

3/85

S.T.P.

APR 11 1985

=====
PHASE II REPORT ON RECOMMENDATIONS FOR AN IMPROVED
BUS OPERATOR PLANNING SYSTEM FOR THE
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
=====

Prepared for:

Southern California Rapid Transit District

Prepared by:

Schimpeler Corradino Associates
in association with

Curry Associates
The Cordoba Corporation
Myra L. Frank and Associates
Reynaud A. Moore and Associates

March, 1985

SCRID
1985
.B662

1.0 INTRODUCTION

In October 1984, the Southern California Rapid Transit District (SCRTD) engaged a consultant team headed by Schimpeler Corradino Associates to develop an efficient bus operator planning system that encompasses the hiring of new trainees, scheduling of bus assignments per operating division, and bus operator staffing needs. The project is one of five being funded under the Transit Operator Performance Improvement Fund (TOPIF) for the Rapid Transit District (RTD). TOPIF was established by the Los Angeles County Transportation Commission (LACTC) to implement selected recommendations of the recently completed SB 759 performance audit of County transit operators that included the District. More specifically, the project has been designed in accordance with the following "Problem Statement" taken from the District's FY 1985-1989 Five Year Short-Range Transit Plan.

In pursuit of the goal of maximum efficiency, a system of integrated planning must be established at the front end of the manpower acquisition process which will enable the District to respond effectively and in a timely manner to service fluctuations - particularly those which take place after the planning and budgetary processes for a given fiscal year have been completed. A structural program is needed in which sufficient account is taken of budgetary, training, and staffing levels, throughout the process of planning and scheduling changes in service levels, locations, or times.

From audit findings and District analysis of these findings, it is suggested that an improved methodology for bus operator manpower monitoring and planning could result in annual cost savings of \$1.25 million. This represents nearly one percent of the FY 1985 budgeted operating expenses for the Transportation Operating Divisions Department.

1.1 OVERVIEW OF OPERATOR PLANNING AND ALLOCATION

The operator planning and allocation process is a complex one, particularly for a transit system as large as the SCRTD. Importantly, the results of this process can significantly impact both the cost and quality of services provided. If operator requirements are not anticipated in an effective manner resulting in a shortage of operators, the results may be:

- o higher costs due to increased operator overtime;
- o increased absenteeism related to the availability of additional overtime work; and
- o reduced service reliability from missed pullouts and trips.

On the other hand, a surplus of operators may ensure that absenteeism levels are controlled and that service reliability is maximized but may also result in higher costs due to increased operator guarantee time and fringe benefit costs.

At the RTD, operator planning is currently a responsibility of the Transportation General unit of the RTD's Transportation Department (see Figure 1-1). While carrying out this responsibility involves a variety of activities, it is useful to initially distinguish between two functions that make up the operator planning process.

- o Anticipating and planning for operator requirements resulting from service and schedule changes.
- o Maintaining manpower levels for established schedules.

Figure 1-2 illustrates the relationship of these functions to operational and administrative activities that make up the operator planning process at the District.

For Transportation General, each of these functions must be approached in a completely different manner. The maintenance function is carried out primarily within the Transportation Department. Interfaces exist with the Personnel Department for the initiation of personnel actions based on operator attrition and with the Scheduling Department for schedule and work run adjustments that may be required for improved operations. On the other hand, the planning function involves coordination with other departments that are engaged in the service planning and implementation process with little direct work required within the Transportation Department. Figure 1-3 provides a comparison of departmental responsibilities for each of these on-going activities related to operator planning and allocation that clearly illustrates the Transportation Department's different roles.

Operator planning also encompasses a third function which is of particular importance. This function relates to establishing or setting manpower levels which are "optimal" with respect to adopted cost control and service reliability objectives. Each of these three functions is interrelated with the others, but planning and maintenance functions are concerned with on-going activities that take into account the determination and monitoring of optimal staffing levels. For the District, this report reviews each of these three components of the operator manpower planning process.

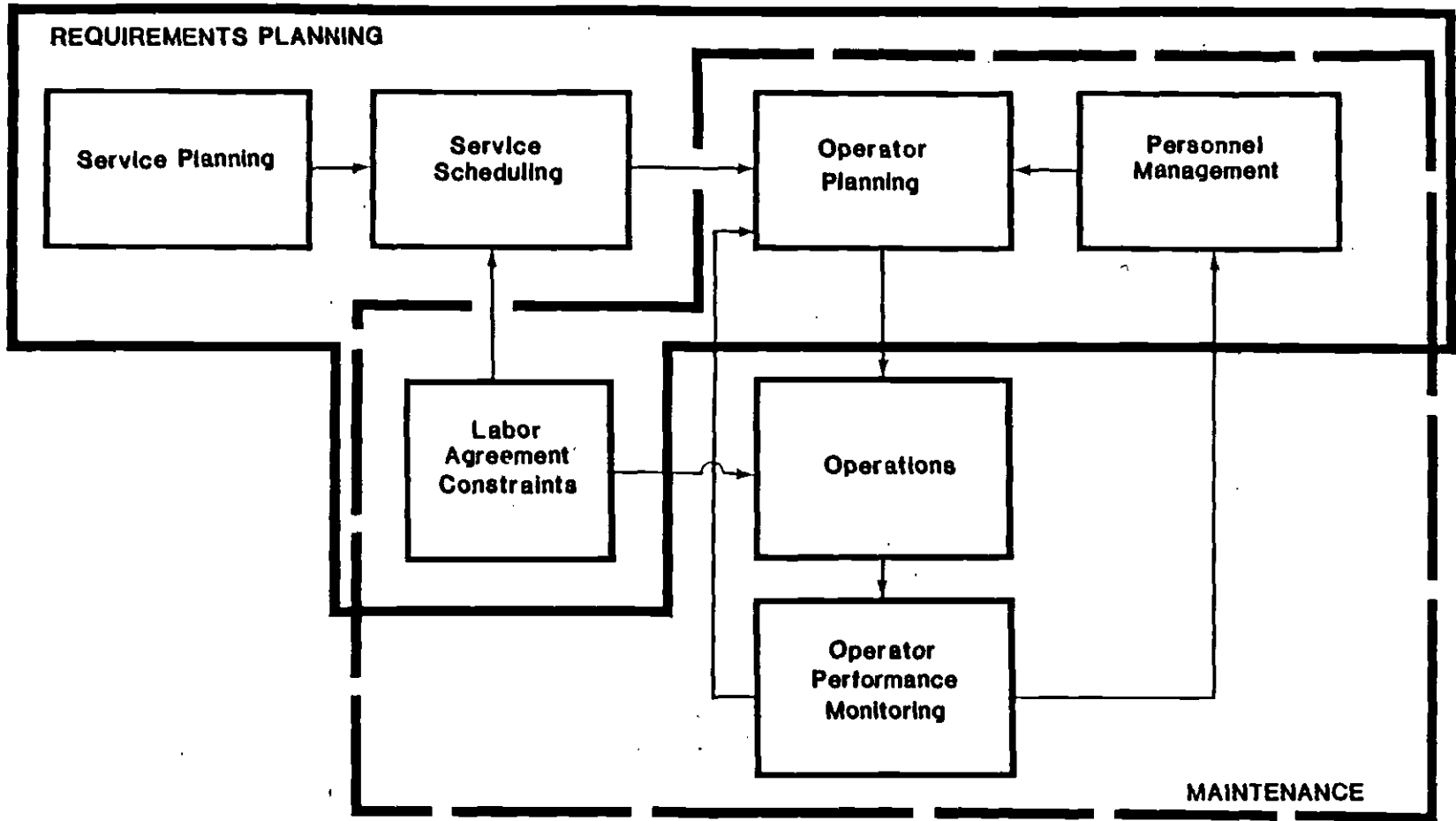
1.2 OPERATOR REQUIREMENTS AT THE DISTRICT

In October 1984, the District employed approximately 4,500 full-time operators and 650 part-time operators. Expressed as full-time equivalent (FTE) operators, this amounts to a total of 4,825 operators. Total operator requirements may be broken down as the following.

- o Sixty percent for scheduled five-day work runs which are usually bid and operated by operators for an extended time period.
- o Seventeen percent for scheduled service which has not been combined into work runs. Typically, this includes pieces of work in the a.m. or p.m. peak periods that are 1-5 hours in length and are referred to as "trippers." This also included "extra service" scheduled on temporary change notices or "pink letters."

Figure 1-1

RTD Organization Chart for
Transportation and Related Departments



46964296

4

Figure 1-2
 RELATIONSHIP OF OPERATOR REQUIREMENTS
 PLANNING AND MAINTENANCE FUNCTIONS

Figure 1-3

BUS OPERATOR PLANNING FUNCTIONS

<u>Department</u>	<u>Requirements Planning</u>	<u>Maintenance</u>
Service Planning	●	
Scheduling	●	●
Management and Budget	●	●
Transportation		
General	●	●
Operating Divisions		●
Instruction		●
Personnel	●	●

- o Twenty-three percent to protect for operators being absent and not available for driving work.

1.2.1 Scheduled Work Runs

Weekly work runs are developed by the Scheduling Department for bidding by operators. These work runs are built by combining weekday, Saturday, and Sunday work assignments into five-day work packages that provide for two consecutive days off. If it were assumed that no operator absence occurs and all service is scheduled into five-day work runs, operator manpower requirements would equal the number of scheduled five-day work runs. However, operators are absent for various reasons and not all service is scheduled into five-day work runs. Only about 60 percent of the required number of operators is based on the number of scheduled work assignments.

Daily work runs are built by the Scheduling Department in conformance with established work rules and practices which govern both the type of runs being constructed and the cost of these runs. Most of these rules and practices are specified in the District's contract with the United Transportation Union (UTU) which represents the District's operators. The cost of work runs is of particular importance, and the "least cost" set of runs should account for the following.

- o Operator pay costs for all scheduled work runs including pay allowances and premiums.
- o Operator pay costs for scheduled service which is not combined into regular work runs, but which is assigned daily to operators or worked by part-time operators.
- o Indirect operator fringe benefit costs.
- o Other direct and indirect costs resulting from the operation of scheduled services.

At the SCRTD, the average pay hours for a daily work run is approximately eight hours, 40 minutes. Whether or not this average number of pay hours represents the least cost sizing for work runs is a complex problem that involves consideration of the interaction of diverse work rules and of the characteristics of service provided. Many of the optimization strategies which are available, including those considered in this report, address only part of this problem due to its complexity.

1.2.2 Scheduled Trippers

Not all scheduled service may be combined or broken up to form operator work runs. This may be due to limitations for the building of work runs or designed to obtain lower operating costs. Approximately 17 percent of the District's operator requirements are related to the operation of scheduled service in this manner, primarily for trippers in the a.m. and p.m. peak periods which may be operated in one of the following ways.

1. Trippers that contain between two and one-half and five hours of work time may be assigned to part-time operators, subject to the District's

limitation than the number of part-time operators does not exceed fifteen percent of the number of full-time operators.

2. Trippers with less than three hours of work time may be designated as being "biddable." An operator may select a biddable tripper together with a regular work run provided that the total work time does not exceed 10 hours, 40 minutes. A minimum of two hours of pay time is guaranteed for working a biddable tripper.
3. Non-biddable trippers not designated for part-time operators and "open" biddable trippers are "marked up" individually, paired, or combined with other available work runs for daily assignment to extra board operators or operators working on overtime.

Presently, the District operates approximately 1,800 scheduled trippers of which 650 are assigned for bidding by part-time operators, 500 are biddable for full-time operators, and 650 are non-biddable trippers marked up daily for extra board operators.

An example that involves the scheduling and operation of two trippers illustrates how the costs of this type of service can vary. It also illustrates where cost advantages exist for the District. Consider two pieces of scheduled work (or "bus runs") in the a.m. and p.m. peak periods with the following characteristics.

1. Pulls out at 7:25 a.m. and back in at 10:38 a.m., resulting in 3:13 vehicle or platform hours. Adding ten minutes as the report allowance and five minutes as the turn-in allowance results in work time of three hours, 28 minutes.
2. Pulls out at 2:45 p.m. and back in at 6:21 p.m., resulting in 3:36 vehicle hours and 3:51 in work time.

These two pieces of work might be operated in four ways at the District.

1. Scheduled as a a split run to be bid and worked by a full-time operator.
2. Scheduled as trippers and then marked up as a combination to an extra board operator.
3. Scheduled as trippers and then assigned for part-time operators.
4. Scheduled as trippers but assigned individually to extra board operators in conjunction with a "report" or protection assignment. This type of daily assignment is referred to as a tripper/report combination.

Table 1-1 summarizes the costs of scheduling and operating the pair of trippers in each of the four ways. From this comparison, the following conclusions may be drawn.

- o Cost comparisons vary significantly depending on whether costs are based on scheduled pay hours or pay hours as dispatched, and whether

TABLE 1-1

PAY HOURS COMPARISON EXAMPLE FOR
OPERATING TRIPPER

	Vehicle Hours	Work Hours	Guarantee Hours	Overtime Premium	Pay Hours	Pay Hours/Vehicle Hours Ratio		
						Scheduled	Operated	Including Fringe Costs
Split Run	6:49	9:11	1:52	0:36	9:47	1.43	1.43	1.97
Tripper Combination	6:49	8:11	0:52	0:06	8:17	1.07	1.22	1.90
Part-time Trippers	6:49	7:19	0	0	7:19	1.07	1.07	1.13
Tripper/Report Combinations	6:49	16:00	8:41	0	16:00	2.34	2.34	2.88

fringe costs are included.

- o The use of part-time operators to the maximum extent permitted is the least costly approach for the District. Part-time operators receive limited fringe benefits, and are not subject to costly guarantee and premium pay provisions which may result when trippers are worked by full-time operators. Additionally, trippers assigned for part-time operators will be worked by the same operator each day which may contribute to increased service reliability.
- o It is less costly for the District to operate most a.m. and p.m. trippers as combinations than as split runs. As a result, the District schedules a large number of non-biddable trippers to be worked in this manner. This cost advantage is directly due to operator spread time provisions that call for an extra board operator to be guaranteed eight hours within a spread of eleven hours (with hours worked in excess of 11 hours paid at overtime rates) while regular operators are paid based on a spread time limitation of ten hours.
- o Operating the trippers as tripper/report combinations is the most costly approach. Trippers may be marked up and operated in this way when there is a surplus or shortage of operators. When there is an operator surplus, this is usually done to avoid reporting that no work was available for an operator (referred to as a "shineout"). When there is an operator shortage, this may be done as a means of providing additional report operators.
- o The example did not include trippers that might be designated as biddable for full-time operators. For most short trippers, the least costly approach will be to operate them as biddable trippers. While this involves overtime premium costs, costs related to the daily guarantee of eight pay hours and operator fringe benefit costs are avoided.

1.2.3 Protection for Operator Absences

Operators may be unavailable for work for a number of reasons governed by provisions of the UTU labor agreement. Additional operators must be retained to cover work assignments that are "open" because of operators being absent. At the District, approximately 23 percent of operator staffing requirements are for this purpose.

Operators may be absent or unavailable for work for a number of reasons that include:

- o vacation time which may be scheduled annually;
- o sick leave for operator illness;
- o other leave time provided for in the UTU labor agreement;
- o discretionary leave requested by operators;

- o assignment of operators to other positions (dispatching, supervision, radio dispatching, instruction, and traffic checking); and
- o disciplinary leave required by District Management.

In calendar year 1983, full-time operators at the District averaged over 55 days absent or not available for driving work. This total of lost time does not include regularly scheduled days off or time off for District holidays. A breakdown of 1983 days not available for driving work for full-time operators is presented in Table 1-2. Note that absences for sickness and missouts have increased in comparison with 1981 and 1982 data presented in the LACTC performance audit report.

For operator planning, absenteeism is particularly problematic due to daily variations in the number of operators absent or not available for work. In some cases, these absences may be known in advance so that appropriate action may be taken such as an extra board shakeup to change days off, "selling" open trippers, or calling in operators for days off work. For other absences, report operators are assigned when it is determined that an operator will not be working. Figure 1-4 illustrates the weekday variations in the number of open runs due to unscheduled operator absence for a District operating division. From this illustration, it may be noted that the number of open runs ranged from 41 to a maximum of 84 with an average of approximately 61 runs per weekday. For manpower planning, it is not immediately clear at what level operator staffing should be established -- at the average, at the level equal to the lowest number of open runs, or at the level equal to the highest number of open runs?

If the operator staffing level for protecting against open runs were set at 41 (or nearly so), open runs in excess of this number would be worked by operators on overtime. Otherwise, these runs would be cancelled. If worked on overtime, this will be done primarily by utilizing operators on their scheduled days off. Days off work may be done on either a voluntary basis (VCB) or be required by the District (OCB). With increased levels of operator staffing, the District would be required to pay guarantee time to extra board operators for whom no work is available. In a later chapter of this report, this question of determining operator requirements to protect against operator absences will be examined further. Since this represents 23 percent of the District's operator staffing and is a portion of total requirements where a variety of optimization techniques and management strategies may be applied, it represents an area where special attention is deserved.

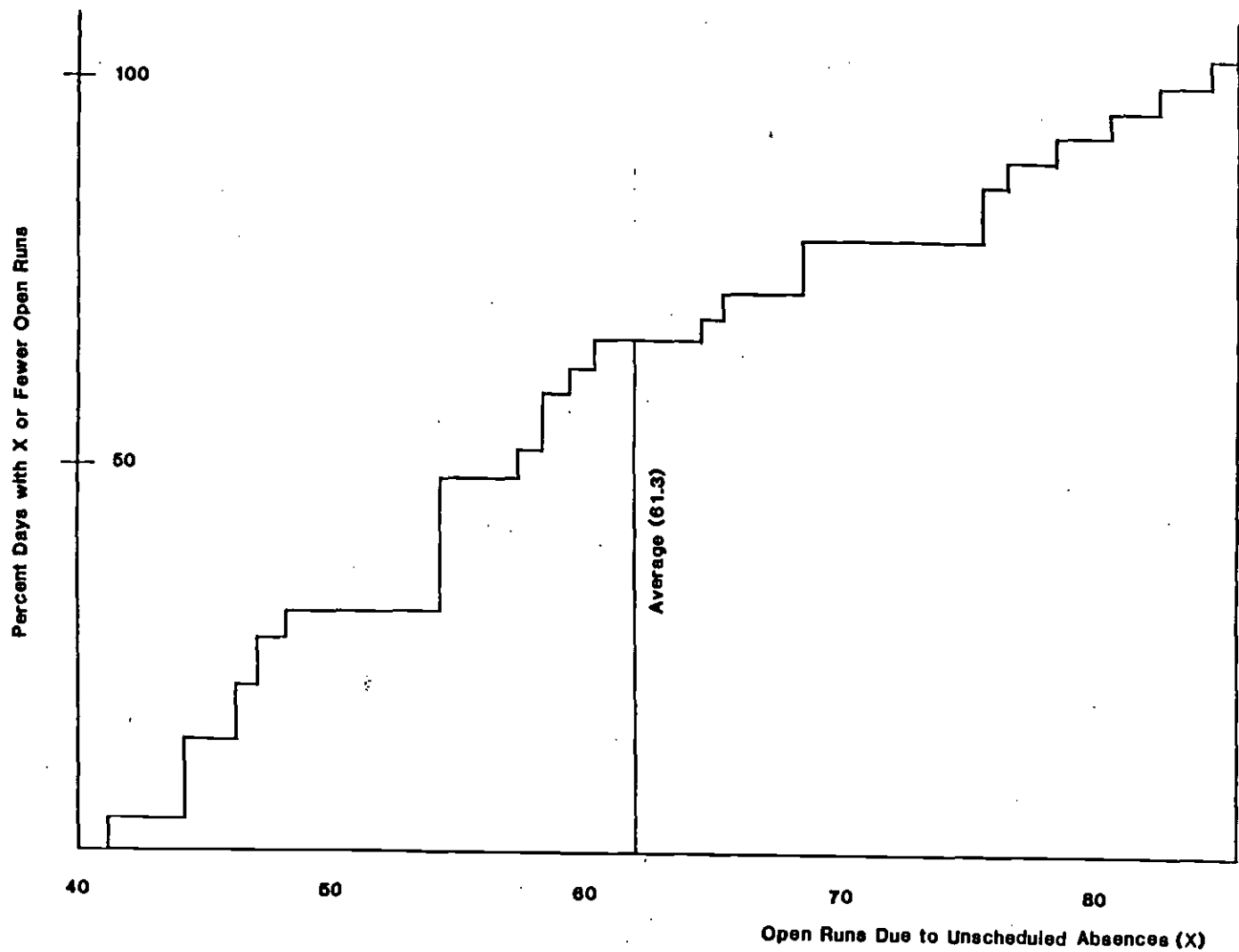
TABLE 1-2

FULL-TIME OPERATOR DAYS ABSENT
AND NOT AVAILABLE FOR 1983

<u>Type of Lost Time</u>	<u>Number</u>	<u>Percent</u>
Sick Leave	20.0	36.1
Vacation	14.4	26.0
Military Leave	0.3	0.5
Missout	2.6	4.7
Suspended	1.4	2.5
Other Leave	2.3	4.2
Personal Holidays	4.0	7.2
Requested Off	5.9	10.7
Instruction	0.9	1.6
Other Positions	<u>3.5</u>	<u>6.3</u>
TOTAL	55.3	100.0

Figure 1 - 4

CUMULATIVE DISTRIBUTION OF OPEN RUNS DUE TO UNSCHEDULED ABSENCES



2.0 ANALYSIS AND EVALUATION OF DISTRICT OPERATOR PLANNING FUNCTIONS

This chapter provides a review of each of the operator planning functions as carried out at the District. As outlined in the introductory chapter, these functions are the following.

- o Anticipating and planning for operator requirements resulting from service and schedule changes.
- o Maintaining manpower levels for established schedules.
- o Setting operator levels which are optimal with respect to cost control and service reliability objectives.

The review has been based on interviews conducted with District management and supervisory staff in all departments involved with the operator planning process and on the analysis of historical operator utilization and attendance data.

2.1 PLANNING FOR SERVICE AND SCHEDULE CHANGES

The Transportation Department is responsible for maintaining the allocation of operators to operating divisions so that costly operator shortage and surplus conditions are avoided. If the forecasting of operator requirements for service changes is not done accurately or if unanticipated changes are introduced on short notice, higher operating costs will be incurred due to paying either added guarantee time for surplus operators or additional overtime costs under operator shortage conditions. To determine future changes in operator requirements, the Transportation Department must work closely with other departments that are more directly involved in the planning and scheduling of service changes.

There is no coordinated approach to the advance planning of operator requirements in place at the District. The current approach to operator planning may be characterized as being reactive to changing requirements and policy decisions that must often be implemented on short notice. This has resulted in higher operating costs for the District, particularly at times where major service changes are being implemented such as following the introduction of the reduced fare program in July, 1982.

2.1.1 Manpower Levels and Allocation for Divisions

In analyzing planning for service and schedule changes, it is useful to begin by examining the magnitude of changes which must be anticipated. From the introduction of the reduced fare program in July 1982 through June 1984, the total of scheduled regular runs and tripper assignments increased from 3,254 to 3,581 work assignments. This increase of 327 assignments is a ten percent increase over the July 1982 level, and represents an increased operator requirement of approximately 432 full-time equivalent (FTE) operators based on established District guidelines. Of the increase in scheduled assignments:

- o 64 were added at the June 1983 shakeup;

- o 65 were added in FY 1984; and
- o the remaining 198 were added throughout the twelve months of FY 1983 following the introduction of the reduced fare program.

In FY 1983, significant changes were required in response to the introduction of the reduced fare program. Changes of this magnitude clearly require effective operator planning mechanisms to be in place.

The changes implemented in FY 1984 were not as large as for the preceding year. In examining the changes in FY 1984 (see Figure 2-1), the number of total runs shows considerable week to week variation. This variation is due to changes in each component of total runs as follows.

- o **Scheduled Runs.** Reduced from 2,852 in July to a low level of 2,798 runs in March and April, then increased to 2,827 runs at the end of June. Changes resulting in a net increase or decrease of ten runs or more were implemented on nine weeks while smaller changes were made on fifteen weeks.
- o **Non-biddable Trippers.** Remained between 609 and 619 from July through early February (except for three weeks from December 25 through January 14), then increased to approximately 640 through late June when the number was again increased to 673. The increase was made as part of scheduling changes to better accommodate part-time operators and to reduce the number of open biddable trippers.
- o **Extra Runs.** These varied from 13 to 72 throughout the year, averaging approximately 40 per weekday (roughly one percent of total run assignments).
- o **Open Biddable Trippers.** These assignments ranged from 34 to 83 through the year, averaging nearly 60 per week. Week-to-week changes in the number reflect operators giving up and bidding for trippers for the most part, although the sharp decreases in December 1983 was due to rescheduling.

From this examination of FY 1984 work assignments data, a number of conclusions may be drawn regarding operator planning for service and schedule changes.

- o The size of schedule changes complemented in this year were not as large as for FY 1983 when service levels were increased following the introduction of the reduced fare program.
- o Changes in the number of scheduled runs were made on 25 weeks, with net changes of ten or more runs occurring on nine weeks. Note that the number of runs changed may actually be significantly greater than the net change, but that the latter number is the one of interest for operator planning purposes. Consideration of limiting changes in scheduled runs as part of an improved operator planning approach may be appropriate, particularly to support the Transportation Department's efforts to improve on-the-street supervision.

Figure 2-1

BREAKDOWN OF WEEKLY
TOTAL RUNS FOR
FY 1984

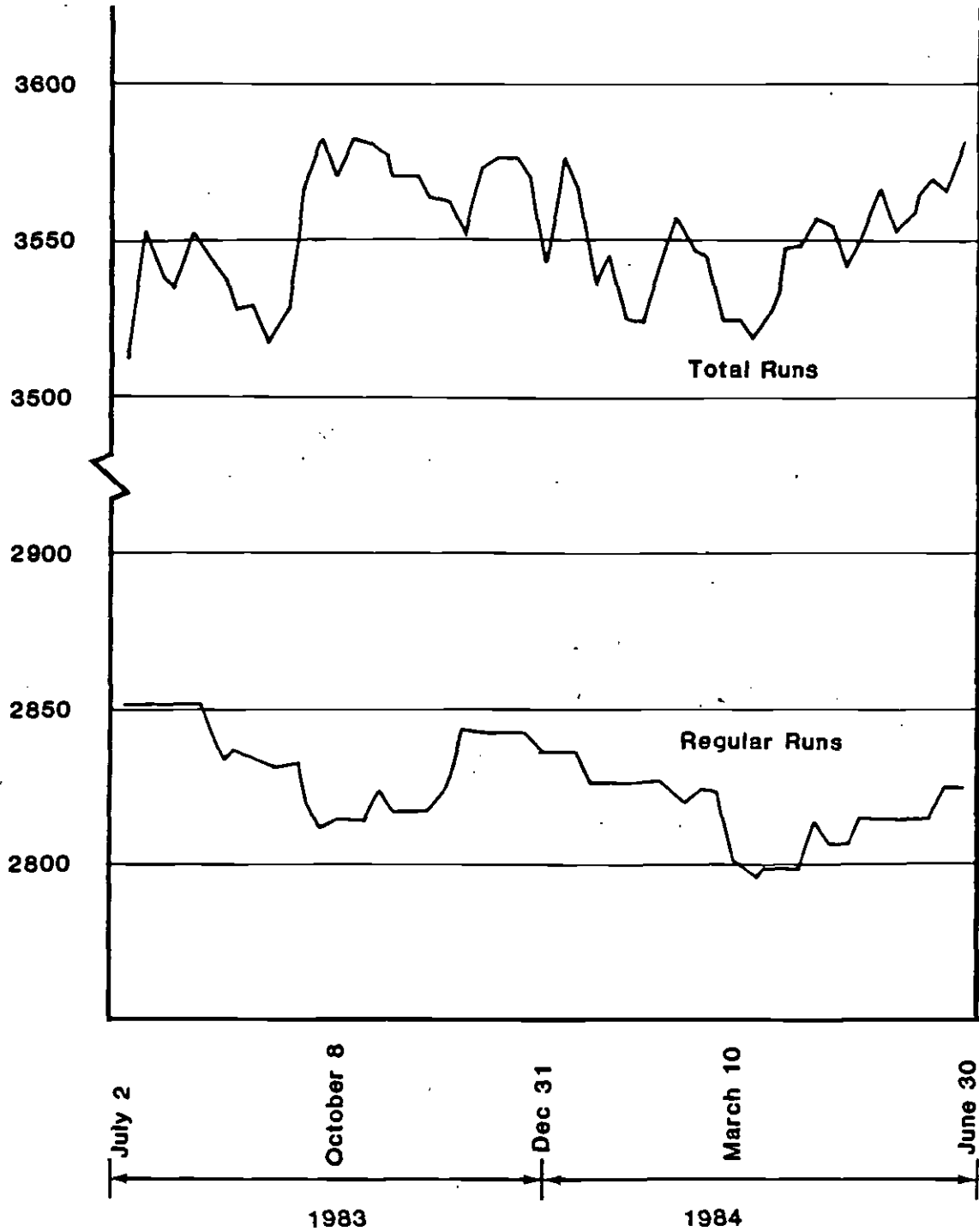
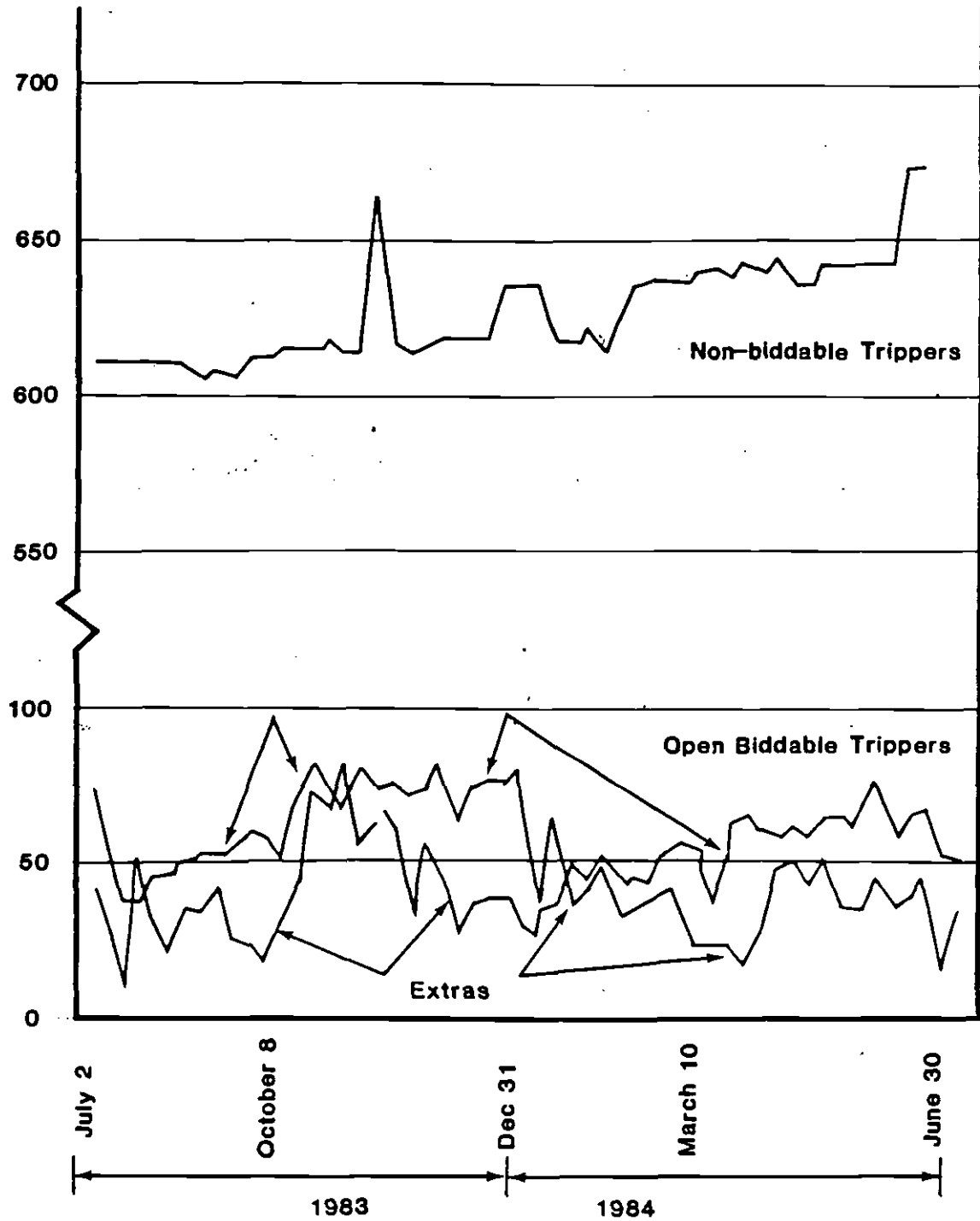


Figure 2-1 (Continued)



- o For the second half of the year, changes for five out of the 12 weeks were programmed in advance with projections of the number of runs by division provided for Transportation Department operator planning purposes. The projections were provided in December (roughly two months in advance of the first changes to be implemented) shortly after preliminary approval of the changes by the District's Board of Directors. The projections were not particularly accurate, partly due to revisions made in the proposed program of changes by the Board in January. If change proposals cannot be finalized with sufficient lead time, manpower planning will be done with less than desired accuracy regardless of the methodology which may be employed.
- o Changes in the number of non-biddable trippers were made in well defined steps.
- o Much of the week-to-week variation in run assignments is due to extras and open biddable trippers. Most of the variation in the number of open biddable trippers is due to the operation of work rules in the UTU labor contract. Week-to-week manpower levels will be subject to a certain degree of variation due to extra and open biddable tripper work assignments, and staffing changes should not be made in response to weekly fluctuations but rather manpower levels should be set for "average" levels.

2.1.2 Hiring Lead Times

Service changes that increase the number of run assignments need to be implemented with sufficient lead time for the hiring and instruction of new operators. For hiring 200 new part-time operators, 12-25 weeks are required for recruitment, testing, processing, and instruction. For hiring twenty operators where an eligibility list exists, the lead time can be reduced to 6-8 weeks. A breakdown of these lead times is given in Table 2-1 based on information provided by the District's Personnel and Transportation Instruction Departments. For the conversion of part-time operators to full-time status, one to seven weeks are required primarily for instruction of the operators. The range in number of weeks required for converting depends on the division to which the operator has been assigned as summarized in Table 2-2.

While required lead times can vary from several weeks to nearly six months depending on the magnitude of the service change, decreased service levels also require lead times of several weeks for manpower planning purposes, specifically to modify any planned hiring actions initiated to replace operators lost to attrition. The lead time for replacement hiring actions would typically be 6-8 weeks. Furthermore, if changes involve a new bus line, time must also be allowed for all extra operators as well as operators successfully bidding runs on the new line to become qualified for operating the new line.

TABLE 2-1
ESTIMATED LEAD TIMES REQUIRED
FOR ADDING OPERATORS

	<u>200 Operators</u>	<u>20 Operators from Eligibility List</u>
Requisition from Transportation	1	1
Gather Applications	5	--
Gather Applications/Ethnic Outreach	14-21	--
Testing/Establishing Eligibility List	5-15	--
Processing	20-35(a)	3-10
Basic Instruction at El Monte	30-50	12
Division Instruction	15	12-15
Final Testing at El Monte	<u>2-5</u>	<u>2-5</u>
Number of Working Days	61-117	30-40
Number of Weeks	12-25	6-8

Note: (a) Concurrent with Basic Instruction except for initial group of students.

TABLE 2-2
QUALIFICATION DAYS BY DIVISIONS

From El Monte

DIV.	NO. OF BASE LINES	NO. OF SPECIAL EVENTS	*FULL-TIME STUDENT (NO. OF DAYS)	*PART-TIME STUDENT (NO. OF DAYS)	*PART TIME TO FULL TIME (NO. OF DAYS)	RE-QUAL. REGULAR OPERATOR (NO. OF DAYS)
1	14	6	25	** 12	13	11
2	11	1	29	** 12	12	7
3	19	4	45	** 12	8	7
5	15	15	31	** 12	7	6
6	10	3	18	** 12	8	5
7	12	2	36	** 12	13	8
8	17	2	38	** 12	10	9
9	35	4	72	** 12	32	15
12	21	3	37	** 12	11	10
15	19	0	45	** 12	11 DAYS 2' 30"	9
16	10	28	28	** 12	16	6
18	20	2	36	** 12	12	0
T-23	5	0	16	** 12	4	3

* Plus 12 days of basic training
 ** Minimum time to qualify.

Operating employees returning to bus operating duties will be retrained as follows:

1. Absent 6 months, but less than 1 year = 2 days training at their respective division
2. Absent 12 months, but less than 18 months = 3 days training at their respective division
3. Absent 18 months or more - 5 days training at Training Center.

2.1.3 Sources of Information for Planning Manpower Changes

Information to assist the Transportation Department in anticipating operator requirements is available from several sources at the District. These sources relate to both annual and on-going service planning and development activities.

Annual

Short-Range Transit Plan (S RTP) development
Budget development

On-going

Service planning that addresses specific service improvement projects and changes.

Schedules revisions being implemented in response to planning studies.

Schedules tuning and adjustments for passenger loads and operational factors.

Quarterly budget and performance review.

A review of each of these annual and on-going service planning and development activities will provide an understanding of the information that is presently available for operator planning purposes. Table 2-3 presents a summary of these sources, noting the typical lead times involved and varying outputs produced.

2.1.3.1 Short-Range Transit Plan Development

The Short-Range Transit Plan (S RTP) provides a five-year projection of service levels, as well as other relevant data concerning existing operations and improvement programs. The S RTP is updated annually in approximately November through February in advance of the beginning of the next fiscal year. From the S RTP, projections of systemwide service miles and hours for the forthcoming fiscal year can be determined approximately four to six months in advance. The S RTP projections do not address specific improvement projects or the timing of proposed service changes, but may provide an overall target to assist in estimating operator requirements in advance of budget development work efforts.

2.1.3.2 Budget Development

The development of the budget is initiated at the beginning of the calendar year for the forthcoming fiscal year and is typically completed in the month before the start of the new fiscal year. Over the past three years, the District has introduced a "management by objectives" approach to budget development wherein the attainment of both performance and budget targets is considered. Based on the best available information regarding service miles and hours, the budgeting process will result in estimates for the number of FTE operator positions, costs by budget account line item, and anticipated levels for selected performance measures for the fiscal year.

TABLE 2-3

SOURCES OF INFORMATION FOR PLANNING
OPERATOR MANPOWER CHANGES

<u>Source of Information</u>	<u>Frequency</u>	<u>Advance Time</u>	<u>Responsible Department</u>	<u>Information Output</u>
SRTP Development	Annual	4-6 months	Planning	Systemwide service hours/ miles
Budget Development	Annual	1 month	Controller/ OMB	Operator Positions
On-going Service Planning Activities	Continuous	2-6 months+	NSRB/ Planning	Service hours/ miles
On-going Scheduling Department Activities	As Needed	1 day to 6 months	Scheduling	Work Assignments
Quarterly Budget and Performance Review	Quarterly		OMB	

2.1.3.3 On-Going Services Planning

The New Services Review Board serves as the coordinating and review forum for all proposed service changes, whether or not they may generate significant changes in operator manpower levels. In this capacity, it provides for the coordination of the Planning, Scheduling, Transportation, Finance, and other District Departments for all proposed service changes that are generated by District staff, as well as those that may be initiated by the District's Board of Directors.

The New Services Review Board comprises four voting members -- Controller (who chairs the Board, the Assistant General Manager for Operations, the Director of the Office of Management and Budget, and the Assistant General Manager for Planning and Communications -- and meets once per week, or more often if needed, to consider both proposed new services and proposed service changes. In addition to the voting members, a number of staff support the activities of the Board and are assigned to it. These include the following individuals or their representative:

- Director of Planning
- Director of Scheduling
- Director of Transportation
- Representatives from:
 - Marketing
 - Stops and Zones
 - Customer Information
 - Transportation Instruction

If a specific proposal is to come before the New Services Review Board affecting a department that is not usually represented, then a representative of that department will be asked to attend.

The New Services Review Board may consider service changes originating from the development of service improvement concepts by the Planning Department of the SCRTD, the on-going performance monitoring of existing routes and schedules, and policy-related considerations of the District's Board of Directors and other agencies that represent the District's service area such as the LACTC and City of Los Angeles. For each service change to be considered whether resulting from on-going planning activities or initiated by the Board of Directors, District staff will present service changes to the Board and discuss the rationale for the changes, the impacts of the changes on various aspects of the District's operations, the financial implications, and the relationship to goals and ceilings established in conjunction with the LACTC. Typically, the impact on operator requirements is not reported as part of this analysis. Following the presentation and discussion of a proposed service change, the New Services Review Board votes on whether or not to proceed. If the vote is to proceed, the proposed change is presented to the General Manager who may approve, amend, or disapprove the recommended change. If it is approved or amended, it goes to the Board of Directors for adoption. Minor changes will be handled as a consent item on the Board's agenda, while major service changes will go first to the Advance Planning Committee of the Board (chaired currently by Director Gordana Swanson) and then to the Board for adoption. In some instances where major changes are being proposed, a public hearing will be necessary before a final Board decision regarding adoption can be made. When adopted, steps required to

implement the service change will be scheduled and carried out.

For operator planning, consideration of the lead time provided by the service planning process is of special importance. Depending on the size of the proposed changes and other factors, the lead time afforded by this process may be from one month to several months. In the latter case, it is likely that the service change proposal will be undergoing significant modifications until it is finalized for implementation. If the service changes involve tradeoffs among the competing interests of jurisdictions within the District's service area, service changes may not be specified with certainty until no further time remains for implementing the changes or any part of them. In situations of this type in the past, little concern has been shown for operator staffing considerations or the cost "penalties" that may result from not providing adequate lead times for initiating personnel actions.

2.1.3.4 Schedules Revisions and Tuning

The Scheduling Department will implement changes in operating schedules and work runs in response to problems on an "as needed" basis and adopted service change proposals. For the most part, permanent and temporary schedule changes implemented in response to problems are minor and will not significantly affect operator requirements. However, a number of schedule changes made in response to unanticipated heavy passenger loads resulting from the reduced fare program were implemented in this manner resulting in operator staffing difficulties.

Other schedule changes are generally defined in a work program covering a period of from two to six months. Estimates of changes in the number of work assignments resulting from the program may be developed, but are typically not reported in advance unless requested by the Transportation Department for operator planning (see Figure 2-2). A summary of work assignments by operating division is provided prior to the implementation of changes after work runs have been finalized (see Figure 2-3). At this time, which is two to three weeks before the effective date of the schedule change, only limited personnel actions which may be necessary for effective operator planning and allocation are possible.

2.1.3.5 Quarterly Budget and Performance Review

This has recently been implemented by the District's Office of Management and Budget to review actual versus budgeted expenditures, and to assess the achievement of performance objectives as indicated by selected measures. Based on this review process, cost and performance objectives may be adjusted for the remainder of the budget year which might impact anticipated operator requirements.

2.1.4 Analysis of Existing Procedures

Based on analysis of the existing operator planning procedures, there are several issues of concern. From the study team's understanding of existing operator planning systems, it appears that there is no regularized operator planning system in place, and no mechanism in use to allow the Transportation Department to anticipate future staffing needs. The specific shortcomings of the existing situation are the following.

FIGURE 2-2

EXAMPLE PROJECTION OF WORK ASSIGNMENTS

Week Ending	Assignments	3201	3202	3203	3205	3206	3207	3208	3209	3210	3212	3215	3216	3218	3223
2-4	Runs	300	318	267	250	110	291	172	310		171	258	77	173	140
	Non-Bid.	52	70	51	46	30	48	67	92		37	37	35	36	24
	Extra	3	0	16	1	0	1	0	20		1	1	0	2	1
	Total	355	388	334	297	140	340	239	422		209	296	112	211	165
2-11	Runs	300	318	267	^{**} 247	^{**} 103	291	172	310		171	258	77	173	140
	Non-Bid.	52	70	51	45	30	48	67	92		37	37	35	36	24
	Extra	3	0	16	1	0	1	0	20		1	1	0	2	1
	Total	355	388	334	293	133	340	239	422		209	296	112	211	165
2-18	Runs	300	318	267	247	103	291	172	310		171	258	77	173	140
	Non-Bid.	52	70	51	45	30	48	67	92		37	37	35	36	24
	Extra	3	0	16	1	0	1	0	20		1	1	0	2	1
	Total	355	388	334	293	133	340	239	422		209	296	112	211	165
2-25	Runs	^{**} 298	[*] 316	267	247	103	^{**} 289	172	310		171	258	77	173	140
	Non-Bid.	51	69	51	45	30	48	67	92		37	37	35	36	24
	Extra	3	0	16	1	0	1	0	20		1	1	0	2	1
	Total	352	385	334	293	133	338	239	422		209	296	112	211	165
3-3	Runs	298	316	267	247	103	289	172	310		171	258	77	173	140
	Non-Bid.	51	69	51	45	30	48	67	92		37	37	35	36	24
	Extra	3	0	16	1	0	1	0	20		1	1	0	2	1
	Total	352	385	334	293	133	338	239	422		209	296	112	211	165
3-10	Runs	298	316	^{**} 262	247	103	289	^{**} 170	^{**} 298		^{**} 170	^{**} 250	77	173	140
	Non-Bid.	51	69	50	45	30	48	67	88		37	35	35	36	24
	Extra	3	0	16	1	0	1	0	20		1	1	0	2	1
	Total	352	385	328	293	133	338	237	406		208	286	112	211	165

FIGURE 2-3

EXAMPLE SUMMARY OF WORK
ASSIGNMENTS FOR SCHEDULE CHANGE

RTD 37-11
REV 5/82

DEPARTMENTAL

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

DO NOT INCLUDE MORE THAN ONE
SUBJECT IN THIS COMMUNICATION

DATE: December 20, 1984

TO: Ed Nash
FROM: J. Woodhull by R. A. Holland
SUBJECT: Manpower

R. A. Holland

This is the systemwide scheduled requirements of regular runs and non-biddable trippers for the December 30 Shakeup. The majority of the extra service and schedule adjustments which has been operating on pink letters for sometime will be made permanent on this date.

System Manpower for December 30, 1984

Div. No.	1	2	3	5	6	7	8	9	10	12	15	16	18	System Totals
Regular Runs	213	271	229	347	79	301	172	299	198	167	251	74	215	2816
Schedule Non-Biddable Trippers AM/PM	35	69	42	66	30	45	70	87	60	35	43	32	48	662
	42	68	40	69	30	53	66	88	58	37	44	36	56	687

- o The lack of an operator staffing plan updated on a monthly basis that defines staffing requirements far enough ahead to allow hiring and training to take place, that is based on the best available information, and that provides a reference for all staffing actions.
- o The lack of a detailed operating plan that incorporates the best available information regarding route and schedule changes to be implemented in the near term future (up to 6-9 months) -- in particular, there is a void with respect to information regarding planned operations from approximately three to four months in the future which is a critical time period for initiating hiring actions.
- o The implementation of as-needed schedule changes from the Scheduling Department that may impact operator requirements significantly.
- o Policy decisions regarding service level changes and near term operating plans that must be implemented on short notice.

The first two deficiencies can be corrected as part of an improved approach to operator planning. Details regarding specific responsibilities and methodologies need to be resolved, so that relevant information from all sources can be made available in a timely manner for operator planning purposes. Specific questions that need to be addressed to resolve these issues are as follows.

- o Through what entity can service changes be coordinated and likely manpower implications relayed to the Transportation Department?
- o What Department should have the responsibility for estimating the effects on manpower levels of service changes using information from the various sources?
- o What mechanisms need to be put in place to allow the estimates of manpower changes to be utilized appropriately and effectively for hiring and instruction activities?

Unanticipated changes made on short notice are problematic for operator planning. Unanticipated schedule changes initiated by the Scheduling Department are the result of providing maximum flexibility for the adjustment of schedules to meet changing service requirements, and are probably not of particular concern except under circumstances such as existed as a result of the reduced fare program. With regard to the impact of policy decisions that result in unanticipated service level changes, it is expected that this will continue in the future as the District Board of Directors and senior management group seek to be responsive to public interests and to the decision making environment for public transportation in the Los Angeles area. However, there needs to be increased sensitivity to the added costs that may result from making service changes on short notice.

2.2 MAINTAINING OPERATOR LEVELS FOR ESTABLISHED SCHEDULES

The second function of the operator planning function is concerned with maintaining the most effective allocation of operators to operating divisions on a week-to-week basis. The maintenance function incorporates the following

elements:

- o monitoring weekly manpower conditions at each operating division;
- o assigning available operators to daily work assignments in an efficient manner; and
- o initiating personnel actions in response to surplus or shortage conditions.

At the District, each of these elements is carried out completely within the Transportation Department except that the Personnel Department is responsible for recruitment and hiring activities as well as for the processing of various personnel actions. Additionally, the Scheduling Department may be involved in making schedule and work run adjustments in response to specific operational problems.

2.2.1 Bi-Weekly Bidding

The bi-weekly bidding process introduced at the District in early 1983 is the means of permitting operators to fill open work assignments according to seniority bidding. By allowing operators to bid on open work assignments throughout the system, it was intended to provide operators with the ability of transferring from one division to another instead of by bidding at the annual system shakeup. The process has created unique requirements for monitoring and maintaining the desired allocation of operators throughout the system.

The bi-weekly bidding process results in a recurring cycle of 50-70 operators successful bidding on open runs at other divisions each two weeks, followed by the transfer of 20-30 operators on a hardship or seniority basis in the next week to equalize division manpower levels. More specifically, the process may be summarized as the following steps.

1. On Sunday at the start of the first week, open work assignments at all divisions are posted for bidding. This includes open assignments created by attrition, operator absences over thirty days, runs not bid at shakeup, operators giving up regular runs for extra board work, and operators successfully bidding for new work assignments.
2. Bids are accepted from operators at all divisions through Wednesday, and then processed to identify and post the successful bidder for each run. Each successful bidder will commence the new work assignment on Sunday at the start of the second week.
3. From the bidding of open assignments, operator shortage and surplus conditions usually result at operating divisions. In the beginning of the second week, the number of operators which must be transferred to restore the balance of operator allocations will be determined. The transferring of operators to achieve a balanced operator allocation is referred to as "equalization."
4. Operators to be transferred for equalization will be obtained by voluntary requests from operators at divisions with surplus manpower, outstanding requests for hardship transfers, or selection from the bottom of the

seniority list at divisions with surplus manpower. Transferred operators will begin new work assignments on Sunday which completes one two-week cycle and marks the beginning the next one.

The bi-weekly bidding process has characteristics which are considered undesirable by both the management and labor groups at the District. For management, the process results in operator staffing levels being out of balance for at least one-half of the time since open assignments designated for systemwide bidding do not necessarily correspond with staffing vacancies or shortage conditions. Secondly, the process creates open assignments due to operators being successful in bidding on new assignments at other divisions. In this way, the process itself contributes to disruption of regular work assignments throughout the system. Thirdly, operator transfers must be carried out over three to four days which means that relevant operator records must be transferred in this same time period. Often, it is difficult to transfer records in this short time frame resulting in some confusion and unnecessary anxiety for division managers.

Of concern for both management and operators is the forced transfers required to equalize the allocation of operators at operating divisions. Low seniority operators being forced to transfer must be paid to qualify on all lines at the division to which the transfer is made. Thus, operators forced to transfer may not be available to work for up to two to three weeks after transferring. Furthermore, it is likely that operators transferred in this manner may seek a hardship transfer back to the original division or, in some instances, may have sufficient systemwide seniority to successfully bid back to that division. In this case, considerable effort has been wasted in making the required operator transfers.

The bi-weekly bidding process has disruptive and costly characteristics. For operator planning, the process introduces additional requirements for maintaining and monitoring operator allocations. In the longer run, the District should seek changes that would confine bi-weekly bidding to the filling of vacancies at operating divisions. RTD management has relaxed its right to establish optimal manpower levels at its operating divisions under the existing procedures. If bidding were only permitted on vacancies, the need for bi-weekly equalization would be eliminated and full control of operator staffing levels would be restored. Also in the future, TRANSMIS capabilities could be applied to relieve some of the troublesome aspects of bi-weekly bidding, and could also be implemented to assist with the reinstatement of systemwide (or partial systemwide) shakeups.

2.2.2 Monitoring of Manpower Conditions

The Transportation Department presently collects daily information concerning operator utilization and attendance at each operating division. This information is summarized into weekly reports that are the basis for operator planning and the initiation of any required personnel actions by the Transportation Department. Presently, the monitoring of operator utilization and staffing levels systemwide and at individual operating divisions is provided through several reports.

1. Weekly Projection of Manpower. This report is prepared at each operating division to determine the projected number of open assignments and

available operators for the next week. by no later than Thursday of each week, all known absences for the next week are compiled by dispatching staff at each operating division. Then, using the projected number of daily open assignments and number of extra board operators available, the daily manpower condition can be projected for each day of the next week. As shown in the example report (see Figure 2-4), the manpower condition for each day is subsequently posted for comparative purposes.

The projections are useful in preparing for the next week's requirements but are not directly used to establish manpower allocations. If shortage conditions are anticipated, selected actions may be taken such as to discourage discretionary time off and to sell open biddable trippers to regular run operators for the week. If the shortage condition is projected for only one or two days, it may be possible to change the days off for extra board operators. An extra board shakeup of days off must be initiated by Wednesday at noon to be effective for the next week and cannot be held more frequently than every other week, but under certain circumstances may represent an effective means for managing operator availability. If a surplus of operators is projected, discretionary leave may be encouraged and operators may be assigned for special instruction or other available non-driving work.

2. Division Statement of Operating Personnel (32-76). This report is prepared at each operating division to summarize daily information concerning operator utilization and attendances. An example of the report is shown in Figure 2-5. Parts A through E summarize the division work assignments, miscellaneous operating data, personnel changes, number of operators not available, and number of students. Parts F and G are filled by 11 a.m. on the preceding day, and provide estimates of the number of extra board assignments and available operators.
3. Statement of Operating Personnel Report (3-5). This report is prepared weekly by Transportation General from daily 32-76 reports and other operating data. An example of the report is shown in Figure 2-6. It is widely used within the Transportation Department to monitor the performance of operating divisions and to review operator staffing and attendance levels on a weekly basis. It is also distributed to other departments to provide a weekly overview of the Transportation Department's activities.

This report is used as a diagnostic tool for the Transportation Department's superintendents concerned with operating division performance and as a management reporting mechanism. As a result of attempting to serve diverse purposes, the report is less than fully effective and often confusing for its users. From the study team's interviews concerning the use of the report, examples of problems encountered with the report included the following.

- o Parts A and D of the report contain data as five day averages while parts B, C, and E are totals for seven days.
- o The number of regular runs reported includes relief runs, and does not correspond to the number of daily work runs dispatched.

FIGURE 2-4

EXAMPLE WEEKLY PROJECTION
OF MANPOWER REPORT

- PINK LETTERS -

		10		11		12		13		14	
		SUNDAY		MONDAY		TUESDAY		WEDNESDAY		THURSDAY	
A - Weekly Proj.	B - Daily Result	A	B	A	B	A	B	A	B	A	B
Regular Assignments open Account Vacation		3	3	4	4	3	3	2	2	2	2
Miscellaneous Open Assignments	Sick	9	9	15	10	16	11	15	9	12	12
	Open	27	26	35	30	37	58	34	37	32	35
Tripper Combinations		10	11	39	39	39	38	39	33	39	33
Reports		24	21	32	32	32	31	32	31	32	31
Am. Biddable Trippers		0	0	4	4	6	6	6	6	6	6
Total Jobs to fill Daily		73	75	129	120	133	122	118	112	123	119

EXTRA BOARD OPERATORS				10		11		12		13		14	
				SUNDAY		MONDAY		TUESDAY		WEDNESDAY		THURSDAY	
A - Weekly Proj.	B - Daily Result	SS	78	A	B	A	B	A	B	A	B	A	B
Total No. Extra Board Operators	SM	19		189	188	189	188	189	188	189	188	189	188
No. on Vacation / HD	MT	21	11	11	11	8	5	9	8	9	8	9	8
No. Sick or Leave	TW	21	16	2	6	3	5	4	6	4	9	4	7
Day Off	WT	21		97	17	40	40	42	42	42	42	39	39
No. Available	TF	18		82	84	129	121	120	119	117	114	123	111
No. Required	FS	4	10	73	75	129	120	133	122	118	112	123	119
Manpower Condition (+ or -)				189	188	+9	+9	-13	-13	-1	-4	0	-8

30

Division 3202

From 6-10-84 To

FIGURE 2-5

EXAMPLE DIVISION STATEMENT OF OPERATING PERSONNEL REPORT

RTD 32-76
REV 4/82

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

DIVISION STATEMENT OF OPERATING PERSONNEL

DIVISION 7

DATE TUE 10-9-84 DAY TUE

CATEGORY	TOTAL
A. DIV. OPERATING STATUS	
1. Regular Runs	299
2. Non-Biddable Trippers	AM 47PM 49
3. Extra Work	AM @PM 4
4. Open Bid	2 1
5.	
6.	
7.	
8.	
9.	
10.	
B. MISCELLANEOUS DATA	
11.	
12. Industrial Injuries	0
13. Bus Accidents/Avoidable	10
14.	
15.	
16.	
17.	
18. Operator Bus Trans.	1
19. Operator Road Calls	2
20. VCB/OCB Combined	0
21. Shined Out	0
C. PERSONNEL CHANGES	FULL PART
22. Oper. Payroll Last Rpt. +	440 63
23. Trans. From Other Div. +	
24. Trans. To Other Div. -	
25. Others Trans. In +	
26. Others Trans. Out -	
27. Students Qualified +	
28. Terminated -	
29. TOTAL OPER. PAYROLL =	440 63
D. OPERATORS OUT OF SERVICE	
30. Sick <u>70/11/4R</u> +	28 2
31. Vacation +	1 0
32. Military Leave +	0 0
33. Missout/AWOP Combined +	4 0
34. Suspended +	2 0
35. Leave +	1 0
36. Request Off +	2 0
37. Instruction +	0 0
38. Other Positions +	6 0
39. Day Off <u>65+XB24</u> +	99 2
40. TOTAL =	143 2
E. STUDENTS	
41. Students Last Report +	0 0
42. Received +	1 1
43. Terminated -	1 1
44. Qualified -	
45. TOTAL Students	0 0

CATEGORY	TOTAL
F. ASSIGNMENTS TO BE FILLED BY EXTRA-BOARD	
46. Regular Assignments Open	
Account Vacation +	1
47. Regular Assignments Open	
Account Sick +	11
48. Misc. Open Assignments +	16
49. Non-Biddable Trippers +	20
50. Reports +	28
51. Open A.M. Bid. Trippers +	2
52. TOTAL Assgmts (To Line 83) =	78
G. X-BOARD OPER. STATUS	
53. X-Brd. Oper. Last Rpt. +	126
54. X-Brd. Oper. Dropped -	
55. X-Brd. Oper. Added +	
56. TOTAL X-Board Oper. =	126
57. X-Brd. Oper. Days Off -	34
58. X-Brd. Oper. Sick -	8
59. X-Brd. Oper. Vac. -	2
60. X-Brd. Oper. H/Down -	10
61. X-Brd. Oper. Leave -	4
62. TOTAL X-Brd. Oper. Avail. =	72
63. TOTAL Assignments -	78
64. Manpower Condition +/-	-6

Pull Out Mileage 24,915

QUAL. PART-TIME	
A.M.	P.M.
35	28

Prepared By: E.H. Sims

Qualified By: R. H. [Signature]

- o The number of VCB/OCB operators and shineouts are only "rough" indicators of the performance of operating divisions.

The preparation of this report was recently computerized using spreadsheet software on a Transportation Department IBM PC microcomputer. Presently, the report's layout is being expanded to provide for more than one week's data and additional data elements for improved diagnostic analysis. In the next several months, it is also planned that this report may be generated by enhanced TRANSMIS-II timekeeping systems.

- 4. Current Operator Status Report. This microcomputer-based report is generated weekly by Transportation General to identify division operator surpluses and shortages as the basis for making hardship and equalization transfers following each bi-weekly bid for open assignments. An example of the report is shown in Figure 2-7.

In September, automated operator timekeeping capabilities were introduced at each operating division as part of the TRANSMIS-II program. In the future, these capabilities and planned enhancements will provide for the automated capture of extensive information regarding operator utilization and attendance. Presently, additional reporting capabilities are being implemented and several reports being generated may significantly assist operator planning functions in the future. Examples of current reports generated on IBM Series 1 minicomputers located at each division and District IBM mainframe systems include the following.

- 1. Daily Operations report (183-A and 183-B). This report is generated at each division, and may also be produced for all operating divisions (see Figure 2-8).
- 2. On-Demand Employee Utilization Report (194-1). This report provides a bi-weekly breakdown of work and pay hours for each operating division. An example report is shown in Figure 2-9.
- 3. Employee Detailed Activity Report (177-2). This report provides a detailed work and pay hours breakdown for each operator for selected days.
- 4. Daily Non-Work Operator Time Report (147). This report lists operators not working each day with the reason for not being available shown.

TRANSMIS-II timekeeping and dispatching systems being designed and implemented in the next several months will provide extensive operator utilization and attendance data which can be effectively employed for improved operator planning. For example, this data can be summarized to analyze daily variations in absence that may be applied for establishing days off for extra operators; monthly variations in absence for determining vacation schedules; and trends in absence for sickness and other reasons at individual operating divisions that may call for management attention. Additionally, planned systems should provide equally for diagnostic analysis and management reporting purposes to replace limited capabilities currently in place.

FIGURE 2-7

EXAMPLE CURRENT OPERATOR
STATUS REPORT

TO: DISTRIBUTION
 FROM: JIM THOMASON
 SUBJECT: CURRENT OPERATOR STATUS DATE: 10-29-84

DIVISION: 3201 3202 3203 3205 3206 3207 3208 3209 3210 3212 3213 3214 3218 3223 SYSTEM

AS OF 10-29-84

REG/REL ROWS	213	271	219	240	84	299	172	300	198	167	251	73	172	140	2807
NR TRIPPERS	41	70	42	54	36	49	69	86	57	39	43	36	39	24	681
EXTRA WORK	3	2	0	6	0	11	1	14	4	2	0	2	1	0	46
OB TRIPPERS	3	4	9	3	3	2	11	15	3	0	2	10	0	1	78
TOTAL HANDAYS	260	347	270	313	119	361	253	415	262	216	298	121	212	165	3612
FT OPER ASGD	321	435	333	377	145	460	312	504	328	269	365	143	264	208	4464
PT OPER ASGD	47	58	48	55	18	52	43	77	47	37	54	21	40	21	618
TOTAL DE ASGD	345	464	357	405	154	486	334	543	352	288	392	154	284	219	4773
OPER/HANDAY RATIO	1.33	1.34	1.32	1.29	1.29	1.35	1.32	1.31	1.34	1.33	1.32	1.27	1.34	1.32	1.32
PT/FT RATIO	14.64%	13.33%	14.41%	14.59%	12.41%	11.30%	13.78%	15.28%	14.33%	13.75%	14.79%	14.69%	15.15%	10.10%	13.84%
FT STUDENTS	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
PT STUDENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL STUDENTS DE	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
ADJ FT OPER ASGD	321	435	333	378	145	460	312	504	328	269	365	143	264	208	4465
ADJ PT OPER ASGD	47	58	48	55	18	52	43	77	47	37	54	21	40	21	618
ADJ TOTAL DE ASGD	345	464	357	406	154	486	334	543	352	288	392	154	284	219	4774
ADJ OPER/HANDAY RATIO	1.33	1.34	1.32	1.30	1.29	1.35	1.32	1.31	1.34	1.33	1.32	1.27	1.34	1.32	1.32
ADJ PT/FT RATIO	14.64%	13.33%	14.41%	14.59%	12.41%	11.30%	13.78%	15.28%	14.33%	13.75%	14.79%	14.69%	15.15%	10.10%	13.84%

FIGURE 2-7 (CONTINUED)

EXAMPLE CURRENT OPERATOR
STATUS REPORT

DIVISIONS	3201	3202	3203	3205	3206	3207	3208	3209	3210	3212	3215	3216	3218	3223	SYSTEM
TO ACHIEVE BALANCE:															
PLUS/MINUS DE RED	-1	-5	0	0	3	-9	1	6	-5	-2	2	6	-4	0	-1
PLUS/MINUS FT RED	-1	-5	0	0	3	-9	1	6	-5	-2	2	6	-4	0	-1
PLUS/MINUS PT RED	0	-1	0	1	0	-1	0	1	-1	0	0	1	-1	0	0
SINCE 10-29-84 (NO OPERATOR MOVEMENTS CONTEMPLATED)															
FT HARDSHIP TRANS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PT EXPERIENCE TRANS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FT 81-KC 810	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FT EQUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PT EQUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL FT MOVEMENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PT MOVEMENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL DE MOVEMENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STATUS AS OF: 10-29-84															
FT OPER ASSG	321	435	333	377	145	460	312	504	320	269	365	113	264	208	444
PT OPER ASSG	47	58	40	55	18	32	43	77	47	37	54	21	40	21	610
TOTAL DE ASSG	345	464	357	405	154	484	334	543	352	288	392	154	284	219	4773
OPER/HANDY RATIO	1.33	1.34	1.32	1.29	1.29	1.35	1.32	1.31	1.34	1.33	1.32	1.27	1.34	1.32	1.32
PT/FT RATIO	14.64%	13.33%	14.41%	14.59%	12.41%	11.30%	13.78%	15.28%	14.33%	13.75%	14.79%	14.69%	15.15%	10.10%	13.84%
PLUS/MINUS DE RED	-1	-5	0	0	3	-9	1	6	-5	-2	2	6	-4	0	-1
PLUS/MINUS FT RED	-1	-5	0	0	3	-9	1	6	-5	-2	2	6	-4	0	-1
PLUS/MINUS PT RED	0	-1	0	1	0	-1	0	1	-1	0	0	1	-1	0	0
DISTRIBUTION:															
E. J. WASH															
M. D. MCCORMS															
L. W. BAILEY-JOHNSON															
A. T. LEAHY															
G. L. DIEML															
M. L. PACKARD															
TRANS STAFF															

FIGURE 2-8

EXAMPLE TRANSMISS-II OPERATOR
TIMEKEEPING SYSTEM DAILY
OPERATIONS REPORT

TOT183-B***** SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT ***** PAGE 2
 * DEPARTMENT: 32 - TRANSPORTATION * TRANSIT OPERATING & TRENOS SYSTEM * DATE PREPARED: 01/24/85 *
 * * * * * TIME PREPARED: 11:06:42 *
 * * * * * DAILY OPERATIONS REPORT * BOARD DATE: 01/23/85 *
 * * * * * DAY: WEDNESDAY *

	DIVISION 07		DIVISION 08		DIVISION 09		DIVISION 10		DIVISION 12		DIVISION 15	
	OPRS	HOURS	OPRS	HOURS	OPRS	HOURS	OPRS	HOURS	OPRS	HOURS	OPRS	HOURS
OPERATORS OUT OF SERVICE:												
1. OPR ON EXTENDED LEAVE												
LONG TERM EXCUSED	0	0	0	0	0	0	0	0	0	0	0	0
LONG TERM INDUSTRIAL	0	0	0	0	0	0	0	0	0	0	0	0
LONG TERM SICK	0	0	6	48	6	48	8	64	2	16	6	48
TOTAL:	0	0	6	48	6	48	8	64	2	16	6	48
2. OPR TEMPORARILY ABSENT												
SICK	26	203	19	147	21	192	13	99	18	144	14	112
VACATION	18	162	7	63	15	135	6	54	13	125	8	72
MILITARY LEAVE	1	8	1	8	0	0	0	0	0	0	0	0
MISSOUT	0	0	0	0	0	0	0	0	0	0	0	0
OK MANAGER	3	24	1	8	1	3	2	11	1	8	3	24
LEAVE	0	0	0	0	1	3	2	16	0	0	1	8
REQUEST OFF	1	8	2	16	0	0	0	0	0	0	3	24
BIRTHDAY/FLOATING/ANNIV HOL	4	32	3	24	2	16	2	16	0	0	2	16
BEREAVEMENT	0	0	0	0	0	0	0	0	0	0	0	0
INDUSTRIAL INJURY	0	8	3	24	3	19	5	41	2	16	1	8
FAMILY EMERGENCY	0	0	0	0	0	0	0	0	2	16	1	8
COURT TIME	0	0	0	0	0	0	2	17	2	13	0	0
JURY DUTY	0	0	0	0	0	0	0	0	0	0	0	0
UNION BUSINESS	0	0	1	8	0	0	0	0	0	0	1	8
WORK OUT OF CLASS	7	0	4	0	10	0	1	0	7	0	6	0
ADMIN / MISCELLANEOUS	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL:	60	445	41	298	53	368	33	254	45	322	40	280
3. OPERATORS IN TRAINING												
STUDENT	0	0	0	0	0	0	0	0	0	0	0	0
RETRAINING	4	32	1	8	1	8	1	8	3	24	3	24
TOTAL:	4	32	1	8	1	8	1	8	3	24	3	24
OPERATIONAL SUMMARY:												
1. ACTIVE EMPLOYEES												
REGULAR	304	62.0%	188	53.6%	319	55.3%	216	56.7%	173	58.8%	263	62.9%
EXTRA	128	26.1%	123	35.0%	185	32.1%	117	30.7%	86	29.3%	104	24.9%
PARTTIME	58	11.8%	40	11.4%	73	12.7%	48	12.6%	35	11.9%	51	12.2%
STUDENT	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
TOTAL:	490	100.0%	351	100.0%	577	100.0%	381	100.0%	294	100.0%	418	100.0%
2. LESS OPR ON DAY OFF/HOL :	98	20.0%	53	15.1%	95	16.5%	73	19.2%	51	17.3%	75	17.9%
3. LESS OPERATORS IN TRAINING :	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
4. TOTAL OPRS SCHEDULED TO WORK:	392	80.0%	298	84.9%	482	83.5%	308	80.8%	243	82.7%	343	82.1%
5. TOTAL OPRS NOT AVAILABLE:	64	13.1%	48	13.7%	60	10.4%	42	11.0%	50	17.0%	49	11.7%
6. %SCHED TO WORK NOT AVAIL (5/4):		16.3%		16.1%		12.4%		13.6%		20.5%		14.2%
7. OPERATORS WORKING ON:												
DAY OFF - VCB	0	0.0%	0	0.0%	0	0.0%	2	0.5%	5	1.7%	0	0.0%
DAY OFF - OCB	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
HOLIDAY	0	0.0%	1	0.3%	2	0.3%	0	0.0%	1	0.3%	0	0.0%
VACATION	0	0.0%	0	0.0%	7	1.2%	0	0.0%	1	0.3%	0	0.0%
MISSOUT	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

FIGURE 2-9

EXAMPLE TRANSMIS-II OPERATOR
TIMEKEEPING SYSTEM EMPLOYEE
UTILIZATION REPORT

TOT194-1 ***** SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT ***** PAGE 5
 * DEPARTMENT: 32 - TRANSPORTATION * TRANSIT OPERATING & TRENDS SYSTEM * DATE PREPARED: 01/24/85 *
 * * * * * ON-DEMAND EMPLOYEE UTILIZATION REPORT * * * * * TIME PREPARED: 11:43 *

FROM 01/01/85 THRU 01/12/85

	DIVISION 15 HOURS	PCT	DIVISION 16 HOURS	PCT	DIVISION 18 HOURS	PCT	DIVISION 96 HOURS	PCT	DEPARTMENT HOURS	TOTAL PCT
A. SCHEDULED WORK RUN HOURS	41,247	100.0	17,543	100.0	38,113	100.0			492,463	100.0
B. ACTUAL HOURS WORKED	23,773	100.0	9,507	100.0	22,337	100.0			287,042	100.0
C. TOTAL HOURS PAID	41,461	100.0	17,815	100.0	37,840	100.0	597	100.0	505,882	100.0
1. REGULAR	28,185	67.9	11,941	67.0	26,224	69.3	533	89.2	341,354	67.4
2. OVERTIME	2,872	6.9	1,955	10.9	3,598	9.5	64	10.7	39,142	7.7
3. WORKED ON HOLIDAY	10,404	25.0	3,919	21.9	8,018	21.1			125,386	24.7
D. OPERATING HOURS SUMMARY	27,196	100.0	11,478	100.0	24,571	100.0	29	100.0	329,982	100.0
1. PREPARATORY TIME	373	1.3	219	1.9	329	1.3			4,796	1.4
2. WALK-IN TIME	3,019	11.1	1,775	15.4	2,877	11.7			39,536	11.9
3. TRAVEL TIME	1,928	7.0	1,187	10.3	2,194	8.9			22,906	6.9
4. VEHICLE TIME	21,176	77.8	7,777	67.7	18,391	74.8			252,626	76.5
5. DEADHEAD TIME										
6. COACH MOVEMENT	70	.2	40	.3	85	.3			875	.2
7. LEASE VEHICLE MOVEMENT										
8. CONTINUOUS TIME					10				48	
9. OCB/VCB PREMIUM										
10. MINIMUM GUARANTEE	627	2.3	480	4.1	685	2.7	29	100.0	9,195	2.7
E. NON-OPERATING HOURS SUMMARY	1,239	100.0	683	100.0	2,783	100.0	564	100.0	20,826	100.0
1. LINE INSTRUCTOR PREMIUM										
2. STUDENT TRAINEE	37	2.9			584	20.9			877	4.2
3. O.T. - STUDENT TRAINEE										
4. HCL - STUDENT TRAINEE										
5. ADDITIONAL QUALIFICATION	344	27.7	53	7.7	1,329	47.7			5,264	25.2
6. ACCIDENT REPORT										
7. CCURT TIME	1				28	1.0			105	.5
8. WAITING TIME	788	63.5	630	92.2	784	28.1			12,865	60.8
9. BID TIME - UNSCHO SHAKEUP										
10. SCHEDULE CHECKER	60	4.8			42	1.5	500	88.6	1,389	6.6
11. O.T. - SCHEDULE CHECKER	9	.7			2		64	11.3	131	.6
12. HOL - SCHEDULE CHECKER										
13. SUPERVISOR - VEH. OPERATIONS (WDOC)										
14. O.T. - SUPERVISOR - VEH. OPERATIONS										
15. HOL - SUPERVISOR - VEH. OPERATIONS										
16. EXTRA DIVISION DISPATCHER (WDOC)										
17. O.T. - EXTRA DIVISION DISPATCHER										
18. HOL - EXTRA DIVISION DISPATCHER										
19. EXTRA RADIO DISPATCHER (WDOC)										
20. O.T. - EXTRA RADIO DISPATCHER										
21. HOL - EXTRA RADIO DISPATCHER										

37

32-READ

UNACO 11/11/85

FIGURE 2-9 (CONTINUED)
 EXAMPLE TRANSMIS-II OPERATOR
 TIMEKEEPING SYSTEM EMPLOYEE
 UTILIZATION REPORT

TOT194-1 ***** SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT ***** PAGE 6
 * DEPARTMENT: 32 - TRANSPORTATION * TRANSIT OPERATING & TRENOS SYSTEM * DATE PREPARED: 01/24/85 *
 * * * * * ON-DEMAND EMPLOYEE UTILIZATION REPORT * * * * * TIME PREPARED: 11:43 *

***** FROM 01/01/85 THRU 01/12/85 *****

	DIVISION 15		DIVISION 16		DIVISION 18		DIVISION 96		DEPARTMENT TOTAL	
	HOURS	PCT	HOURS	PCT	HOURS	PCT	HOURS	PCT	HOURS	PCT
22. GENERAL ADJUSTMENT BUREAU									53	.2
23. ADMINISTRATIVE TIME									342	1.6
24. MISCELLANEOUS REPORT										
25. OVERNIGHT DEADHEAD										
26. PHYSICAL EXAM										
27. TRAFFIC LOADER										
28. O.T. - TRAFFIC LOADER										
29. HOL - TRAFFIC LOADER										
30. TRAFFIC REGULATOR										
31. O.T. - TRAFFIC REGULATOR										
32. HOL - TRAFFIC REGULATOR										
HOURS NOT WORKED SUMMARY	7,524	100.0	3,895	100.0	2,414	100.0	4 100.0		94,188	100.0
1. BEREAVEMENT									80	
2. HOLIDAY NOT WORKED	1,816	24.1	816	20.9	1,368	16.2			19,784	21.0
3. INDUSTRIAL INJURY	128	1.7	128	3.2	72	.8			1,830	1.9
4. JURY DUTY										
5. MILITARY LEAVE	56	.7			14	.1			352	.3
6. TRUN-AROUND										
7. UNPROVOKED ATTACK	136	1.8			248	2.9			1,766	1.8
8. VIOLATION PAY										
9. WORKERS COMPENSATION										
10. MISS-OUT	119	1.5	8	.2	208	2.4			2,328	2.4
11. OTHER LEAVE WITHOUT PAY	1,465	19.4	747	19.1	2,409	28.6	4 100.0		18,002	19.1
12. SICK LEAVE	1,805	23.9	916	23.5	2,200	26.1			26,636	28.2
13. OK MANAGER	127	1.6	11	.2	338	4.0			2,557	2.7
14. VACATION	1,872	24.8	1,269	32.5	1,557	18.5			20,853	22.1

38

2.2.3 Operator Hiring Program

Discussions with the Personnel Department indicated that operator requisitions have typically been received from the Transportation Department on an irregular basis with short notice over the past 2-3 years. From that Department's viewpoint, a more regular weekly or monthly program with maximum advance notice would be more cost effective. From July 1982 through June 1984, operator requirements increased by approximately 432 full-time equivalent operators as a result of increased service implemented following the introduction of the reduced fare program. At an average rate of approximately six operators per week lost due to attrition for various reasons, it is noted that 624 operators were added by the District over the same two year period. Given that 60 percent of new operator requirements in fiscal years 1983 and 1984 were due to attrition, it appears that the establishment of a regular hiring program should be possible that addresses hiring and conversion requirements due to attrition (i.e., the principal element of maintenance of the operating manpower level).

2.3 SETTING OPERATOR STAFFING LEVELS

Operator planning at the District is based on the application of a "rule of thumb" formula relating the number of operator assignments to full-time equivalent (FTE) operator requirements. Specifically, the formula used for manpower planning is that the number of operators required is equal to the number of run assignments times an operator-to-assignment ratio. The method is applied for establishing systemwide requirements, and also for operator requirements at each operating division. An operator-to-assignment ratio of 1.30 has been established for FY 1985 operations. For the first six months of the year, operator staffing levels have been maintained at a higher level in order to retain a number of operators recruited and trained for Olympics special services.

The operator-to-assignment ratio has been the subject of considerable and often heated debate at the District in recent years. In developing the FY 1985 budget, there was much discussion regarding the "optimal" value of the operator-to-assignment ratio. The discussions centered on tradeoffs of the following.

- o unscheduled overtime costs;
- o missed or late pullouts; and
- o operator staffing levels.

More specifically, there was concern that reduced operator staffing levels would result in increased unscheduled overtime and reduced service reliability. Furthermore, the availability of increased overtime for operators may contribute to increased absenteeism, thereby compounding any increased unscheduled overtime costs. While the nature of these tradeoffs is well understood, agreement on quantifying each of the underlying relationships has been difficult.

Additionally, it appears that the Transportation Department has historically considered that minimizing the number of missed or late pullouts and minimizing the amount of unscheduled overtime (more specifically, the number of OCB/VCB operators used) are "top priority" objectives. Prior to the current year, the ratio was established as 1.32 which was judged to be optimal for meeting District objectives. It remains to be determined how budget and performance measures will be affected by applying the 1.30 ratio for this year, and in the

longer run, at what level the District's objectives may be best satisfied.

2.3.1 Application of the Operator-to-Assignment Ratio

The application of the operator-to-assignment ratio, for either assessing the "manpower condition" or establishing operator requirements at an operating division involves several calculations. Data for the calculations is taken from daily and weekly operating personnel reports, or from projections of the number of work assignments supplied by the Scheduling Department. The calculations may be summarized as follows.

1. The number of assignments is calculated as the total of the following.
 - o Regular five-day work runs.
 - o Highest of the a.m. or p.m. number of scheduled non-biddable trippers.
 - o Highest of the a.m. or p.m. number of open biddable trippers.
 - o Highest of the a.m. or p.m. number of extra assignments.

The number of trippers and extra assignments is calculated as a weekday or five-day average. The number of regular runs reflects work assignments for operating all weekly services including weekdays, Saturdays, and Sundays.

2. Operator requirements are calculated as the number of assignments multiplied by the operator-to-assignment ratio.
3. The actual number of operators (which may be compared with the calculated operator requirements to assess a surplus or shortage condition) is calculated as the number of full-time operators plus 0.5 times the number of part-time operators. This number of full-time equivalent (FTE) operators includes all operators holding runs or assigned to the extra board, whether or not these operators are available for work. It also includes operators on extended sick leave who have laid off runs which have subsequently been bid and are filled by other operators. Operators on indefinite leave are not included.

The use of the operator-to-assignment ratio for establishing operator requirements and allocating operators to divisions appears to be a straight forward approach. However, the approach as applied by the District's Transportation Department involves some modifications and assumptions that deserve further attention and investigation.

1. The number of part-time operators is converted to full-time equivalent (FTE) operators using a 0.5 factor. This assumption is reasonable and reflects RTD work constraints as applied to part-time operators.
2. Non-biddable tripper, extra, and open biddable tripper assignments are converted to an equivalent number of regular runs by adding the highest of the a.m. or p.m. count for each type of work. In other words, it is assumed that all trippers and extras are balanced with two pieces of work, and that no more than one a.m. and one p.m. assignment can be worked by an operator. For example, consider the following breakdown of trippers for a division.

	<u>a.m.</u>	<u>p.m.</u>
Non-biddable trippers	35	41
Open biddable trippers	10	1
Extra service	--	--
TOTAL	<u>45</u>	<u>42</u>

For determining operator requirements, the District's formula would be based on (1.30 times (41 + 10)) equals 66 operators. However, operator requirements may be more correctly estimated as (1.30 times 42) equals 55 operators or eleven fewer operators than calculated above. The difference is based on the assumption that open biddable and non-biddable trippers may be combined into daily work assignments where necessary.

From an analysis of tripper assignments data for a selected number of weeks, it is estimated the District's approach to converting tripper assignments to an equivalent number of regular runs results in operator requirements being overstated by approximately 0.3 percent or 14 operators systemwide. For individual operating divisions, the difference was found to be as high as two percent of operator requirements which is a significant factor affecting operator staffing.

3. The calculation of tripper and extra work assignments is determined as an average for weekday schedules operated. This serves to understate operator requirements to the extent that there are non-biddable trippers, open biddable trippers, and extra service scheduled on Saturdays and Sundays that need to be operated. A review of daily work assignments data for a selected number of days in October, 1984 indicated that systemwide operator requirements would be increased by nearly 80 operators (approximately 1.7 percent) of total operator requirements if weekend tripper and extra work assignments were considered. At individual operating divisions, increased operator requirements ranged to as high as 2.9 percent for the time period analyzed. This means that divisions balanced at a 1.30 operator-to-assignment ratio are actually at ratios ranging from 1.27 to perhaps 1.29 depending on the number of weekend tripper and extra assignments at each division.

Additionally, the calculation of tripper and extra runs as a weekday average does not account for single day extra service in a realistic manner. However, data analysis indicated that single day variations in extra assignments do not significantly affect manpower requirements.

4. The methodology for estimating operator requirements for trippers is based on two important assumptions concerning the operation of trippers at the District. First, it is assumed that part-time operators are assigned to balanced a.m. and p.m. trippers, and not assigned so that trippers left for extra board operators are balanced to the maximum possible extent. This assumption is consistent with District operating practices regarding the use of part-time operators but is not necessarily the most effective use of available part-time operators. Second, it is assumed that open biddable trippers will be worked as part of a tripper/report or paired tripper combination rather than marked up or assigned with a regular run assignment. While the latter approach is often taken when there is a manpower shortage condition, operator requirements are based on the

assumption that additional manpower is necessary for operating open biddable trippers.

5. Operator vacations are bid annually in June. The District has sought to allocate the number of operators taking vacation each week to account for increased operator requirements for known extra assignments. Thus, more operators will be available at times when additional work assignments are scheduled.

This approach can be effectively utilized to manage the availability of operators. Similar strategies relate to adjusting the days off assignments for extra board operators and to recognizing seasonal variations in operator absences for establishing operator levels. At the District, the effectiveness of vacation scheduling has been limited by the lack of an operating plan as the basis for identifying projected extra work requirements. Furthermore, it should be noted that a division where manpower availability has been increased in this manner will be reported as having a below-average operator-to-assignment ratio as illustrated in the following example.

	<u>First Week</u>	<u>Second Week</u>
Number of assignments	100	100
Additional extra service	--	5
Number of FTE operators	130	130
Operator/assignment ratio	1.30	1.24

It is possible that this low ratio might serve to initiate operator transfers to equalize division operator-to-assignment ratios if it were not recognized that operator requirements had already been planned for by vacation scheduling adjustments. In any case, this example illustrates an instances where the low ratio value is misleading and does not indicate manpower shortage conditions.

6. Operators on extended sick leave who have laid off runs which have subsequently been put up for bid and filled are included as available manpower. These operators may be referred to as being on "bump" status. For daily and weekly reporting, they are not counted as being absent because they are not holding runs and open assignments have not been created which must be filled. Accurate information is not available regarding the number of operators in this category, but it is estimated that approximately 2.5 percent of the total number of operators may be on extended leave at any time. For individual divisions, it is expected that variations exist in the number of operators on extended leave, but the nature of these variations cannot be determined with certainty from available daily and weekly manpower reports.

2.3.2 Assignment of Trippers to Part-Time Operators

The District is able to assign part-time operators to one piece trippers where work hours are between 2.5 and five hours. To generate maximum cost savings with the allowable level of part-time operators, the District analyzes non-biddable tripper combinations to generate a rank ordered list of tripper combinations for part-time operators. The pay hours of each tripper combination

is compared based on its being worked by a full-time operator with guarantee and spread premium pay provisions and being worked by part-time operators. The prioritized listing is provided to assist the Transportation Department in determining which non-biddable trippers are assigned for part-time operators.

Based on the cost analysis, part-time operators are assigned to a balanced (or nearly so) number of a.m. and p.m. trippers at each operating division. Consider the following example for a District operating division.

	<u>a.m.</u>	<u>p.m.</u>
Non-biddable trippers	46	55
Part-time assigned	28	28
Open biddable trippers	2	1
Extra service	5	5
Extra board balance	25	33

From this example, note that part-time tripper assignments have been exactly balanced, but that the extra board is not balanced between a.m. and p.m. peak periods. This means that eight full-time operators will work p.m. trippers only resulting in guarantee time being paid for the remainder of the working day for each of these operators. If the number of non-biddable and open biddable trippers were evenly balanced, all full-time operators would be assigned a tripper combination and the assignment of work for part-time operators would be of no concern.

An alternative approach for this example operating division would be as follows.

	<u>a.m.</u>	<u>p.m.</u>
Non-biddable trippers	46	55
Part-time assigned	24	32
Open biddable trippers	2	1
Extra service	5	5
Extra board balance	29	29

Using this approach, four fewer operators are required. Furthermore, the number of pay hours will be significantly lower. Using data for tripper assignments in October 1984, it was estimated that operator requirements might be reduced by a maximum of 46 operators with potential annual savings in direct pay costs of up to \$0.5 million by improving the utilization of part-time operators. The potential for cost savings using this approach is dependent on the degree to which non-biddable trippers, open biddable trippers, and extra service assignments are not balanced between the a.m. and p.m. peak periods throughout all months of the year. The approach also requires that the number of part-time operators is maintained at or close to the maximum allowable level at each operating division so that part-time operator assignments can be controlled.

2.3.3 Relating the Operator-to-Assignment Ratio to Operator Absenteeism

The operator-to-assignment ratio is directly related to the absence characteristics of operators. It may be calculated based on the average days absent or adjusted to a value that is higher or lower depending on specific operational considerations. To illustrate the determination of the ratio based on average number of days absent per operator, assume that only full-time

operators working straight, split, and relief runs are of interest in order to simplify calculations. The methodology can later be expanded by converting part-time operators to full-time equivalents, and other types of work assignments such as tripper combinations to an equivalent number of regular runs.

1. Assume that 100 regular runs are scheduled. This will require 100 operators if each operator worked five days per week for 52 weeks.
2. Assume that each of the 100 operators is expected to be not available (for scheduled and unscheduled reasons) for an average of sixty days per year, meaning that each operator will be working only 200 days per year on the average. For manpower planning, staffing for (60×100) or 6,000 days per year must be determined.
3. Since each operator is expected to work 200 days annually, the runs held by regular run operators can be worked by $(6,000/200)$ or 30 extra operators on days when regular run operators are not available.
4. For this example, the operator-to-assignment ratio is 1.30. By making different assumptions about the number of days not available, this ratio will vary as depicted in Figure 2-10 with the value of the ratio directly related to the average number of days not available per year.
5. For this example, a "rate of absence" (typically expressed as a percent of average annual workdays) may be computed as $(60/260)$ or 23.0 percent.

For 1983 weekly manpower reports prepared by the Transportation Department, it is estimated that the average number of days not available for full-time operators is 55.3 days per year. This estimate is based on certain assumptions for interpreting weekly report data and converting it to annual totals. It has been assumed that each operator uses four personal holidays per year as days off permitted by the UTU labor agreement. Days absent for holidays (other than for personal holidays) and for sickness over thirty days are not included because open runs do not result in either case. Basing the operator-to-assignment ratio on the average number of days not available, the ratio may be calculated as 1.27 operators per assignment. This calculation may be extended to account for the absence characteristics of part-time operators. From the recently completed LACTC audit, part-time operators were found to be absent 6.4 days annually on the average. An analysis of 3-5 report data for 1983 indicates that this rate has increased to approximately ten days annually per operator. Using the higher 1983 rate for the maximum number of part-time operators, a weighted operator-to-assignment ratio of 1.25 may be calculated.

The operator-to-assignment ratio is directly related to the number of days that operators are not available. The ratio may be established using the average number of days not available or adjusted lower or higher from this average value to obtain the most cost effective staffing. For FY 1985, the District has established an objective to maintain the systemwide operator-to-assignment ratio at 1.30. The targeted level is significantly higher than a ratio based on the average days not available for full-time and part-time operators at the District. If the targeted level is adjusted for assumptions that appear to be incorporated into the use of the operator-to-assignment ratio by the

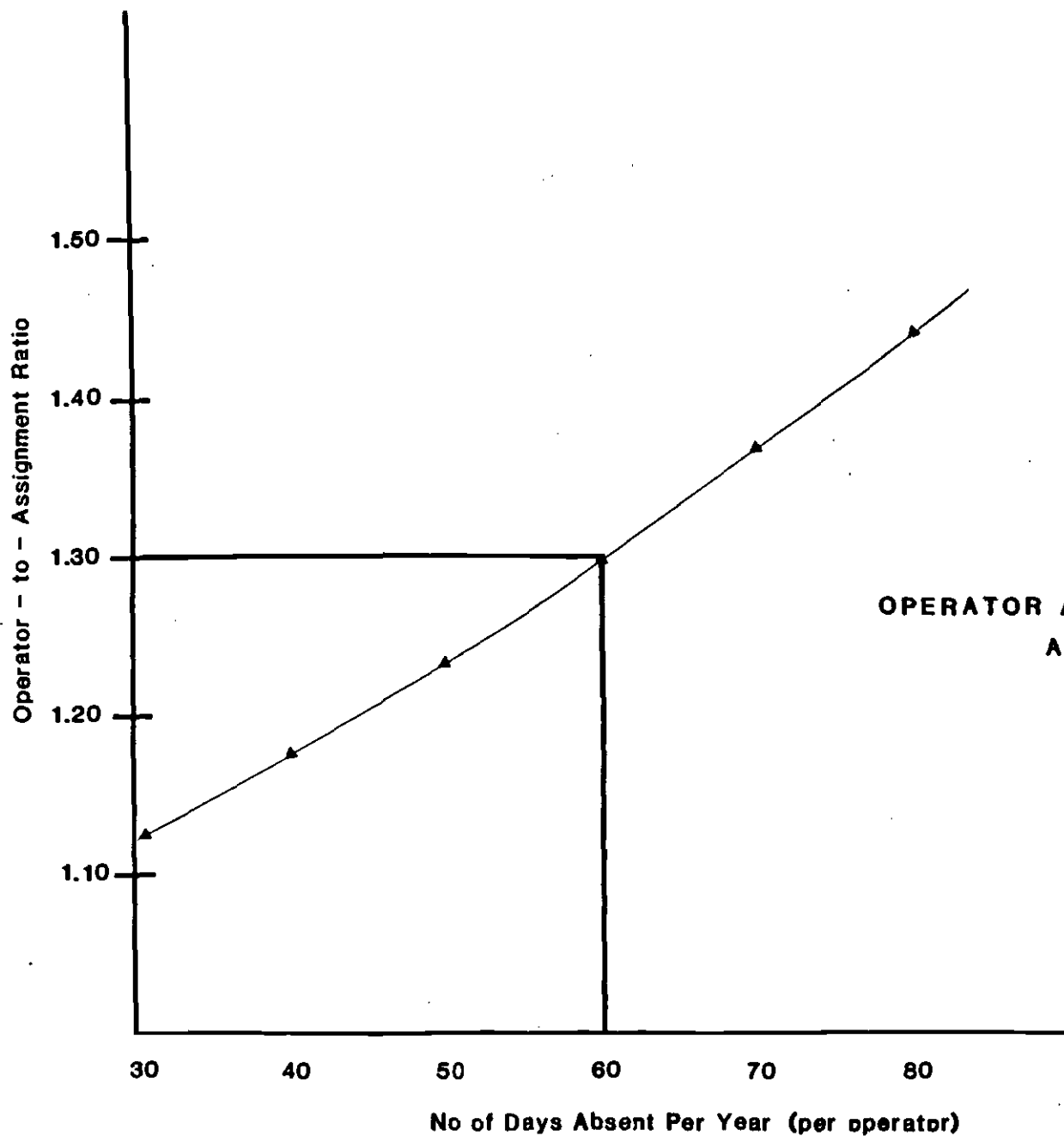


Figure 2-10
OPERATOR /ASSIGNMENT RATIO BASED ON
AVERAGE DAYS ABSENT

Transportation Department, the following results are obtained.

FY 1985 targeted ratio	1.30
Adjustment for operators on extended leave	(0.03)
Adjustment for weekend tripper and extra service assignments	<u>(0.02)</u>
Adjusted target	1.25

This adjusted value corresponds to an operator-to-assignment ratio based on the average number of days not available for full-time and part-time operators.

2.3.4 Operator-to-Assignment Ratios for Operating Divisions

The District applies the operator-to-assignment ratio for operator planning with the same ratio used for all operating divisions. The FY 1985 objective of maintaining the systemwide operator-to-assignment ratio at 1.30 specified that the ratio could vary from 1.27 to 1.33 which could be interpreted to permit operating divisions to use different ratios. From time to time, the requirement that ratios be balanced for all divisions has been relaxed in consideration of circumstances requiring special attention. Data analysis indicates that there is significant differences in the average number of days not available per operating divisions which should be reflected in the operator-to-assignment ratios being applied for manpower planning at each division.

Based on operator average attendance data, the systemwide operator-to-assignment ratio has been calculated as 1.25. For individual divisions, comparable ratios based on the average number of days not available range from 1.22 to 1.30 as listed in Table 2-4. Adjusting this for comparison with District ratios results in a range of approximately 1.27 to 1.35. Divisions 5, 7 and 9 have ratios significantly higher than the systemwide average. For divisions 1, 2, 6 and 15, the ratios based on the average number of days not available per operator are significantly lower than the systemwide average ratio. From this analysis, significant differences in operator availability characteristics have been identified for operating divisions. Operator staffing levels should be established that take these differences into account.

2.3.5 Previous Studies of the Operator-to-Assignment Ratio

The determination of the most cost effective operator-to-assignment ratio (or other basis for establishing operator staffing allocations) has been a subject of considerable interest at the District for several years. In addition to much discussion, four studies have been undertaken for the District since 1978 which at least partly addressed the question of optimal operator staffing levels.

TABLE 2-4

OPERATOR-TO-ASSIGNMENT RATIOS BASED
ON OPERATING DIVISION CHARACTERISTICS

Operating	Estimated Number of Days Not Available in 1983 per Operator		Operator-to-Assignment Ratio
	Full-Time	Part-Time	
1	51.3	5.8	1.22
2	49.8	5.6	1.22
3	54.1	10.4	1.24
5	64.0	8.9	1.30
6	49.0	11.8	1.22
7	59.8	13.9	1.28
8	54.6	10.7	1.24
9	59.9	17.8	1.28
12	54.0	11.3	1.24
15	49.7	10.9	1.22
16	56.5	8.1	1.25
18	55.2	5.5	1.25
23	57.0	5.3	1.26
Systemwide	55.3	10.0	1.25

Note: (a) The operator-to-assignment ratio has been calculated based on the average number of days not available per year for full-time and part-time operators.

The first study was carried out in 1978-1979 by the District's Management Services Section to investigate operator absenteeism characteristics. While it did not address the setting of optimal operator levels directly, the study did conclude that absenteeism rates increase as the operator-to-assignment ratio becomes smaller. This finding is of particular importance if reductions in operator staffing are considered as an approach to generating cost savings for the District. The study also developed a number of other findings regarding absenteeism patterns and recommendations pertaining to the management of operator availability.

The second study was conducted by the "Transportation Department Manpower Forecasting Task Force" in late 1980 or early 1981. This study attempted to relate the average cost per operator assignment to the operator-to-assignment ratio using monthly systemwide data, and concluded that:

- o the "optimal" operator staffing level is at 1.32 operators per assignment; and
- o the "optimal" levels for individual divisions may vary from 1.28 to 1.35 operators per assignment.

The study also noted the fluctuations in operator requirements due to extra service, and suggested increased attention to operator needs planning and monitoring. The SCA study team believes that the systemwide monthly data used for this second study effort was not sufficiently comprehensive for conclusions to be drawn with certainty -- this assessment was also noted in the third study to be described shortly.

The third study was conducted by the Transportation Department in April and May, 1984 using division-level manpower and attendance data for a period of approximately 65 weeks (January, 1983 through March, 1984). This study sought to measure the marginal costs associated with varying operator-to-assignment ratios where marginal costs included:

- o unscheduled guarantee pay hours estimated from the number of shineouts;
- o unscheduled overtime pay hours estimated from the number of OCB/VCB operators;
- o operator fringe benefit costs; and
- o operator sick pay hours estimated from the number of days absent for sick leave.

In reviewing this study's results, it was determined that the computer program used for data analysis had major "bugs" which resulted in virtually all data generated being substantially incorrect. The approach was judged to be of sufficient interest that the data base was rebuilt and analyzed by the SCA study team. These results will be presented later in the report.

The fourth study is a recently completed UMTA-funded demonstration of a methodology for establishing operator requirements based on relationships initially formulated by Peat, Marwick, Mitchell & Company (PMM) in the 1970s and

refined since then by others. The methodology provides for the estimation of "minimum cost" extra board staffing requirements to protect against absences by operators with scheduled assignments. Using this approach, the optimal staffing level corresponds to that where the sum of the following costs is at a minimum:

- o premium pay for working regular runs on overtime;
- o unscheduled guarantee pay for extra board operators; and
- o fixed fringe benefit costs for full-time operators assigned to the extra board.

Both the Transportation Department's representative and the consultants for this demonstration project have been unwilling to share the results of the project with the SCA study team. Later in this report, the implications of demonstration project approach for District operator planning are examined.

2.3.6 Analysis of Weekly Operating and Attendance Data

The SCA study team analyzed weekly manpower report data to investigate relationships that would assist in determining optimal operator staffing levels. Specifically, data analysis efforts were directed to:

- o applying the methodology developed by the Transportation Department for its 1984 study to examine optimal staffing levels;
- o investigate relationships between the number of missed or late pullouts and the operator-to-assignment ratio; and
- o investigate relationships between operator absence due to sickness and the operator-to-assignment ratio.

Based on the application of the Transportation Department's methodology, the "minimum cost" operator-to-assignment ratio was determined to be between 1.25 and 1.27 using full operator fringe benefit costs as estimated by the Finance Department. Cost savings in comparison with applying a 1.30 operator-to-assignment ratio were estimated to be approximately \$1.4 million annually. Using a lower fringe benefit cost factor developed for the Transportation Department study, the minimum cost operator-to-assignment ratio was found to be 1.27. Annual cost savings were estimated to be approximately \$0.6 million in using this lower factor.

The methodology was modified from that used by the Transportation Department in its handling of sick leave costs. The weekly manpower report data used for the analysis did not indicate any relationship between the number of sick leave days per assignment and the operator-to-assignment ratio. Consequently, a relationship based on data developed for the 1978-1979 Management Services Section study was adopted for the SCA study team's analysis. The relationship that was employed showed operator sick days per assignment increasing as the operator-to-assignment ratio decreased according to the formula (0.16 times (1.30 minus the operator-to-assignment ratio)).

Over the past three years, the District has introduced a management by objectives approach wherein the attainment of both performance and budget targets is measured on a regular basis. As already noted, objectives adopted for FY 1985 relate directly to the determination of operator staffing levels, as well as to operator absenteeism and service reliability. It is of particular importance to identify relationships between operator staffing levels and both operator absenteeism and the number of missed or late pullouts to assist in quantifying performance objectives for the Transportation Department so that an appropriate balance among competing objectives can be obtained.

The analysis of weekly manpower report data by the study team has resulted in three findings that may be applied in quantifying changes in operator absenteeism and the number of late or missed pullouts for varying operator-to-assignment ratios. These findings are as follows.

1. The number of days missed due to sickness per assignment does not significantly change as the operator-to-assignment ratio changes. This is an interesting finding which is contradictory with the results of other studies.
2. The number of days missed due to sickness per operator increases as the operator-to-assignment ratio decreases. Mathematically, this relationship follows directly from the finding that the number of sick leave days per assignment remains unchanged.
3. The number of late or missed pullouts due to operators not available increases as the operator-to-assignment ratio decreases. The relationship was found to vary significantly by operating division. For the system, the increase in late and missed pullouts is substantially less than estimated in the past by the Transportation Department for changes in the operator-to-assignment ratio. For a reduction in the operator-to-assignment ratio from 1.32 to 1.30, the Transportation Department estimated an increase in cancelled pullouts from approximately 20 to 370 per week -- data analysis results suggest that the increase would be only from 20 to 25 per week. Based on weekly manpower report data, the change in late or missed pullouts may be estimated as (38 plus-or-minus 3.5 per 0.01 change in the operator-to-assignment ratio).

The data analysis results need to be interpreted with some caution. Specifically, it may be that only short-term relationships are being measured. The number of days absent for sick leave may not increase over a period of 2-3 weeks with a shortage of operators. For a longer period, the increased amount of unscheduled overtime resulting from an extended shortage of operators (or lower operator-to-assignment ratio) may cause higher levels of operator absenteeism.

2.3.7 Estimating Extra Board Operator Requirements for Protecting Against Unscheduled Absences

A methodology was referred to earlier that may be applied to estimate a least cost staffing level for the number of extra board operators to protect against unscheduled absences. This approach provided the basis for the UMTA-sponsored study which was recently completed at the District, and it deserves to be evaluated for District consideration in setting operator levels.

Figure 2-11 illustrates a typical cumulative distribution of open runs for a District operating division. The open runs are the result of unscheduled absences only. If known with sufficient lead time, the open runs will be marked up for extra board operators or operators working days off. If not known in advance, the open runs will be assigned to available report operators or to VCB/OCB operators when necessary. On Figure 2-11, the number of extra board operators available to work open runs may be plotted for alternative approaches to establishing operator levels. This is illustrated in Figure 2-12 where the number of operators has been based on the average number of days not available per operator. For this example, the "last" extra board operator would have no work available for approximately three days of each week. The hatched area in Figure 2-12 represents the total number of days where no work is available for extra board operators and unscheduled guarantee time will be paid.

With the extra board staffing set according to the average number of days not available as shown in Figure 2-12, there will be a number of days where all extra board operators are working and additional operators are required to operate open runs. The total number of daily work assignments requiring additional operators is represented by the shaded area in Figure 2-12. Each of these assignments will result in overtime premium costs being paid to operators.

The methodology considers unscheduled overtime premium and guarantee time costs in addition to operator fringe benefit costs to determine the least cost number of extra board operators. Mathematically, this least cost condition will occur corresponding to the percent days with no work available value in Figure 2-12 of $(100 \text{ times } (a-b)/(a+c))$ where:

- o "a" is the premium pay for an average regular run worked on overtime or one-half of the average run pay hours (estimated 4 hours, 20 minutes);
- o "b" is the daily fixed fringe benefit costs of a full-time operator (estimated by the RTD Finance Department as equivalent to 3 hours, 40 minutes for the recently completed HASTUS demonstration project); and
- o "c" is the guarantee pay per day (8 hours).

Using the estimated values for a, b, and c, the optimal number of extra board operators will correspond to the percent days with no work available for the "last" extra board operator of $(100 \text{ times } (4:20-3:40)/(4:20+8:00))$ or approximately five percent. Thus, the least cost number of extra board operators to protect against operator absences for the District is very close to the level under which no unscheduled guarantee time is paid to operators.

Figure 2-11

CUMULATIVE DISTRIBUTION OF OPEN RUNS DUE TO UNSCHEDULED ABSENCES

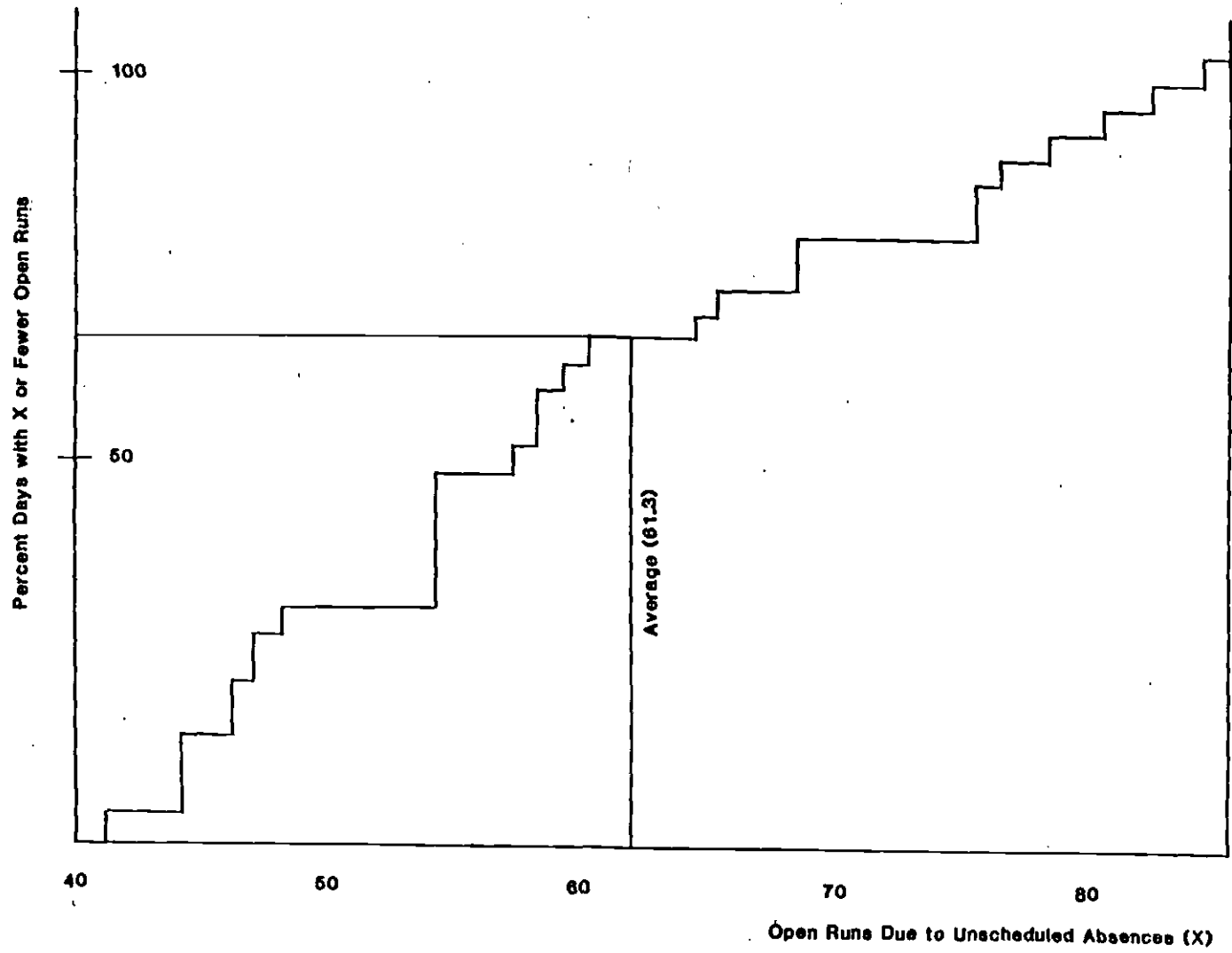
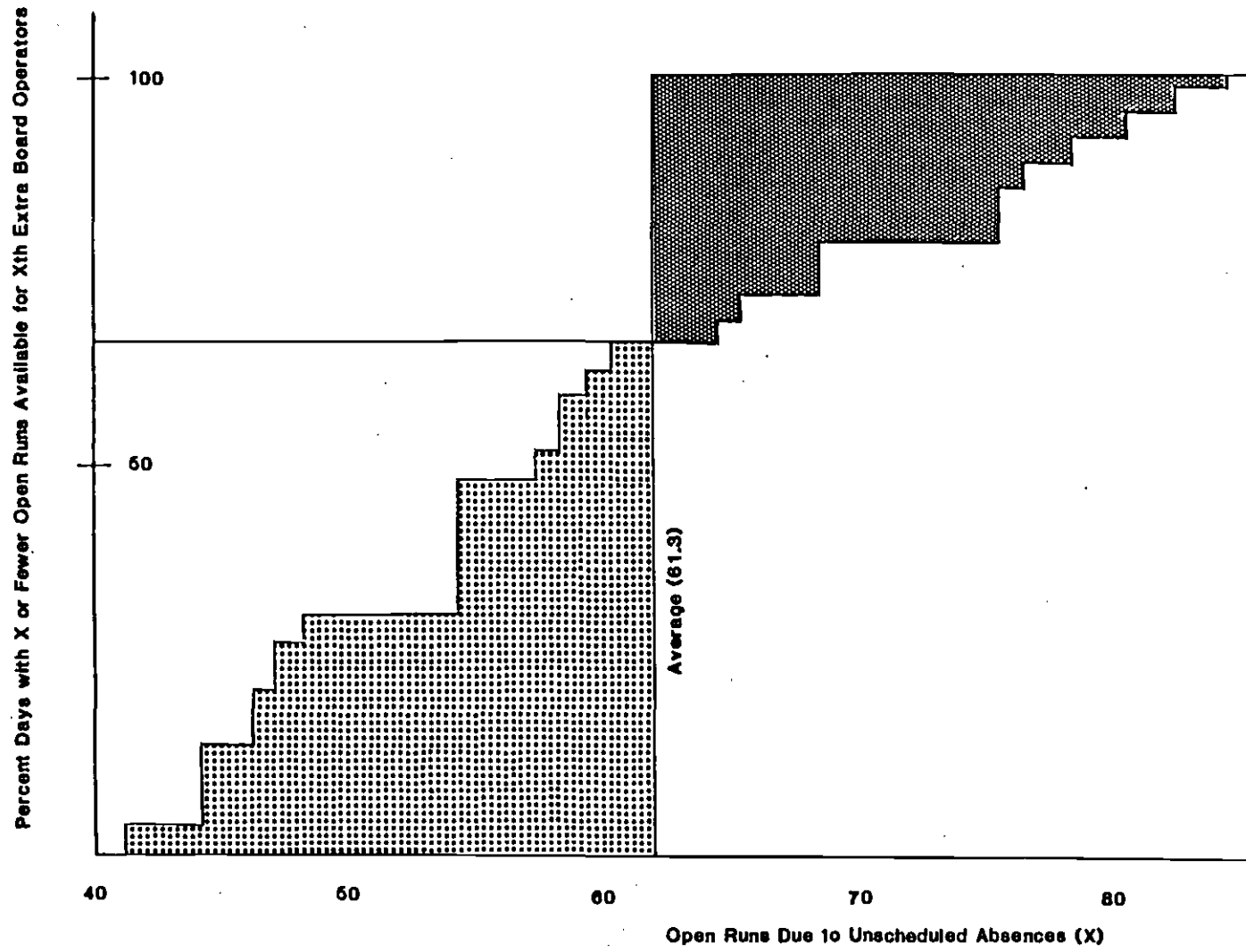


Figure 2-12

CUMULATIVE DISTRIBUTION OF OPEN RUNS DUE TO UNSCHEDULED ABSENCES



This result needs further consideration as it suggests a substantial reduction in operator staffing for daily open assignments. If current District staffing levels are assumed to correspond with extra board staffing based on the average number of days not available (or average number of open runs), reduced operator staffing of 150-220 operators systemwide is indicated. The exact amount depends on the variation in number of open runs at operating divisions. If this approach were implemented for the District, the potential for cost savings would be significant -- annual cost savings are estimated to be between \$1.1 and 1.7 million. If current operator staffing is higher than staffing levels based on the average number of days not available, potential cost savings would be increased.

There are concerns regarding the feasibility of this approach. Each operating division would be required to operate with a reduced number of extra board operators meaning that the following areas of concern need to be considered.

1. The availability of operators for overtime work assignments, either as OCB/VCB operators or by increased work for scheduled regular and extra board operators. From historical weekly manpower report data, it is estimated that the number of OCB/VCB operators would increase to a minimum of 350 per week on the average.
2. It is possible that OCB/VCB operators may be marked up for report assignments and be paid for shining out (12 pay hours guaranteed).
3. With increased overtime requirements, it may be necessary to employ OCB operators for a large number of open run assignments. OCB operators may be paid more than VCB operators for certain types of runs due to the guarantee of 12 hours pay time within a maximum spread time of 11 hours for OCB work assignments.
4. It might be necessary to use operators missing out but reporting late for open assignments. This could serve to increase the number of missouts.
5. Increased absenteeism resulting from higher overtime availability would serve to lower potential cost savings, and to increase the number of daily open run assignments.
6. Reduced service reliability from missed and late pullouts may occur as a result of lower staffing levels.

It is not possible to judge with certainty the extent to which each of these areas of concern may affect the feasibility of the suggested approach or the magnitude of potential cost savings. However, the methodology does demonstrate the potential for significant cost savings through reduced extra board staffing and increased unscheduled overtime costs provided that underlying assumptions are not significantly in error.

The establishment of optimal staffing levels for RTD operators needs to reflect cost control objectives, as well as those related to absenteeism and service reliability. In the end, tradeoffs will need to be made between the degree to which competing objectives are attained. For manpower planning, the least cost level of operator staffing may not be preferred even if its feasibility can be

demonstrated. In view of the above areas of concern, reducing extra board operator staffing by about one-half of the amount resulting from the optimization methodology calculations is recommended as the basis for implementation efforts. On the average, this would reduce systemwide District operator requirements by an estimated 100-125 operators resulting in an operator-to-assignment ratio of 1.27 calculated using the District's current formula. Annual potential cost savings are estimated to be between \$0.8 and 1.1 million with this level of reduced extra board operator staffing. OCB/VCB utilization would increase to an estimated 250 per week on the average based on historical weekly manpower report data.

3. RECOMMENDATIONS FOR IMPROVED OPERATOR PLANNING

The preceding chapter presented the results of the SCA study team's analysis of each of the three components of the manpower planning process at the District. A number of findings were contained in that chapter that indicated possible modifications to current methods and procedures. Based on the analysis results, three principal recommendations for improved operator planning at the District have been developed. Each of the three recommendations is designed to reinforce on-going District programs, specifically:

- o the setting of budget and performance objectives at the beginning of each fiscal year as the basis for monitoring actual budget and performance results;
- o systems development and implementation work under the District's TRANSMIS program; and
- o extension of the District's "management by objectives" approach to operating division managers in the Transportation Department.

With this introduction, the following sections describe each of the areas for improvement recommended for the District's consideration.

3.1 DEVELOPMENT AND MAINTENANCE OF SIX-MONTH OPERATING PLAN

It is recommended that a six-month operating plan be maintained by the District to serve as a blueprint for operations from the present month to approximately six months into the future. It is intended as a rolling plan that is to be updated on a monthly or more frequent basis so that the plan is always in place for six months ahead, but revisions are made on an on-going basis recognizing that all elements of the six-month plan at any point in time could be changed. The plan will be developed to track service levels, work assignments, operator requirements, and selected performance measures for the six-month planning period for each operating division. As a starting point, it is suggested that the plan might encompass the following elements.

Number of bus lines.

Miles and hours of service.

Bus requirements.

Regular run, tripper, and extra service work assignments.

Number of full-time and part-time operators.

Operators not available for selected reasons.

Personnel actions including new hires, transfers, and terminations.

Operator pay and work hours by selected classifications.

Selected performance indicators for which weekly or monthly variations may be anticipated.

The six-month operating plan process will reinforce the District's budget and performance monitoring activities. Initially, it may not be possible that to fully link operating plan data with monthly/quarterly budget and performance objectives. In the longer run, this linkage should be developed. Without the operating plan process as a mechanism for anticipating future changes, the attainment of budget and performance objectives will most likely be dependent on the District's ability to react to monthly and quarterly operating results.

The six-month operating plan process will also reinforce the development of a regular hiring program for transit operators lost to attrition. When incorporated into the six-month operating plan, hiring requirements will be specified so that the Personnel Department is able to anticipate all actions that may be necessary in the near future. Through the six-month operating plan process, all changes in operator work assignments will be identified in advance. One of the District's operating objectives is to minimize changes in operator work assignments (except when required for service and schedule changes and for operational problems) in order to provide for maximum continuity of on-the-street supervision of bus operators. With the consideration of work assignment changes as an element of the six-month operating plan, increased attention may be directed to reaching a balance of competing District objectives for scheduling responsiveness to changing conditions and for providing maximum stability in operating schedules for improved operator supervision.

3.1.1 New Services Review Board

Management responsibility for the six-month operating plan is recommended for the New Services Review Board with staff support for developing and maintaining the plan coordinated by the office of the Assistant General Manager for Operations. The New Services Review Board is already in existence to provide a means to coordinate actions and information on service changes that may include manpower changes. There appears to be no reason to change the New Services Review Board with respect to its composition and staffing, its frequency of meetings, and its overall responsibilities, except perhaps to add the Director of Personnel as staff support on a regular basis.

The primary element of change that is recommended is for the New Services Review Board to consider the six-month operating plan at each of its meetings. Proposed service and schedule changes will then be considered in the context of the six-month plan. Operator staffing levels at the divisional level in terms of full-time and part-time operators will be considered in connection with proposed service and schedule changes -- will staffing changes require a reallocation of operators among divisions or between full-time and part-time? Will staffing changes require new hiring or a decrease in a number of operators by type and division? On a regular basis, it is also recommended that the New Service Review Board report to the Advanced Planning Committee of the SCRTD Board of Directors concerning the six-month operating plan.

3.1.2 Staff Support for Plan Development and Maintenance

Staff responsibility for developing and maintaining the six-month Operating Plan should be located in the office of the Assistant General Manager for Operations

where management authority for the Transportation, Scheduling, and other operating departments currently exists. This responsibility may require a new staff assignment, and the application of analytical skills and tasks not currently resident in the office of the Assistant General Manager for Operations. In this case, the necessary position will need to be created and filled by either hiring or by transfer from within the District.

Technical support for the six-month operating plan will also be required from the Scheduling and Transportation Departments on a regular basis. From the Scheduling Department, estimates of the number of weekly regular runs, trippers, and extra service assignments taking into account any anticipated changes in schedules and work runs will be required. It is necessary that the estimation of work assignments be achieved quickly without the necessity for detailed analysis. This may be done using professional judgment and experience or through the application of appropriate analytical methods. From the Transportation Department, operator staffing and related elements of the six-month operating plan will be required in a timely manner. The six-month operating plan is intended to an end product that reflects the best available information from all departments concerned with bus operations, and therefore it is important that these departments be directly involved in the development and maintenance of the operating plan.

3.1.3 Implementation of the Recommendation

The District's initial six-month operating plan should be developed for the first six months of FY 1986, July through December, 1985. The operating plan would be based on the adopted FY 1986 budget currently under development at the District. This period of six months will involve a number of service changes that may provide the basis for judging the effectiveness of the recommended six-month operating plan process. Specifically, service changes are being planned or may be required for the following.

- o On July 1, 1985 a significant reduction in bus service levels is planned with the elimination of approximately 175 bus runs, mostly peak period tripper service. This reduction in service levels is in anticipation of lower ridership resulting from increased fares to become effective in July.
- o Following this increase in fares and service reduction for selected bus lines, it is anticipated that schedule adjustments may be needed in response to actual ridership levels throughout the system.
- o It is planned to close operating division 2 located in central Los Angeles in September, resulting in the distribution of work assignments and operators to other operating divisions.
- o Possible reductions in Federal operating subsidy monies may require additional service cutbacks in the fall months.

To be in place by July, the District may elect to utilize SCA consultant team support available as part of the third phase of this study to assist in the establishment and initial development of the six-month operating plan process.

3.2 AUTOMATED INFORMATION SYSTEMS TO SUPPORT OPERATING PLANNING FUNCTIONS

It is recommended that automated information systems be developed and implemented to support each of the operator planning functions at the District. This can be most effectively done as part of the TRANSMIS systems development program although selected capabilities may be enhancements outside of the scope of the current work program. In the interim period until TRANSMIS systems are in place, selected capabilities may need to be implemented using available District microcomputer processing resources. Information systems requirements for operating planning purposes have been identified to include the following.

- o Customization of available operator planning systems to support the development maintenance of the six-month operating plan.
- o Implementation of automated capabilities for estimating and developing operator work assignments using mathematical optimization techniques.
- o TRANSMIS systems capabilities to support each of the operator planning functions.

3.2.1 Customization of Available Operator Planning Systems

The SCA study team believes that providing automated tools to support the development of the six-month operating plan is required for the successful introduction of this planning process at the District. Without the support of analytical tools, the manual manipulation of data from several sources will become burdensome resulting the six-month operating plan being consistently out-of-date and eventually disregarded. At this point, the District will have returned to the current situation where a systematic approach is lacking as the basis for anticipating service and schedule changes.

In the longer run, TRANSMIS systems may provide the full range of necessary capabilities. To support the development of the initial six-month operating plan for July through December, 1985, there are two possible courses of action:

- o customization of either the UBUCKS Driver Extraboard Cost Model or Seattle Metro Weekly Manpower Planning Model; or
- o custom development of support system capabilities using an available microcomputer spreadsheet or data base management system

The UBUCKS package of programs is under development by the Urban Mass Transportation Administration (UMTA). The system has been designed as a micro-computer tool to assist transit operators with five-year financial planning and budgeting activities. The Driver Extraboard (DEB) Cost Model component of the package has been developed and may be obtained from UMTA although it is not available for general distribution. It was obtained by the SCA study team and evaluated for use in the development and maintenance of the six-month operating plan.

The UBUCKS/DEB model would require modification to support the maintenance of the six-month operating plan. More specifically, modifications of the following types would be required.

- o Increased detail for selected data inputs and outputs -- for example, the model presently provides a monthly framework for a five-year planning period. For the six-month operating plan, weekly information may be required.
- o Override parameter-driven model components -- for example, hiring and instruction activities are specified on the basis of input parameters concerning hiring and instruction lead times. These lead times will vary depending on specific hiring and instruction requirements that may be anticipated for the six-month operating plan. Except for the requirements of a regular program for attrition, other hiring and instruction activities should be input to the six-month operating plan directly by the Personnel and Transportation Departments.
- o Customization for District-specific requirements -- for example, providing capabilities for recording extra work assignments and operator transfers between divisions.
- o Eliminate program bugs -- as UMTA is continuing with UBUCKS/DEB development efforts, modifications of this type may not be necessary.

The UBUCKS/DEB package provides sophisticated modeling capabilities that have been designed for five-year financial planning. Figure 3-1 shows examples of the model's standard reports. Its design incorporates limitations that would significantly restrict its usefulness for near term operational planning, and includes components such as the "scheduling simulator" which would be of no interest for operational planning purposes at the District.

The Seattle Metro Weekly Manpower Planning Model is written in FORTRAN and designed to run on an IBM mainframe. It provides for the estimation of weekly manpower variances and hiring needs based on the following variables.

- Annual absence rates.
- Annual attrition rates.
- Tolerance for manpower deficits before hiring.
- Training class attrition.
- Class size.
- Training period in weeks.
- Starting driver population and drivers in training.
- Weekly operator vacation weeks.
- Weekly scheduled and unscheduled work estimates.

Seattle Metro's model is similar to one of the components of the UBUCKS/DEB model for staffing plan development, but it has been developed for weekly operator planning purposes and not for longer range financial planning. Figure 3-2 shows an example report generated by the model which illustrates the information being processed by the program.

Based on the study team's preliminary analysis of support system requirements for the development and maintenance of the six-month operating plan, it is not clear that the use of either of these packaged models offer any advantages in comparison with the custom development of microcomputer-based capabilities. At this time, the latter approach is recommended as the preferred course of action to support the startup of the six-month operating plan process.

FIGURE 3-1

EXAMPLE UBUCKS DRIVER
EXTRABOARD COST MODEL REPORTS

SERVICE HOURS SUMMARY
DRIVER/EXTRABOARD COST MODEL
MONTHLY SUMMARY FOR FIRST HALF OF YEAR 10/84 - 9/85

	MODEL PERIOD 1/83 - 12/87		REPORTING PERIOD 10/84 - 3/85			
	OCT	NOV	DEC	JAN	FEB	MAR
DAILY SERVICE HOURS						
WEEKDAY	2257	2257	2257	2483	2483	2483
SATURDAY	1705	1705	1705	3166	3166	3166
SUNDAY	1242	1242	1242	1366	1366	1366
HOLIDAY	1242	1242	1242	1366	1366	1366
DAYS OPERATED						
WEEKDAY	23	21	20	21	20	21
SATURDAY	4	4	5	4	4	5
SUNDAY	4	4	5	4	4	5
HOLIDAY	0	1	1	2	0	0
MONTHLY SERVICE HOURS						
	63699	60427	61117	73003	67788	74803

FIGURE 3-1 (CONTINUED)

EXAMPLE UBUCKS DRIVER
EXTRABOARD COST MODEL REPORTS

MANPOWER LEVELING SUMMARY
DRIVER/EXTRABOARD COST MODEL
MONTHLY SUMMARY FOR FIRST HALF OF YEAR 10/84 - 9/85

	MODEL PERIOD 1/83 - 12/87			REPORTING PERIOD 10/84 - 3/85		
	OCT	NOV	DEC	JAN	FEB	MAR
DRIVER POPULATION						
FULL TIME						
INITIAL	386	383	380	377	425	421
ATTRITION	3	3	3	3	4	4
PART TIME						
INITIAL	61	61	61	61	61	61
ATTRITION	0	0	0	0	0	0
AVG WEEKLY DEMAND VS SUPPLY						
FULL TIME						
NEED	316	316	316	345	345	345
AVAILABLE	301	297	296	294	325	327
VARIANCE	-15	-19	-20	-51	-20	-18
PART TIME						
NEED	61	61	61	61	61	61
AVAILABLE	61	61	61	61	61	61
VARIANCE	0	0	0	0	0	0
FULL TIME EQUIV VAR	-15	-19	-20	-51	-20	-18
LEVELING ACTION						
FULL TIME						
HIRE FROM PT	0	0	0	51	0	0
NEW HIRES	0	0	0	0	0	0
LAYOFF	0	0	0	0	0	0
PART TIME						
HIRE	0	0	0	51	0	0
LAYOFF	0	0	0	0	0	0
HIRING ACTIVITY						
FT FROM PT	11	20	20	0	0	0
NEW FT	0	0	0	0	0	0
NEW PT	20	0	0	0	0	0

FIGURE 3-1 (CONTINUED)

EXAMPLE UBUCKS DRIVER
EXTRABOARD COST MODEL REPORTS

EXTRABOARD UTILIZATION SUMMARY
DRIVER/EXTRABOARD COST MODEL
MONTHLY SUMMARY FOR FIRST HALF OF YEAR 10/84 - 9/85

	MODEL PERIOD 1/83 - 12/87						REPORTING PERIOD 10/84 - 3/85					
	OCT	NOV	DEC	JAN	FEB	MAR	OCT	NOV	DEC	JAN	FEB	MAR
WEEKDAY EB REQ												
VACATION WORK												
REGULAR	13	13	13	15	16	15	13	13	13	15	16	15
PART TIME	0	0	0	0	0	0	0	0	0	0	0	0
EB AVAILABLE	13	13	13	15	16	15	13	13	13	15	16	15
OTHER OPEN WORK												
REGULAR OPEN	30	30	30	34	36	34	30	30	30	34	36	34
PT OPEN	1	1	1	1	1	1	1	1	1	1	1	1
OPEN TRIPPERS	39	39	39	39	39	39	39	39	39	39	39	39
TOT OTHER-AVG	70	70	70	74	76	74	70	70	70	74	76	74
TOT OTHER-MIN	64	64	64	67	69	67	64	64	64	67	69	67
TOT OTHER-MAX	76	76	76	81	83	81	76	76	76	81	83	81
EB AVAILABLE	60	65	76	67	62	62	60	65	76	67	62	62
MONTHLY UNSCHEDULED PAY HOURS												
GUARANTEE	1125	1327	2691	1250	812	933	1125	1327	2691	1250	812	933
OVERTIME	860	473	52	587	1093	1010	860	473	52	587	1093	1010

FIGURE 3-2

EXAMPLE SEATTLE METRO WEEKLY
MANPOWER SUMMARY REPORT

PERIOD	1018		1025		1101		1108		1115		1122		1129		1206		1213		
WORK	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	
RUNS & COMBOS		714		714		714		714		714		714		714		714		714	
TRIPPERS	782	36	782	36	782	36	782	36	782	36	782	36	782	36	782	36	782	36	
EXTRAS & LEASES	0		0		0		0		0		0		0		0		0		
REPORTS		52		52		52		52		52		52		52		52		52	
TOTAL WORK	782	802	782	802	782	802	782	802	782	802	782	802	782	802	782	802	782	802	

NUMBER OF OPERATORS																			

START	687	1188	682	1185	677	1182	691	1179	686	1176	681	1173	690	1170	696	1167	702	1164	
ATTRITION	5	3	5	3	5	3	5	3	5	3	5	3	5	3	5	3	5	3	
QUALIFIED	0	0	0	0	19	0	0	0	0	0	14	0	11	0	11	0	0	0	
BALANCE	662	1185	677	1182	691	1179	686	1176	681	1173	690	1170	696	1167	702	1164	697	1161	

ABSENCES																			

INDUSTRIAL		17		17		17		17		16		16		16		16		16	
VACATIONS		60		60		60		60		60		60		60		60		60	
HOLIDAY		4		4		4		4		4		4		4		4		4	
DETAILED		28		28		28		28		27		27		27		27		27	
SICK	14	45	14	45	14	45	14	45	14	44	14	44	14	44	14	44	14	44	
MILITARY		4		4		4		4		3		3		3		3		3	
EXCUSED	6	33	6	33	6	33	6	33	6	32	6	32	6	32	6	32	7	32	
RCV		178		177		177		176		176		175		175		175		174	
OTHER	0	2	0	2	0	2	0	2	0	1	0	1	0	1	0	1	0	1	
TOTAL	20	371	20	370	20	370	20	369	20	362	20	361	20	361	20	361	21	360	
** NUMBER AVAILABLE	662	814	657	812	671	809	666	807	661	811	670	809	676	806	682	803	676	801	
** BALANCE	-120	12	-125	10	-111	7	-116	5	-121	9	-112	7	-106	4	-100	1	-106	-1	
** OT TRIPPERS		40		40		40		40		40		40		40		40		40	
**** VARIANCE	-120	52	-125	50	-111	47	-116	45	-121	49	-112	47	-106	44	-100	41	-106	39	
FULL-TIME EQUIV VAR		-8		-12		-8		-13		-11		-9		-9		-9		-14	

64 63

3.2.2 Implementation of Optimization Software for Estimating and Developing Operator Work Assignments

It is recommended that the District undertake the implementation of automated capabilities for the development of operator work assignments using mathematical optimization techniques. Software providing capabilities of this type could be effectively used at the District for the following.

- o Forecasting changes in the number of work assignments resulting from service and schedule changes.
- o Developing operator work assignments that provide for the "optimal" breakdown of bus runs into regular run and tripper work assignments.
- o Adjusting the size of regular runs for short-term operator shortage and surplus conditions.

The District is currently employing a system with the desired capabilities to assist with on-going UTU labor negotiations at the District. The HASTUS system includes modules for the development of production operator work assignments ("run cutting") using mathematical optimization techniques, and for the simulation of operator work assignments. The operator work assignment simulation module, referred to as HASTUS/macro, was demonstrated at the District in 1982 and is currently being applied for labor agreement negotiations to forecast changes resulting from work rule modifications.

To support the development and maintenance of the six-month operating plan, the HASTUS/macro module could be effectively employed by the Scheduling Department to estimate work assignment changes for service and schedule revisions. To be used with maximum confidence and to provide added capabilities for optimizing operator work run assignments, the run cutting module (referred to as HASTUS/micro) should also be implemented for use by the Scheduling Department.

3.2.3 TRANSMIS Transportation Systems Development

A major portion of the TRANSMIS-II work program is directed to systems development to support the District's Transportation Department operations. For operator planning functions, TRANSMIS capabilities need to provide for the following.

- o Operating division operations monitoring including historical data relating to operator absenteeism, service reliability, and cost control that may be analyzed to establish operating division budget and performance objectives.
- o Management reporting of operating divisions performance supported by capabilities for the diagnostic analysis of problem areas noted from management reports.
- o Development and maintenance of the six-month operating plan.

The final phase of the TRANSMIS-II systems development program for the District's Transportation Department is to address software systems for operator manpower planning. This phase is scheduled to begin in late 1985 meaning that

capabilities to support the development and maintenance of the six-month operating plan would not be in place until the middle months of 1986. It is possible that this approach would result in a system that is highly integrated with other TRANSMIS-II transportation, scheduling, and planning systems depending on the level of effort which may be available for systems development in the final phase of the TRANSMIS-II program.

3.3 OPERATOR ALLOCATIONS AT OPERATING DIVISION

The District consists of fourteen operating divisions, each with varying characteristics such as the types of lines operated, peak-to-base ratio of bus runs, seniority of operators working at the division, and effectiveness of the management and supervisory groups at the division. In some respects, each District operating division may be as different from the others as would be expected in comparing the transit operators in Santa Monica, San Diego, and Sacramento with each other. In the future, an understanding of these differences will become increasingly important. For the Transportation Department, both budget and performance objectives are currently established as systemwide objectives. The systemwide objectives are then assigned on a "pro rata" or other uniform basis to individual operating divisions. This approach to establishing division budget and performance objectives results in the following.

1. Division performance and budget objectives may be easily attained by some divisions, but for other divisions, achieving the desired results may be impossible. The result is either that the objective will not be met for the system or that objectives are specified so that the "worst" performance is accommodated.
2. Division managers need to be involved in the development of budget and performance objectives which reflect division-level characteristics and historical trends. Improvements should be sought in establishing budget and performance expectations for each operating division that are realistic with respect to the preceding year's operating performance and results.

The operator-to-assignment ratio is closely tied to budget and performance objectives, specifically relating to cost control, service reliability, and absenteeism. These relationships have been examined in an earlier chapter of this report. Currently, division operator allocations are generally determined by applying the systemwide operator-to-assignment ratio to individual operating divisions. This approach results in some operating divisions having surplus manpower available to cover daily open assignments while other operating divisions are operated with relatively fewer operators available for filling open work assignments. The application of the operator-to-assignment ratio in this manner illustrates the problems of setting budget and performance objectives based on systemwide data. As part of the foundation for the Transportation Department's "management by objectives" program being effectively extended to operating division managers, it is necessary that operator staffing levels be established based on the requirements and characteristics of each operating division. Budget and performance objectives relating to cost control, service reliability, and absenteeism may then be implemented in a similar manner.

3.3.1 Calculation of Operator Requirements

It is recommended that operator requirements be calculated for operating divisions based on the following.

- o The determination of work assignments should include tripper and extra service operated on Saturdays and Sundays.
- o The operator-to-assignment ratio used to set operator levels at each operating division should be adjusted for differences in operator absence characteristics.

To illustrate the calculation, consider the District's operating Division 2.

	<u>Current</u>	<u>Adjusted</u>
Number of assignments (October 27, 1984)	346	--
Adjust for Saturday and Sunday trippers	--	349
Operator-to-assignment ratio based on 1983 average days not available	--	1.22
Adjust for operators on extended leave	--	1.25
Operator-to-assignment ratio	1.30	1.25
Number of operators required	450	436

This is a reduction of fourteen operators or approximately three percent below the level calculated using the District's current approach. Using the current operator-to-assignment ratio formula, this reduced staffing would correspond to a ratio of 1.26 (calculated as 436 operators divided by 346 assignments).

Using this approach, operating staffing levels would be lowered significantly at operating Divisions 1, 2, and 15; increase significantly at Divisions 5, 7, and 9; and be nearly the same for other operating divisions. Divisions 5, 7, and 9 are currently operating without problem at existing staffing levels so that increased staffing would only result in higher costs for the District. Table 3-1 summarizes operator staffing requirements at each operating division using the operator-to-assignment ratio adjusted for division characteristics, but without any increase in the number of operators required. This results in an overall operator staffing reduction of approximately 46 operators, and estimated potential annual cost savings of approximately \$500,000.

3.3.2 Potential East Savings Through Reduced Operator Staffing

Study analysis has indicated the potential for \$0.8-1.1 million in annual cost savings by reducing operator staffing levels by approximately 2.5 percent systemwide. In comparison with the existing operator-to-assignment ratio of

1.30 based on the District formula, the lower number of operators would correspond to an operator-to-assignment ratio of 1.27.

In the preceding section, the application of an operator-to-assignment ratio adjusted for individual operating division characteristics was illustrated resulting in a significant reduction in operator requirements and potential cost savings. Except for operating Divisions 5, 7, and 9 where lower operator allocations are already implemented using the District's operator-to-assignment approach, it would be possible to reduce the number of operators at each of the other divisions by up to approximately 2.5 percent to obtain additional cost savings. For all divisions, this reduction would be approximately 72 operators to obtain the full amount of estimated cost savings (see Table 3-1).

3.3.3 Implementation of the Recommendation

For any reduction in the number of operators, there is concern regarding the feasibility of introducing lower operator staffing levels due to potential increases in operator absenteeism OCB/VCB operator requirements, and the number of late and missed pullouts. Historical weekly manpower report data for the District's operating divisions that potential increases in each of these areas may occur, but without causing undue disruption to the District's operations. The historical data analysis may not accurately reflect changes in operator absenteeism, OCB/VCB operator requirements and the number of late and missed pullouts resulting from longer term periods of reduced operator staffing levels and requirements for increased overtime work.

Without definitive data to address the areas of concern, it is recommended that a pilot or project demonstration of reduced staffing levels be implemented for at least two operating divisions. At a minimum, it is recommended that the pilot program include a reduction of ten to twelve operators at either Division 1 or Division 15 and a reduction of at least 2.5 percent below current levels at any one of operating Divisions 3, 8, 12, or 18.

Full management support for the demonstration is essential, particularly during the startup period and at other times when days having a large number of open runs are not managed in an effective manner since mark-up and dispatching strategies for these conditions have not been fully considered. If it is believed that one or two days with a large number of missed or late pullouts will lead to the restoration of higher staffing levels, it can be assured that the demonstration program will not be successful as a test of lower operator allocations.

The demonstration project should be allowed to continue for a period of at least six months. This should be an adequate length of time for longer term responses to increased overtime to be determined. Throughout the demonstration period, daily and weekly operations should be carefully monitored using existing reporting systems and comparative data tabulations developed for monitoring and evaluation purposes. Additionally, mark-up and dispatching results should be examined periodically, particularly for days of poorer performance, to investigate alternative strategies that are being employed or that might be used for improved performance in the future.

TABLE 3-1

OPERATOR ALLOCATIONS BASED ON ADJUSTED
OPERATOR-TO-ASSIGNMENT RATIO

Division	Number of Assignments (a)		Number of Operators		Change
	Current	Adjusted for Saturday and Sunday Trippers	Current (b)	Adjusted Ratio (c)	
1	265	268	345	334	(11)
2	346	349	450	435	(15)
3	274	281	356	356	--
5	311	315	404	404	--
6	114	117	148	146	(2)
7	356	361	463	463	--
8	249	253	324	320	(4)
9	406	418	528	528	--
10	264	269	343	343	--
12	212	215	273	272	(3)
15	292	296	380	369	(11)
16	119	121	155	155	--
18	212	216	275	275	--
23	166	168	216	216	--
Total	3,586	3,647	4,662	4,616	46

- Notes: (a) Number of assignments is based on operating data for the week ending October 27, 1984.
 (b) Using District operator-to-assignment ratio of 1.30.
 (c) Number of operators based on the adjusted operator-to-assignment ratio except where an increased number of operators calculated.