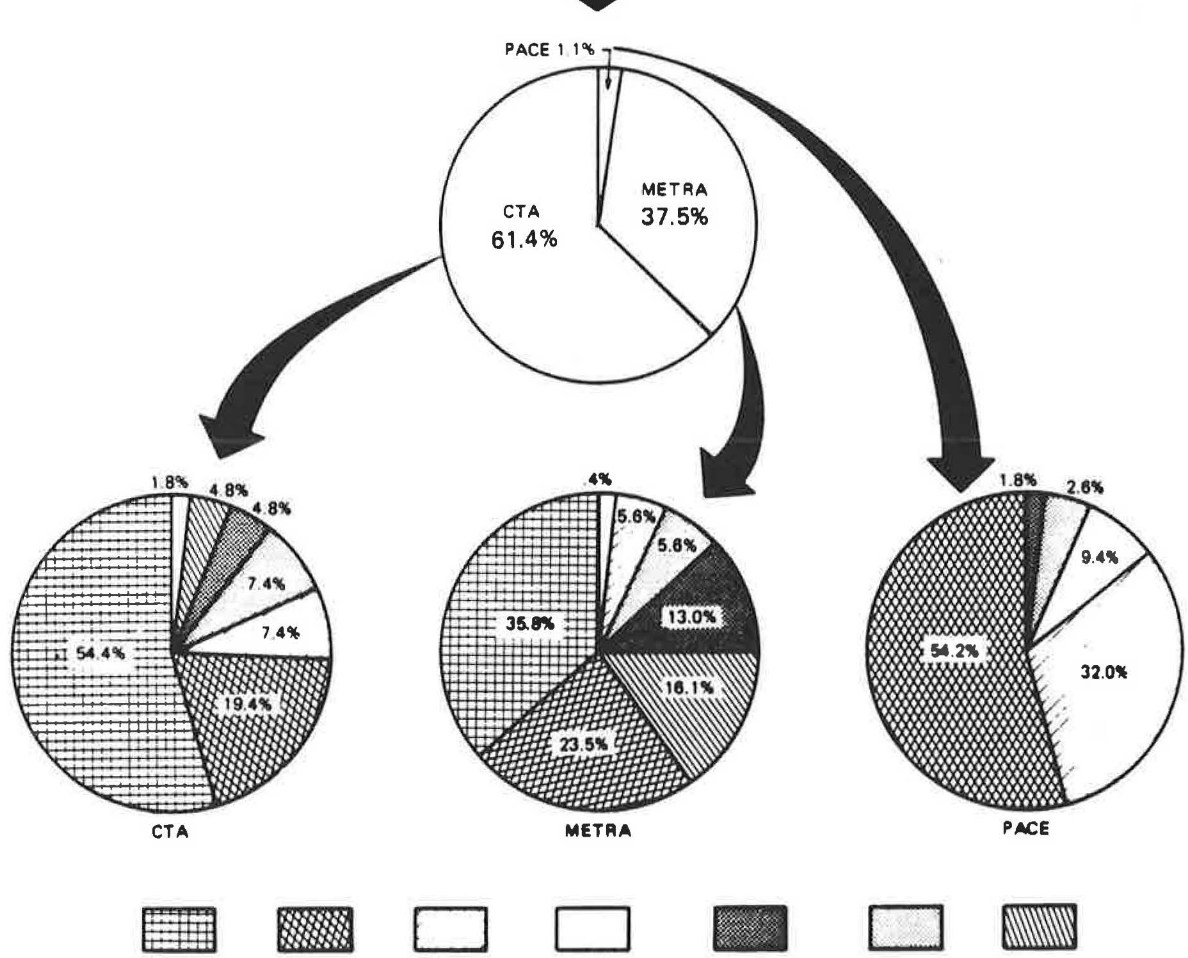
MARKET, FINANCIAL, AND OPERATING STRATEGIES

In the face of a shortfall between capital funding and need, there are a number of approaches to equalizing capital needs with funding availability:

- Reduce capital funding requirements:
  - Extend capital life cycles (determined to be insufficient as a single initiative);
  - Expand rehabilitation program [linked to and in concert with an extended or "stretch" (SBIP) life-cycle program];
  - Convert capital costs to operating costs through leasing arrangements for rolling stock (will transfer the problem to the operating side of the ledger); and
  - Disinvest in underused facilities (a difficult, unpopular, and potentially self-defeating approach toward achieving long-term urban mobility and regional development goals).

- Reduce service levels to lessen capital needs:
  - Tighten service standards (to increase equipment use and requirements);
  - Pursue privatization initiatives (to transfer capital financing to private sector depending on structure and financing of privatized services); and
  - Price to reduce peaking characteristics and supply requirements (also disadvantageous to the overall objective of increasing transit ridership and lessening dependence on the automobile).
- Increase capital funding support:
  - Increase local contribution through gas, sales, or other taxes (faced with the normal unpopularity of tax increases);
  - Increase state contribution (requires resolution of state budgeting problems and modified attitudes); and
  - Increase private contribution through, for example, joint development (a good potential for new services but only limited potential for infrastructure renewal funding—the vast majority of the RTA's needs).

	TOTAL ASSET VALUE	RTA SHARE OF ASSET VALUE
CTA	$8,382.6	$ 8,373.7
METRA	6,845.6	5,102.0
PACE	152.7	152.7
TOTAL	$15,380.9	$13,628.4



	STRUCTURES	ROLLING STOCK	SUPPORT FACILITIES	SUPPORT EQUIPMENT	ELECT/SIG/COMM	STATIONS	TRACK	TOTAL
CTA	$4,556.8	$1,628.4	$615.2	$150.3	$ 405.1	$616.9	$ 403.0	$ 8,373.7
METRA	1,825.3	1,197.0	288.2	18.6	668.9	285.3	820.7	5,102.0
PACE	–	82.9	46.8	14.4	2.6	4.0	–	152.7
TOTAL	$6,382.1	$2,908.3	$950.2	$183.3	$1,076.6	$906.2	$1,223.7	$13,628.4
% OF TOTAL	46.8%	21.3%	7.0%	1.3%	7.9%	6.7%	9.0%	100.0%

FIGURE 2 Replacement value of RTA assets in thousands of dollars, 1985.

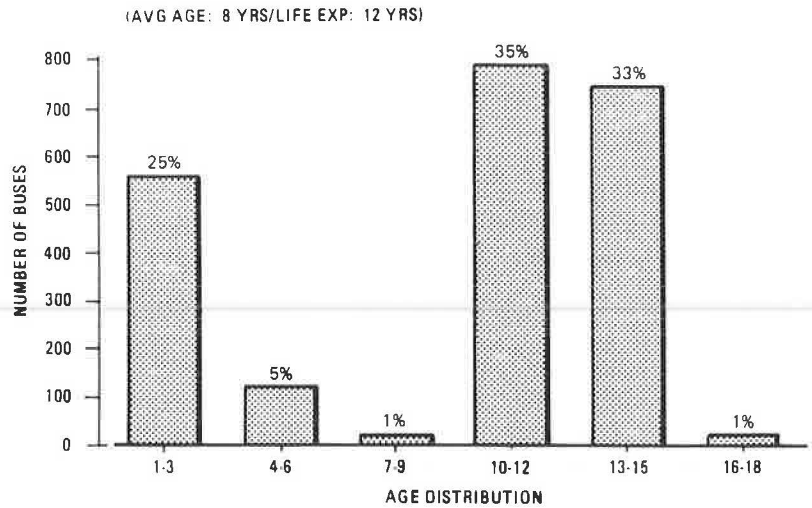


FIGURE 3 CTA-Bus asset age distribution, 1985—buses.

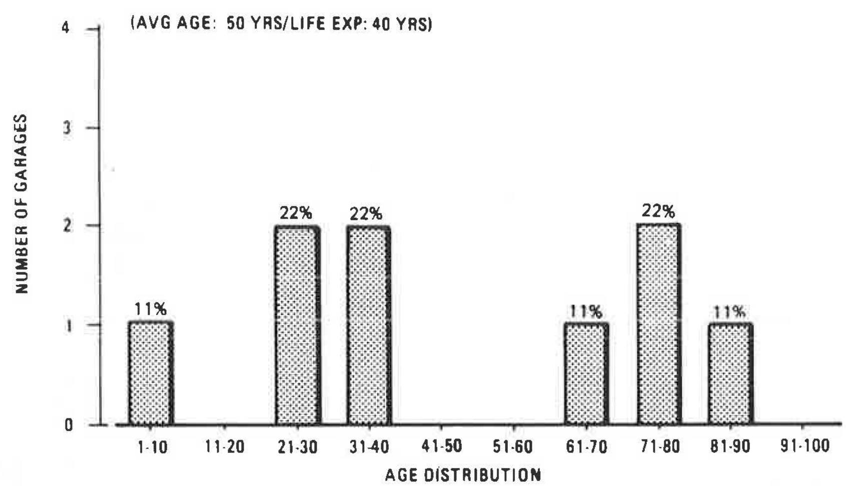


FIGURE 4 CTA-Bus asset age distribution, 1985—garages.

TABLE 6 REPLACEMENT LIVES OF MAJOR ASSETS FOR BIP AND SBIP

	Years	
Assets	BIP	SBIP
Track	20–40	Increase 20 percent
Rolling stock	12–40	Increase 25 percent
Structures	70–100	No change
Electric/signal/communication		
Train communication signals	20	50
Substations	40–50	75
Interlockers	40	50–60
Automatic block signals	40	50
Signals	25	30
Centralized train control	40	50
Distribution	50	100
Support facilities		
Yards	40	80
Support equipment	25	50
Stations		
Buildings	50	70

- Create and divert operating surplus to capital:
  - Increase recovery ratio ratio targets above mandated 50 percent levels and force service boards to increase farebox contribution through fare increases, cost reductions, efficiency gains, or combinations thereof (also an unpopular and potentially counterproductive option for the long run).
- Selectively expand into high growth and potentially strong ridership and revenue areas:
  - Invest in technologies or services that reduce operating costs or increase revenues, or both, and capture these savings for use in financing these and other investments (conceptually a good solution but with few opportunities to implement and return a profit) and
  - Develop and expand premium priced services for selected markets (e.g., express buses and express trains) to create surplus potential.

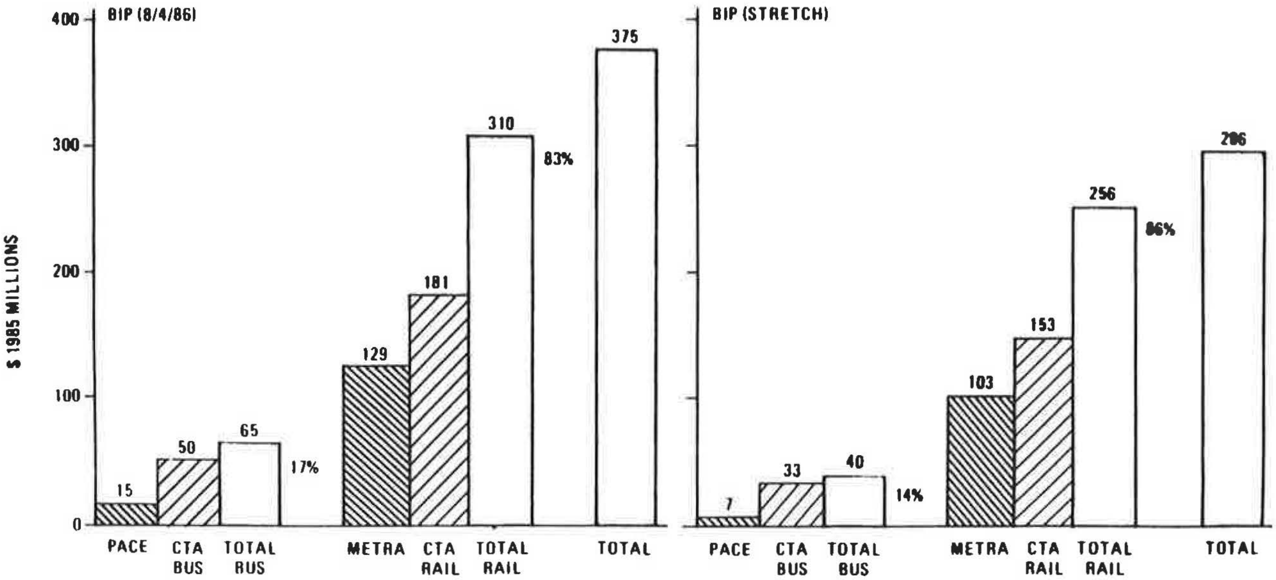


FIGURE 5 RTA Bedrock Investment Program average annual spending level. (System includes Southwest Rapid Transit Line and Howard Dan Ryan connection.)

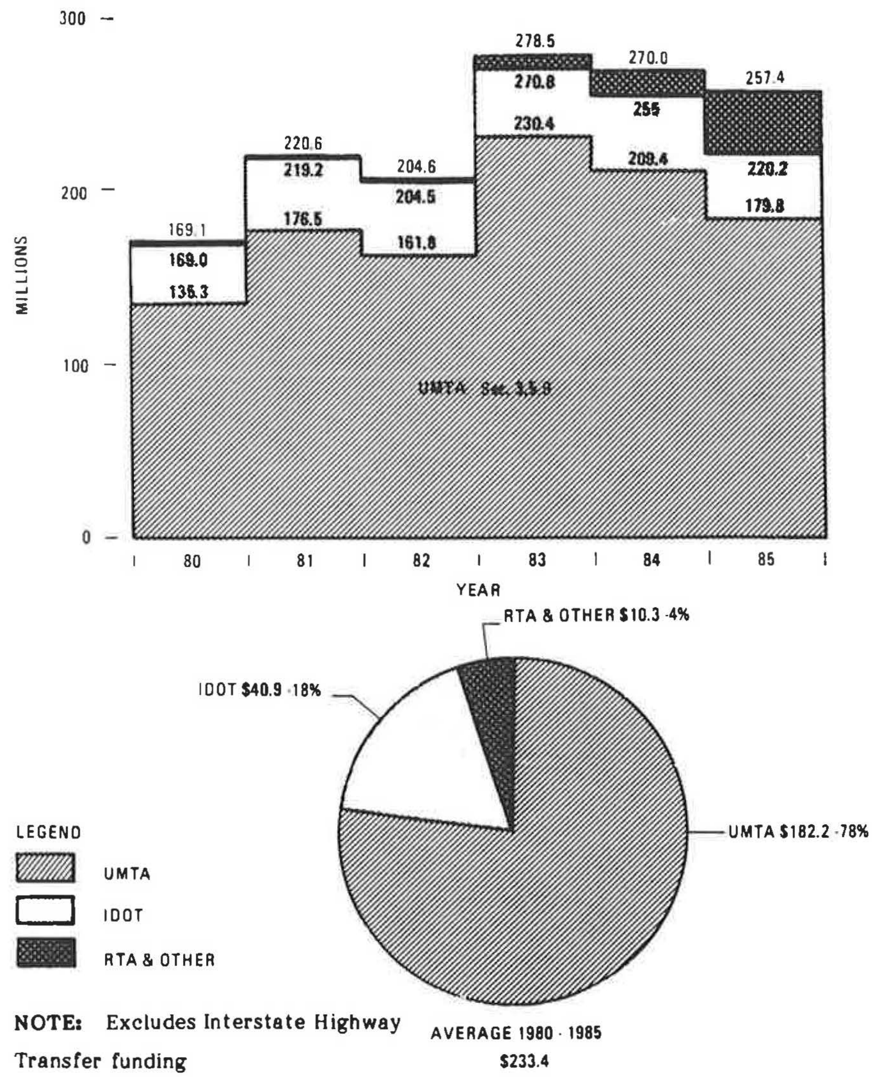


FIGURE 6 Sources of capital funds, 1980 through 1985, excluding Interstate transfer funding.

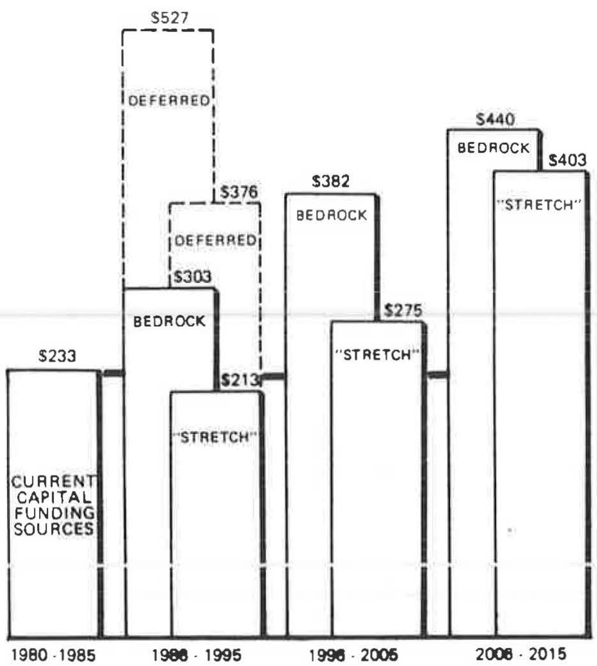


FIGURE 7 Annual capital requirements by decade—BIP plan compared with SBIP plan, in millions of 1985 dollars.

Clearly a wide range of policy and operating alternatives is available to the RTA and service boards, all with some inherent "down side" trade-offs for implementation from users or regional development perspectives. Development of an overall strategy for the RTA including capital investment priorities is based on a perspective of transit markets, operating strategies, and the economics of service provision.

BASIC CRITERIA FOR CAPITAL INVESTMENT ANALYSIS

Traditional measures of capital investment potential such as return on investment, cost benefit ratios, and net present value are and continue to be valid techniques in measuring investment alternatives. These techniques work well only where monetary gains (e.g., fare revenue increases associated with increased ridership or reduced realized operating cost savings) exceed monetary investment costs. Public benefit measures (e.g., consumer surplus, travel time savings, etc.) are useful as effectiveness measures but introduce other difficulties. In the case of an aging infrastructure approaching the end of its "useful life," the tendency has been to replace assets as they become due based on simplified life-cycle cost criteria or on an assessment of relative conditions. This is particularly convenient as a capital programming approach, if there is adequate capital funding available and regional agreement can be reached on the allocation of funds to transit operators. Availability of capital investment funds is becoming increasingly scarce for the RTA, and decision criteria for capital investments by the service boards have, in the past, been driven as much by board policies and preferences as by consistently applied analysis techniques. In any event, but particularly in the case of scarce capital resources, a reasonable approach to developing investment priorities is required. But how are these priorities developed in recognition of the policy making perspectives of the Regional Transit Authority and three service boards?

There is, of course, no panacea for this problem. But it is clear that ridership levels (measured as passengers and passenger miles) and potential must be a major driving factor in prioritizing investment funds. Simply stated, all benefits, direct and indirect, will not accrue unless the investments are used and ridership is substantial. Benefits are, therefore, directly linked to ridership. Thus at least even simplified measures of return on investment such as measures of passengers (or passenger miles) carried per dollar invested need to be developed for major elements of the transit network as a major guide to policy decision making.

Recognition of the opportunities to save operating costs through investment in new technology or equipment must also be recognized. In this case more standard return on investment criteria can be developed.

The development of an overall strategy for the RTA (including basic capital investment focus) evolved through the analysis of the current environment and the examination of alternative futures. The overall recommended strategy for the RTA's consideration can be summarized in a few words:

- Continue prudent fiscal controls on operating expense growth while serving current markets better and probing emerging markets;
- In the short term, capital investments must be used to do the important things well and not everything to a mediocre level; and
- In the long term, forge a regional partnership that can find the resources to rejuvenate and expand a transit infrastructure that can spur growth and economic development.

The major strategic thrusts include

- Market priority—focus of operations plans and improvements;
- Cornerstone protection—specification of a capital program designed to invest in the most important elements of the RTA system both now and for the future;
- New initiatives—exploration of new service concepts at one end of the spectrum to investments in improved productivity and performance in rail operations at the other;
- Technology investments—infusion of new technology in terms of equipment (e.g., fare collection), techniques (maintenance procedures and equipment), and most cost-effective modal alternatives;
- Operating cost containment—establishment of a cost containment philosophy to support both capital program costs and, even more importantly, protect the ridership base and good will of the RTA constituency;
- New funding sources—financing of the cornerstone and new initiatives; and
- Capital programs—using a stable, consistent, reliable, and inflation-sensitive funding base.

One of the principal dangers of implementing capital investment strategies is the undue and overriding concern over the sources and uses of funds. At the two extremes of investment thought are

- Investments should be made in an "equitable" manner and should benefit the citizens who contribute the funds (i.e., the jurisdiction from which tax receipts are generated).

- Investments should be made that are "optimal" regardless of funding source (i.e., that maximize ridership regardless of location).

Inability by the region's decision makers to reconcile these perspectives and strike a reasonable balance can create irrevocable harm to the region.

Another key factor in capital programming development is the recognition of agency capacity to convert capital dollars into capital improvements in an expeditious and efficient manner. It is increasingly clear that major capital programs suffer as much from implementation capability as do funding levels. Improvement in delivery capability must improve or funding will either not be forthcoming ("why should we give it to you, if you can't spend it well") or, worse yet, the money that is available will not be used to maximum advantage. At least one nontraditional capital programming criterion will inevitably be the ability to deliver quality capital projects. Besides costs and benefits (using ridership or other public welfare criteria), delivery capability is likely to become a pragmatic parameter for allocating funds.

CONCLUSION

The capital investment decision making process has been discussed in the framework of strategic planning. The definition of capital funding requirements using a replacement cost and capitalized rehabilitation model has been presented along with a contrast to available and forecast capital funding. The estimate of capital funding shortfall has been an important factor shaping agency priorities in terms of market focus and operating strategies. The need for prioritization of investments using existing and future ridership estimates as an important factor has also been discussed. The capital investment process housed in an overall strategic planning framework is increasingly being recognized as a private sector technique that, when appropriately adapted to the public policy arena, provides guidance and perspective in defining the future path for the transit agency.

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