A Survey of Budget Elements Relating to Cost and Performance Standards

Table of Contents

A Survey of Budget Elements Relating to Cost and Performance Standards

SUMMARY

A comparative review of seven public transit operators' cost and performance statistics based on the latest available data published by the American Public Transit Association indicates that the RTD compares favorably with other operations around the country.

Further analysis of budgetary considerations suggests that, while the District is an efficiently running operation, possible significant economies may be possible by improving certain control procedures and practices.

This report recommends two areas of close analysis for the near future: 1) the determination of optimum overtime for operators and maintenance personnel, to serve as a standard for work scheduling, and 2) an evaluation of the bus and operator scheduling and run-cutting processes. A third recommendation suggests several general study items for the next year, such as the establishment of performance frequencies for various maintenance tasks and the establishment of programs to perform these tasks, and the standardization of operating division clerical procedures to insure maximal use of available manpower at minimum cost.

While it cannot be said with assurance that the analysis of these issues may result in the identification of areas of considerable savings, the absence of precise data suggests that opportunities for economies in these areas exist.

INTRODUCTION

The District is nearing the end of a five-year period of sustained rapid service expansion and increases in personnel staffing levels. This growth has allowed the RTD, in addition to increasing service, to perform support activities which are necessary to the efficient long-range operation of the District.

The purpose of this study has been to review the general budget considerations of the District's Transportation and Maintenance Departments, to survey the key points or decisions upon which these departmental budgets are made, and to estimate or assess where a potential small efficiency or economy in a key decision-making area or process may result in a significant dollar savings.

An additional element of this review was to collect and present available comparative statistics indicating RTD cost and efficiency factors in relation to other bus operators. These statistics are presented in Appendices A and B. Appendix C presents a brief summation of RTD efficiency factors from fiscal year 1971-1972 to projections for 1976-1977.

In general terms, RTD budget decisions all grow from a policy determination by the Board of Directors of what levels of service the District will offer, on how many miles of route at what frequency, over what hours of service, will what lines be served. From this, the Operations and Planning Departments estimate the vehicles required to provide the desired level of service. This decision is based upon estimates of operating line speed, layover time, vehicle reserves needed, labor contract requirements, and so on. From these decisions, in turn, come further budgeting estimates of bus operators needed, total miles operated, mechanics and utility workers required, overtime, and total operating costs.

In other words, a series of apparently "small" decisions has the potential for major dollar costs or savings.

In assessing the possibility of these types of potential savings, several general questions are pertinent.

1. What kinds of performance and efficiency measures are presently being used to evaluate and predict manpower and equipment requirements?

2. What procedures and work schedules are followed in obtaining these performance and efficiency measures?

3. What efficiency measures would provide the most complete picture of what kind of a job the RTD is doing and where small, but significant, economies might be possible?

4. What can be done to anticipate and smooth the implementation of improved automated and computerized information processing methods in this area?

In response to the first question of performance measures in predicting manpower and equipment requirements, the following tentative generalizations have emerged in the course of this survey:

1. The rapid service expansion and accompanying "fine tuning" has precluded a detailed, line-by-line assessment of maximum line speed or optimal allocations of buses.

2. Determinations of economically optimal manpower levels are primarily based on professional or historical RTD experience rather than on a verified and updated formula of optimally cost-effective overtime hours.

Regarding the second question of the means of obtaining these performance measures, the following tentative generalization has emerged:

It appears that systematic review mechanisms for assessing all aspects or impacts of manpower or scheduling decisions are not being followed.

In respect to the third question of what measures would illustrate RTD performance and economies, the following efficiency measurements may be useful in assessing the RTD's performance and in suggesting areas of potential economies:

1. economically optimal, hourly work-week

2. actual hourly work-week

3. optimal operators per bus

4. actual operators per bus

5. optimal line speed for each line

6. maximum buses optimally required (at present service levels)

7. equipment "downtime" standards

8. mechanic and utility workers per bus

9. maintenance task frequencies and calendar for task performance

10. maintenance task performance standards

11. operating cost per bus hour

12. scheduled vs. non-scheduled overtime

13. by division comparison of extra-board operations

14. standardization of clerical procedures

The identification of performance and cost factors such as those listed above could provide the following tools for improved management:

1. a basis for periodic monitoring and for establishing operating goals,

2. cost consciousness at all levels,

3. a basis for analysis of trade-offs to achieve an optimal balance of cost and service, and

4. a means for management by exception.

In response to the fourth question of smoothing implementation of data processing systems, these improved management tools, although manually developed at first, would assist managers in recognizing the value of later computerized data processing systems in providing quality and economic-related data for the best management of resources.

RECOMMENDATIONS: DISCUSSION

To begin to address the questions raised above, three recommendations follow. Two recommendations suggest specific areas for further study which are critical pivot points for major decisions and commitments of resources. The third recommendation outlines other areas where a detailed review of District procedures might assist in the preparation of future budgets, operating and performance standards and improved overall efficiency.

1. Optimum Overtime for Operators and Maintenance Personnel

In budgeting from year to year, the cost of operator and maintenance personnel wages, a certain portion is allotted for the premium time of overtime. For fiscal year 1977, an average of 46 working hours or 49 pay hours is being used to project operator wages expenses, based on historical practice. Similarly, mechanics are estimated to work a 42-1/2 hour work week or to be paid 44 hours. Operators' workruns are compiled with built-in overtime frequently being part of regularly scheduled work assignments, and maintenance expenditures reflect a relatively constant level of overtime from month to month. However, no guidelines currently exist defining the optimum level of overtime hours an employee could work before the cost of overtime exceeds the cost of hiring additional personnel.

This is, it should be noted, a very complex problem with the other possible major impacts: the easy availability of overtime to operators may tend to increase the frequency of one-day sicks and may, as a consequence, result in a larger manpower reserve or extra-board requirement for each operating division than otherwise necessary. The large amount of overtime work also makes personnel more susceptible to accidents.

> It is recommended that an analysis be performed to determine the economically optimum level of overtime for operators and maintenance personnel where the premium portion of overtime does not exceed the cost of fringe benefits of additional employees.
>
> The analysis of this question was not performed as a part of this study because of its complexity. Such an analysis would require the isolation of each fringe benefit and the determination of its cost for each additional hour after an eight-hour day. The summation of the costs would then have to be compared to the cost of overtime hours for various job levels.

With this information, the Scheduling Department could analyze current runs to determine those that may be beyond the range of cost-effectiveness. The Maintenance Department could use this information as a factor in determining the need to hire additional personnel when the cost of overtime may continually remain high in a particular division.

2. The Scheduling Processing

In considering various performance factors that could be developed for manpower and equipment, it became evident that the scheduling process dictates the need for operators, the length of an operator's day, the assignment of operators and operating line speed. These factors directly come into question in determining whether the RTD is providing the maximum amount of service with the minimum amount of cost.

It is recommended that a thorough analysis and evaluation be performed on the process of schedule building, seeking to identify the central factors guiding determinations of running time, layover time, headways, run-cutting, and other factors which may govern the allocation of manpower and equipment.

The product of this analysis should be to outline the general parameters and cost/benefits of alternative scheduling decisions for review by management.

Particular areas of concern are:

1) Is the scheduling of layover time in accordance with contract guidelines, limited strictly to only that time required by the union contract?

2) Are such other overhead time factors such as sign-on and sign-off time, deadhead time, penalty time or premium time major concerns in building a schedule?

3) What efforts are made to determine optimum line speed or passengers per mile for each line, maximizing the use of each bus on a line?

4) Could equipment use be further maximized such as through rotating operators at layover points to keep equipment continually in service?

5) Could the number of operators assigned to the extra-board be reduced? Can non-biddable trippers be made into more economical runs?

6) What procedures or programs are followed or would be beneficial in assessing bus schedules and productivity on an on-going basis?

7) How closely can operators' runs be scheduled to coincide with an economically optimal operator work-week?

The problem of maximum line running speed is a complex one. The greatest number of buses are required during peak-hours when running times are slowest, and yet, probably closest to optimal. This suggests that a significant increase in non-peak line speed resulting in a lower non-peak equipment requirement would still not reduce the District's peak hour or total vehicle needs.

Because of the various stipulations in the union contract regarding bus operator pay for "split time" exceeding two hours and so on, it seems possible that an increase in non-peak line speed resulting in a lower vehicle requirement would not immediately or necessarily bring about a one-to-one reduction in the cost of operator pay time. It would, perhaps, result in lower mileage requirements and faster service to RTD patrons. Presumably some cost reductions through decreased maintenance needs and through some reduction in bus operator overtime would be possible, nevertheless.

Despite these problems, it may be that worthwhile peak-hour cost reductions can be achieved through a detailed assessment of scheduling factors as they affect vehicle requirements. This is probably especially true of that peak-hour service which operates totally or largely in areas of lower population and lower ridership density.

3. General Study Items

In addition, other areas of question could be viewed as study items for the next fiscal year.

1) Development of manpower levels in maintenance such as mechanics per bus, and cost performance standards for each major maintenance task, such

as a particular type of engine overhaul costing $250 including parts, and requiring thirty man-hours. These standards could be used to project workload and to assess individual employee and division performance.

2) Establishment of "downtime" standards for various maintenance operations and subsequent analysis of such standards to determine if, through improved performance of tasks or service equipment, this time could be reduced.

3) Analysis and evaluation of extra-board mark-up procedures to ensure board mark-up is uniformly performed in the most cost effective manner.

4) Investigation of the cost of bus operator one-day sickness in terms of increased extra-board manpower requirements and in relationship to the availability of overtime and operators who have gone sick.

5) What use is made of line summaries and line profiles in adjusting line running time and in the identification of potential service-intense trunk lines or short lines?

6) What performance or task standards are used in estimating optimal personnel levels in schedule checking?

7) How can schedule and ridership check information be most efficiently utilized?

8) What steps can be taken to insure maximum accuracy of cost accounting information obtained from the Maintenance Department? What are the principal difficulties in obtaining this data accurately and how can they be minimized?

RECOMMENDATIONS: SUMMARY

The following list represents a summary of recommendations made in the previous section.

It is recommended that:

1) An analysis be performed to determine the economically optimum level of overtime for operators and maintenance personnel where the premium portion of overtime does not exceed the cost of fringe benefits.

2) An analysis and evaluation be performed of the process of schedule building, seeking to identify the central factors guiding determinations that may govern the allocation of manpower and equipment.

3) The following items be studied in the next fiscal year:

   a) development of manpower levels and cost performance standards in maintenance,

   b) establishment of "downtime" standards,

   c) analysis of extra-board mark-up procedures,

   d) investigation of cost of one-day sickness to bus operators,

   e) analysis of the use of line summaries and line profiles,

   f) analysis of performance standards for schedule checking,

   g) analysis of content and use of schedule and ridership check information, and

   h) analysis of information source of data from Maintenance department.

CONCLUSIONS

The recommendations contained in this report are the result of a survey of present operating cost and performance conditions. The intent of these recommendations is to enhance the efficiency and effectiveness of RTD services by developing internal operational standards. These standards are viewed as a means of self-evaluation which could assist operational managers at all levels in augmenting the capabilities of their departments.

Appendix A
Selected Efficiency Factors
Comparison With Other Bus Operators
1974

	Pass. per Bus Mi.	Pass. Per Bus Hour	Bus. Mi. Per Bus Hour	Avg. Mi. Per Driver	Drivers Per Bus	% of Fleet Op. in Peak	Drivers as % of Work Force	Avg. Mi. Per Bus
RTD	3.03	38.46	13.41	22,228	1.64	88 %	66.5%	36,490
WMATA	NA	NA	NA	16,222	1.46	86.4	69.3	23,881
Detroit	NA	NA	13.11	23,381	1.38	80.1	62.2	32,038
CTA	5.64	49.33	8.81	16,154	2.04	80.2	NA	32,978
Twin Cities	2.42	30.67	12.74	21,396	1.07	73.4	70.9	23,001
Bi-State	2.79	34.16	12.64	NA	NA	81.6	NA	26,495
San Diego	2.75	38.31	13.87	23,138	1.34	53.4	71.4	31,029
AC Transit	2.54	36.45	14.45	22,194	1.51	85.9	73.6	33,505

Source: APTA "Transit Operating Costs," 1974

Appendix B
Selected Cost Factors
Comparison with Other Bus Operators
1974

	Cost per Passenger	Cost per Mile	Cost per Hour	Total Operating Cost
RTD	$ .45	$1.37	$ 17.43	$ 92,845,000
WMATA	NA	1.66	NA	82,270,534
Detroit	NA	1.77	22.92	58,087,896
CTA	.36	2.07	18.13	182,738,690
Twin Cities	.47	1.15	14.55	26,818,200
Bi-State (St. Louis)	.50	1.37	16.90	31,607,681
San Diego	.48	1.31	18.34	14,159,008
AC Transit	.49	1.24	17.84	34,378,264

Source: APTA "Transit Operating Costs," 1974

	Total Miles	Total Passengers	Pax. Per Bus Mi.	Bus. Mi. Per Bus Hour	Avg.Mi. Per Driver	Drivers Per Bus	Total Operating Expense $	Cost Per Mile
1971-72	58,808,363	193,000,000	3.27	11.80	23,394	1.62	36,151,074	$ 1.06
1972-73	61,268,437	185,000,000	3.03	12.80	23,950	1.64	81,615,206	1.21
1973-74	66,906,768	195,000,000	3.03	13.40	21,731	1.64	90,611,799	1.31
1974-75*	68,873,640	200,000,000	3.00	14.00	18,904	1.70	113,200,793	1.37
1975-76	100,000,000	230,000,000	2.30	14.58	22,471	1.80	163,000,000	1.63
projection 1976-77	108,000,000	230,000,000	2.13	13.54	24,128	1.90	188,295,000	1.74

*Totals affected by 68-day strike.

Source: RTD Revenue and Expense Accounts
RTD Annual Reports

Appendix C
Selected RTD Efficiency Factors
1971-1976