UMTA-MA-06-0016-82-8
DOT-TSC-UMTA-82-30

U.S. Department
of Transportation

**Urban Mass
Transportation
Administration**

Evaluation of the July, 1980, SCRTD (Los Angeles) Fare Increase

**Final Report
September 1982**

UMTA/TSC Project Evaluation Series
Service and Management Demonstrations Program

NOTICE

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

NOTICE

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UMTA-MA-06-0016-82-8		

4. Title and Subtitle

EVALUATION OF THE JULY, 1980, SCRTD (LOS ANGELES) FARE INCREASE

5. Report Date: September 1982

6. Performing Organization Code: DTS-64

7. Author(s): John Attanucci, David Vozzolo, Imogene Burns

8. Performing Organization Report No.: DOT-TSC-UMTA-82-30

9. Performing Organization Name and Address

Multisystems, Inc.
1050 Massachusetts Avenue
Cambridge, MA 02138

10. Work Unit No. (TRAIS): UM227/R2676

11. Contract or Grant No.: DOT-TSC-1412

13. Type of Report and Period Covered: Final Report

12. Sponsoring Agency Name and Address

U.S. Department of Transportation
Urban Mass Transportation Administration
Office of Technical Assistance
Office of Service and Management Demonstrations
Washington DC 20590

14. Sponsoring Agency Code: URT-30

15. Supplementary Notes

*Under contract to: U.S. Department of Transportation
Research and Special Programs Administration
Transportation Systems Center
Cambridge MA 02142

16. Abstract

This report presents an evaluation of a fare structure revision planned and implemented by the Southern California Rapid Transit District (SCRTD) during July, 1980. The changes included a variety of increases in both cash fares and monthly pass prices for different user groups (local, express, student, E&H); however, the most significant revision involved a substantial increase in the cash transfer charge.

The evaluation indicates that SCRTD realized a substantial and relatively stable increase in revenue without a significant ridership loss. However, there are indications of a loss of some non-work, off-peak discretionary trips. The majority of the new revenue generated was a result of a substantial increase in monthly pass sales. In fact, major shifts in fare payment method were detected (primarily from cash to pass use for transferring passengers). Perhaps the most significant finding showed a surprisingly large number of a sample of individual riders (40%) entering or leaving the system, or significantly increasing or decreasing frequency of use, as a result of changes in personal activity - and not due to the fare structure revisions. The methodology used and reported on here includes a rather innovative retrospective panel interview for which a sample of riders using the system prior to the fare change were recontacted several months after the revision to determine what changes, if any, they had made in their travel patterns.

17. Key Words	18. Distribution Statement
Bus, Fixed Route; Transit Fare Policies; Transit Management; Evaluation Techniques; Surveys; Transit Planning.	DOCUMENT IS AVAILABLE THROUGH SUPERINTENDENT OF DOCUMENTS U.S. GOVERNMENT PRINTING OFFICE WASHINGTON DC 20402

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED	76	

PREFACE

This report was prepared by Multisystems, Inc. The authors are John Attanucci, David Vozzolo, and Imogene Burns. Technical and editorial input was received from Carla Heaton and Robert Waksman of the Transportation Systems Center as well as Joel Woodhull and Ed Vanderenter of the Southern California Rapid Transit District. Draft and final documents were typed by Gail Bublis, Gail Pasquale, Joanne Polley and Ranwa Ramadan.

The authors would like to thank the staff of the Southern California Rapid Transit District for their invaluable assistance and cooperation. In particular, Joel Woodhull of Scheduling, Ed Vanderenter and Ann Huck of Service Analysis, Jim Sowell of Planning and Jackie Matosian of Marketing were extremely helpful. In addition, we express our thanks to Richard Hurlbert and Allen Buchalter of MSI International in Los Angeles for their assistance in conducting and processing the data from the retrospective panel interview.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

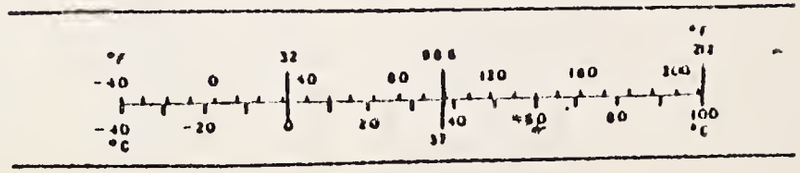


TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION AND BACKGROUND

Faced with rapidly escalating costs and shrinking public resources on all levels of government in recent years, public transit authorities around the country are increasingly turning to the farebox as an important source of new revenue. This development follows a decade during which fares were stabilized and, in some cities, reduced with the aim of increasing ridership, often on expanded services. Rather than reduce productive services, transit managers and boards have realized that fares can provide a significant revenue boost while, presumably, not impacting ridership appreciably. It has been argued effectively that auto operating costs have inflated so rapidly during the last five years that even a doubling of transit fares would fail to approach the point at which a significant transit ridership loss could be expected due to price competition.

While the primary objective of a fare increase obviously is to raise revenue, a secondary objective can be to alter the structure of ridership and thereby facilitate more efficient operation of the system. As regards the former, in order to maximize the revenue gain from a fare increase, the transit operator must balance the sometimes conflicting objectives of raising fares for the riders who are least likely to leave the system, e.g., by switching to another mode or choosing not to make the trip, with the wish to minimize the hardship placed on the riders least able to afford it. As regards the latter, some redistribution of ridership can be realized through pricing schemes, such as offering discounts during off-peak periods to certain user groups and thus reducing congestion during the peak periods. Marketing functions can also be facilitated by changes in the fare structure, such as encouraging companies to offer transit passes as part of the benefit package, or promoting the use of weekend family passes.

This kind of fine-tuning of the level and structure of fares requires detailed knowledge of passengers and their ridership patterns, which can be greatly enhanced by information about past fare increases on the system in question and the experiences of other systems. Unfortunately, little information is available regarding the detailed impacts of recent transit system fare increases. Such analyses are often difficult to perform since the detailed "before" data necessary to make sound comparisons are often unavailable on a routine basis and decisions to raise fares are made with short lead times, making special data collection efforts difficult. The need for rigorous analyses is especially critical as more systems look to overall revisions to their fare structure, rather than simple across-the-board

increases. In such cases, the impacts of a fare increase may fall more heavily on one or more market segments and the differential impacts should be assessed. As transit properties move toward a second or third round of significant fare increases, information concerning the impacts of prior increases as well as the experiences with similar changes in other cities can provide important indications to decision-makers of the implications of particular types of fare changes.

This report relates the results of an analysis of one such fare increase: a fare structure revision planned and put into effect by the Southern California Rapid Transit District (SCRTD) during July, 1980. While only a limited number of special data collection activities accompanied this particular fare increase, the type and level of detail of data normally collected by SCRTD have permitted a reasonably detailed examination of the impacts of this fare increase. (It is clear, however, that the use of more sophisticated data collection techniques would improve this and other such analyses.) The analysis is not exhaustive nor are the specific results particularly startling. The results and conclusions should be added to the limited body of knowledge currently available regarding fare hikes and further research should be undertaken to integrate the impacts being reported as a result of individual fare increases in cities around the country.

1.1 Study Site[1]

The SCRTD provided fixed-route bus service to the urbanized southern portion of Los Angeles County as well as some contiguous urban areas in surrounding Orange, San Bernardino, Riverside, and Ventura Counties. The district serves a region of over eight million people within a service area of approximately 2,300 square miles. During the summer of 1980, the SCRTD carried 1,220,000 average weekday passengers (unlinked trips) on 224 local and express routes, making it the third largest transit system in the country and the largest all-bus property. The district operated 2,016 peak period buses and 1,228 base (midday) period buses during the summer of 1980 for a total of 23,200 average weekday scheduled vehicle hours. For the quarter immediately preceding the July, 1980 fare increase, system revenues accounted for approximately 37% of a total annual operating budget of about $300 million.

The SCRTD is governed by an eleven member appointed Board which has the authority to supervise and regulate all transit facilities and services owned and operated by the District. The Board is empowered to issue general obligation bonds, tax property with the consent of District voters, and set fare levels and price structures for all SCRTD services. Until early 1974, the SCRTD had a rather intricate fare structure encompassing 318 zones. The base fare was 30 cents and zonal stages were 8 cents each. Following the oil embargo of 1973, the District instituted a flat fare system with the base fare set at 25 cents. Over the past six years, there have been a number of fare adjustments. Between July 1, 1977 and June 30, 1978, the base cash fare was 40 cents for regular customers and a dime for seniors, supplemented by 10

---

[1] Portions of this description were taken from Cervero et al., Efficiency and Energy Implications of Alternative Transit Fare Policies, UCLA, September, 1980.

cents transfers and 20 cents express service surcharges. On July 1, 1978, the regular base and senior citizens price was raised by 5 cents, with most other fare components remaining unchanged. On November 1, 1979, the base fare was raised to 55 cents, transfers were reduced from 10 cents to 5 cents, senior cash fares were raised by 5 cents, and all other fare components remained the same. This fare structure remained in effect until the July, 1980 modifications.

Results from ridership surveys conducted in both 1978 and 1979 indicated that many of the SCRTD's patrons were transit-dependent. Over 75 percent of the district's users were from households with incomes below $15,000. Also, many were either young or old - riders under 21 and above 62 years of age comprised more than a third of sampled riders. Approximately 36 percent of all users lived in households with no cars; nearly 60 percent of SCRTD's riders cited the unavailability of a car as their main reason for traveling by bus. About half of all journeys were to and from work, 43 percent of all trips occurred during the five hour morning and evening peak period, and the average ride was about 4 miles in length. However, in 1970, only about 5.4 percent of the workers in Los Angeles County reported to the U.S. Census that they used public transit for work trips.

1.2 Background

On July 14, 1980, the Southern California Rapid Transit District (SCRTD) increased cash fares on all services operated by the District. An across-the-board increase in monthly pass prices was subsequently made effective on August 1, 1980. These fare increases followed more than three months of negotiations regarding the most appropriate future fare structure by the SCRTD Board of Directors.

The deliberations included a host of alternative fare structure proposals which would increase revenues approximately $30 million annually to cover projected FY '80-'81 budget deficits. An initial proposal, scheduled for implementation on May 1, 1980 was never implemented when the Board heeded angry public reaction to the specifics of the plan and the Los Angeles County Transportation Commission released a $4.6 million emergency subsidy for use until July 1, 1980.

The major objections to the earlier plan revolved primarily around the proposed elimination of all reduced-fare transfers (i.e., all boarding passengers would pay their regular fare), elimination of college student reduced fares, and the introduction of peak period surcharges for the elderly. While these objections were generally heeded (e.g., the increases were more across-the-board) in the determination of the final adopted plan, the existing structure was altered somewhat and the changes may have had significant impacts on SCRTD travel and fare payment patterns. Although the final plan implementation was delayed the day before its proposed effective date of July 1, 1980 due to a preliminary court injunction obtained by a community group, this delay was overturned shortly thereafter and the adopted increases were all in effect by August 1, 1980.

The changes made in each of the various SCRTD fare categories are shown in Table 1.1. The impact on each express zone is shown as well as the impact on local zone transferring passengers. The cash fares and total pass prices are shown along with a measure of the pass value based on the "break even" number of trips per month. The table indicates several shifts in the overall fare structure:

- the cash fare for transferring passengers increased significantly more than the fare for non-transferring passengers, although monthly pass prices were increased at the same rate for both groups;
- the cash fare discount for college and vocational students was eliminated, although they still enjoy a significant, although lesser, discount (23%) if they purchase a monthly pass;
- pass purchases became much more attractive (greater discounts) for longer distance riders (e.g., transferring passengers, longer express trips) while local one-bus and short express riders had pass value reduced slightly; and
- while elderly and handicapped fares were increased by 50%, the percentage discount from full fares was changed only slightly and elderly/handicapped fares (especially monthly passes) remain a substantial bargain.

1.3 Analysis Issues

There are a number of issues raised by the SCRTD fare changes which can provide insight into transit fare policy considerations currently underway at many properties throughout the country. In the case of SCRTD, these issues can be classified into two general impact areas:

- the impact of increased fares on overall system ridership trends including the differential impacts on different user groups; and
- the impact on the fare payment methods chosen by riders and the implications of potential changes on SCRTD revenues and operations.

Each of these issues is discussed in turn below. The following section discusses the different data sets which were available to address these evaluation issues.

1.3.1 Overall Ridership Trends

Of primary interest in any study of across-the-board fare increases is the impact on system ridership and its components. The cash fare increases of 18-75% and the monthly pass hikes of 14-50% can be expected to have at least some dampening effect on system ridership. In a system such as SCRTD which has experienced continual ridership growth over the past several years, it can be expected that this growth will at least be slowed somewhat by the implementation of the fare increase. While it is probably unrealistic (in the face of

Table 1.1

SCRTD FARE CHANGES (Effective August 1, 1980)

FARE CATEGORY	CASH			PASS COST			PASS VALUE*		
	Before	After	% Change	Before	After	% Change	Before	After	% Change
Adult/Local	$.55	$.65	18%	$20	$26	30%	37	40	8.1%
Adult/Exp-1	.75	.95	27	26	34	31	35	36	2.9
Adult/Exp-2	.95	1.25	32	32	42	31	34	34	-
Adult/Exp-3	1.15	1.55	35	38	50	32	33	33	-
Adult/Exp-4	1.35	1.85	37	44	58	32	33	32	(3.0)
Adult/Exp-5	1.55	2.15	39	50	66	32	33	31	(6.1)
Adult/1 Transfer	.60	.85	42	20	26	30	34	31	(8.8)
Adult/2 Transfer	.60	1.05	75	20	26	30	34	25	(26.5)
Adult/3 Transfer	.60	1.70	183	20	26	30	34	16	(52.9)
Student/Elm. & H.S.	.45	.50	11	14	16	14	32	32	-
Student/Elm. & H.S./1 Transfer	.50	.60	20	14	16	14	28	27	(3.6)
Student/College	.45	.65	44	14	20	43	32	31	(3.1)
Student/College/ 1 Transfer	.50	.85	41	14	20	43	28	24	(14.3)
E & H	.20	.30	50	4	6	50	20	20	-
E & H/1 Transfer	.25	.40	60	4	6	50	16	15	(6.3)

* Number of one-way linked trips which must be taken to "break even" on pass cost as compared to paying cash fares.

constantly increasing auto operating costs) to apply the Curtin formula rule-of-thumb (-0.3 fare elasticity), it is important to document what ridership loss is experienced and from which user groups, if any, it is most prevalent.

The SCRTD ridership impacts should be evaluated in relation to recent ridership trends and seasonal patterns. While some recent data related to these issues were available to include in this analysis, a rigorous "time-series" treatment of the interrelationship between ridership changes caused by exogenous factors and those changes which are related to the fare increase was not performed. Although the time series analysis would not affect the actual outcome of the fare increase, it would be useful to estimate the magnitude of the ridership effects actually attributable to the fare increase, e.g., the price elasticity of demand, for the planning of future fare changes. Thus, further analysis of these trends might be appropriate if the current analysis is extended to examine the SCRTD July, 1981 fare increase. Limited data were available, however, on individual changes in travel behavior from a retrospective survey of users. This survey provided some insight into the issue of "normal" ridership turnover as well as the more specific impacts of the fare increase. In addition, a distinction could be made between passengers who stopped riding transit altogether and those who decreased or increased their use.

1.3.2 Fare Payment Methods

The most significant changes in the SCRTD fare structure implemented in July, 1980 were the increase in the cost of transferring and the limitations placed on the use of a transfer. Not only was the cost of a single transfer raised from 5¢ to 20¢, but an additional 20¢ is now required to use the transfer a second time, after which it becomes worthless and full fare must be paid for any additional transfers. (Previously, a 5¢ transfer was good for an unlimited number of rides on any local route for an hour and a half.) Thus, while non-transferring full cash fares were increased from 18 to 39 percent, cash fares for passengers who must transfer were increased from 42 percent (one transfer) to 183 percent (three transfers).

In contrast, since monthly passes can be used for an unlimited number of rides, both transferring and non-transferring pass purchasers experienced the same hike of approximately 30 percent. Since the discount for regular use of the pass became greater for transferring passengers and actually declined slightly for local non-transferring passengers, it is expected that there will be some significant shifts to greater pass use by transferring riders and a possible small shift away from the pass by local one-bus users. It is estimated that approximately 11 percent of SCRTD riders made multiple transfers prior to the fare change, while another 23-38 percent made a single transfer, thus ensuring a large potential new market for monthly passes.

More specifically, the following potential changes in fare payment patterns might be expected due to the fare change:

- a shift of cash transferring passengers to passes;
- a shift of local one-bus passholders to cash fares; and
- a shift of the longer-distance express riders to passes.

The extent to which each of these changes can be detected will obviously depend on the magnitude of the resulting shifts as well as the quantity and quality of the available data.

1.4 Data Sources

The data used to analyze the impact of the July, 1980 fare increase were compiled from several sources, most of which are routinely collected and/or assembled by SCRTD. The lone exception to the regularly collected data was a special retrospective telephone interview of 682 users who were initially surveyed on-board RTD buses just prior to the fare increase. Since no one source of data provides the breadth of information necessary to explain the impacts of the fare increase, it was important to piece together findings from several different sources to obtain a clear picture of the resulting effects. Each data source used in the analysis is discussed in turn below, including the available information from each and possible sample biases.

1.4.1 System Revenue

SCRTD maintains files of daily system cash revenue totals as well as monthly pass sales. These files were analyzed for the period from January, 1979 through June, 1981 to determine overall revenue trends and impacts. In addition to system revenue, SCRTD has developed estimates of system ridership (a measure of total unlinked trips known as "revenue ridership" in the industry) using average fare factors (which are described further in the next section). Using these daily revenue/ridership data, comparisons of average weekday, Saturday and Sunday system usage can be made over the periods before and after the fare increase. Given the process used by SCRTD to compile these revenue and ridership figures, these data can be considered reasonably accurate on a system level and without significant bias.

1.4.2 Average Fare and Fare Category Factors

Prior to 1980, SCRTD used calculations of systemwide average fare derived from on-board passenger surveys and route-level fare category counts to estimate system ridership from revenues on a regular basis. Not completely satisfied with the prior average fare factors which had been developed and in anticipation of the proposed fare hikes, SCRTD began a quarterly procedure in March, 1980 to randomly sample a number of trips throughout the system to obtain estimates of average fare and the percent of passengers by fare category for each season. SCRTD traffic checkers were used to observe and note actual fares paid by each boarding passenger, including additional transfer or zone charges, type of pass, and free uses. This procedure was an improvement over prior practices because of an increased ability of the checkers to note each fare category (since they did not have to count alightings as well) and because it represented a measurement of the system at one point in time rather than over a period of a year or more.

This random sampling approach has been increased in size as a result of the March experience and similar efforts were conducted during August, 1980, October, 1980 and March, 1981. (The October, 1980 and March, 1981 counts were actually made on a larger cluster sample of random runs rather than trips to

ease checker assignment costs.) These data provide accurate before and after average fare factors to determine overall ridership impacts as well as estimates of the impacts on certain market segments and the possible shifts in fare payment methods. The accuracy of the March data appears adequate for total ridership estimates, although it may need to be supplemented (by the other data sources described below) to determine impacts on the various market segments.* The larger sample August, October and March counts were shown by SCRTD to be slightly more accurate on comparisons of total revenue observed and collected during the sample period. There is no evidence to suggest that these counts were biased in any way.

1.4.3 Selected Line Data

SCRTD is unique among large transit operators in that the district maintains a large route level data base which includes boardings by trip by fare payment type. Each route in the system is completely ride-checked for one full day approximately once a year. A recent analysis by RTD staff of the accuracy (at least on the system level) of these data was encouraging: the aggregate fare category distribution obtained by summing data from individual lines almost exactly matched data obtained in the special fare category count (discussed above) of randomly selected runs throughout the system. Analysis of individual line data for periods both before and after the fare increase would enable an assessment of the differential impacts of the fare increase by service type (e.g., local, intercity, express) or geographical area in the region. In particular, it was hypothesized that ridership impacts might differ according to route type, since the fare increase weighed heavily on longer distance express riders and on those who transfer, especially more than twice.

Unfortunately, three problems limited the usefulness and validity of such before/after line comparisons:

1. only 22 lines which did not undergo significant service changes had data available both before (from December, 1979 to July, 1980) and after (from August, 1980 to June, 1981) the 1980 fare increase, thus limiting comparisons by route type to relatively small groups;

2. of the 22 lines for which before/after data were available, only 5 had both measurements during the same season of the year, thus introducing possible seasonal ridership impacts; and,

3. counts for only one day were available, introducing the possibility that some individual line comparisons were inaccurate based on prior industry findings that normal day-to-day variation sometimes requires more than one day of counts to obtain accurate estimates of individual line ridership.

---

* See memo by Anne Huck, "Analysis of a Sampling Plan for Fare Mix Estimation," SCRTD Service Analysis Section, May 29, 1980, for a more detailed description of the methods used, actual sample sizes, and accuracy estimates.

In general, the results of the line data analysis corroborated those of the systemwide and panel survey analyses. For example, the direction of the changes in the percent of total boardings by fare category (see Section 3.1) was the same as that in the system counts, although the magnitude of the line changes was not as great. The line data also showed some differential impacts in the amount of ridership decline by line type, with statistically significant declines of 6.9% and 15.4% for intercity and local lines, respectively, and a 0.2% decline in express line ridership that was not statistically significant.

However, due to the limitations noted above and the correspondingly high variances, the data reported from these line comparisons cannot be considered as accurate as the data obtained from other sources. As such, the line data analysis did not contribute substantially to the overall findings of this report, and has been omitted from subsequent discussions of the impacts of the fare increase.

1.4.4 Retrospective Telephone Interview of a Panel of Users

One special data collection effort was mounted to evaluate the impacts of the July, 1980 fare increase, that being a retrospective interview of some 682 SCRTD riders who were intercepted on-board several RTD lines just prior to the initiation of the new fare structure.

In anticipation of the fare increase scheduled for mid-July 1980, the RTD conducted a short on-board survey on several "representative" bus lines in early July. (Actually, approximately 5000 surveys were distributed only on several bus lines which were previously scheduled for regular ride checks by the SCRTD Schedule Department.) The primary purpose of this survey was to obtain the pertinent personal information (i.e., name, address, phone number) of a sample of RTD riders who would be willing to participate in a telephone interview to be conducted after the fare increase was implemented. Slightly more than 1500 responses were obtained, including approximately 500 Spanish language surveys. Of this total response, the 1200 who had adequate contact information were telephoned in February, 1981 and 682 were successfully interviewed. The objectives of the retrospective interview can be generally summarized as follows:

- to identify before and after travel patterns, emphasizing the changes in frequency of transit travel due to the fare increase, and the specific alternatives selected;
- to examine the above impacts as they relate to riders' socioeconomic characteristics; and
- to determine the awareness of the fare increase and of alternative fare payment mechanisms among RTD users.

Some user groups have been found to be underrepresented by the panel including students (since the panel was assembled during the summer), cash paying riders, and, obviously, new users who began riding after the fare increase was implemented. The relatively small sample (especially when broken down by before/after travel patterns and market segments) leaves open the question of the accuracy of the results obtained from these data. In addition,

while few respondents answered that they "did not recall" information regarding their "before" travel patterns nine months prior to the interview (in May, 1980), the long time lag undoubtedly affected the validity of the response to some degree. In general, however the interview added significant pieces of information to the overall analysis and provided valuable insight into some of the causes of the observed aggregate ridership impacts. Appendix A documents the survey methods and instruments used in more detail and presents the results of the limited validity checks performed on the panel data, while Appendix B presents the retrospective telephone interview instrument.

1.5 Organization of Findings

The results of the analysis of the impacts of the SCRTD fare increase are reported in the following two chapters. Impacts on total ridership and individual frequency of use of the SCRTD system are presented in Chapter 2. In Chapter 3, the impacts of the fare structure modifications on fare payment used by riders are presented. Conclusions drawn from the results and implications for future fare-related research are then discussed in Chapter 4.

CHAPTER 2: CHANGES IN SYSTEM RIDERSHIP AND FREQUENCY OF USE

This chapter relates the findings of the analysis of the July, 1980 fare increase with regard to SCRTD system revenue, ridership, and rider frequency of use. Both the analysis of aggregate and disaggregate data sources are discussed in order to provide the reader with a fuller understanding of the various ridership shifts which have occurred at SCRTD in the time spanning the 1980 fare structure changes. Impacts related to changes in transit tripmaking during the same time period which were due to reasons other than the fare increase are also discussed briefly.

2.1 Systemwide Revenue and Ridership

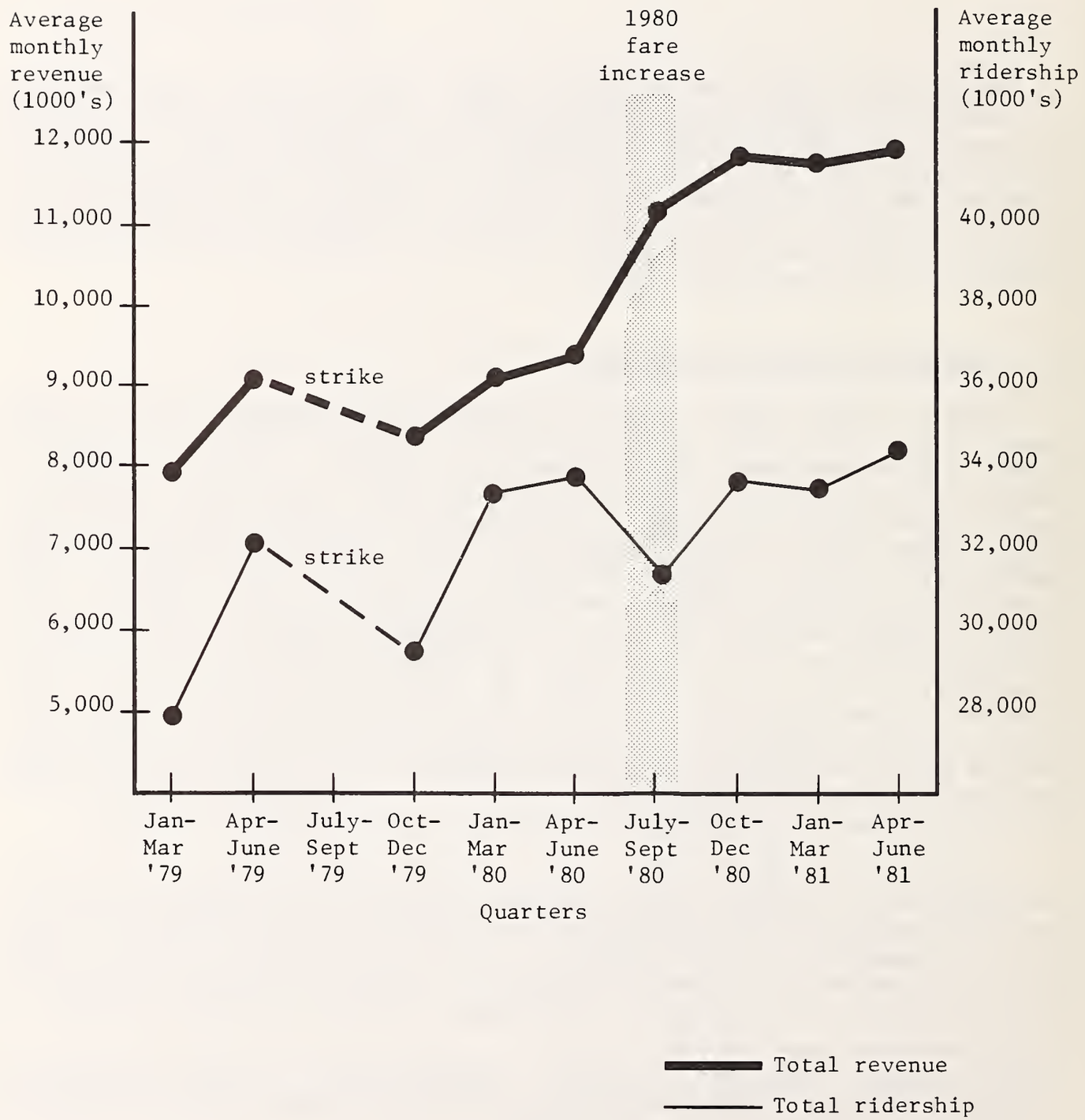
Among the many issues raised by the SCRTD fare increase, one of the most basic is the impact of the increased fares on overall ridership trends and total revenue generated. To illustrate the general trend in revenue and ridership, Figure 2-1 is a plot of average monthly revenue and ridership per quarter from the first quarter of 1979 through the second quarter of 1981.[1] As the figure shows, revenue, exhibiting a modest upward trend since the first quarter of 1977, grew sharply in response to the 1980 fare increase. More specifically, average monthly revenue per quarter had grown 14.5% from the first to second quarters in 1979. A substantial decline in the third and fourth quarters due to a 23-day strike in September, 1979, was then followed by growth of 8.8% in the first quarter of 1980 attributable in part to a fare increase. Modest growth of 2.1% in the second quarter of 1980 was followed by strong growth of 19.5% due to the fare increase being analyzed in this report. Revenue growth subsequently leveled off gradually, as it increased 4.9% during the fourth quarter of 1980, dropped 1.1% from the fourth to the first quarter of 1981, and again increased 2.5% between the first and second quarters.

Similarly, the figure shows that the SCRTD fare increase of July-August 1980 occurred at a time of strong ridership growth, again ignoring the drop in the third quarter of 1979 attributable to a 23-day strike in September of that year. An apparently strong recovery in the next two quarters is then followed by a 7.7% decline in ridership attributable in part to the fare increase of July-August 1980, and in part to the seasonal effect of lighter transit use

[1] Total system ridership is revenue ridership (i.e., total boardings or unlinked passenger trips) derived in the normal industry manner by applying an average fare factor to total revenue.

FIGURE 2-1

AVERAGE MONTHLY TOTAL REVENUE AND RIDERSHIP PER QUARTER



during the summer. This drop was in turn followed by ridership growth of 7.9% in the fall quarter of 1980, and a leveling out of ridership and revenue during the first half of 1981. The short term nature of the actual ridership decline is even more clearly evident in monthly ridership figures, which show July and August declines of 5.5% and 1.7%, and subsequent growth of 5.8%, 6.0% and 0.4% in September, October and November 1980, respectively.

Although the period of actual ridership decline attributable to the fare increase was short-lived, the leveling out of ridership that follows suggests that the fare increase may have had a dampening effect on system ridership. Although a more direct measure would be to compare current system ridership with a projection of ridership based on past trends, it is instructive to compare the rate of ridership growth from the first to second quarter in each of 1979, 1980 and 1981. Ridership growth from winter to spring in 1979 was a strong 15.8%, followed by 8.5% in 1980 prior to the fare increase, and growth of only 2.9% in 1981 subsequent to the fare increase.

In addition to aggregate ridership and revenue effects, differential impacts can also be observed in weekday versus weekend revenue growth. Using a March 1980 to March 1981 comparison to reduce seasonal effects, Table 2.1 shows the percent change in systemwide revenue and ridership for an average weekday, Saturday, and Sunday for the total month. While revenue growth on the average weekday was as high as 26.2%, weaker growth of only 13.1% was observed for the average Saturday, with fairly strong growth on Sunday of 23.6%. Total monthly revenue rose 24.5% from March 1980 to March 1981.

On the ridership side, weekday ridership remained fairly stable, with a less than one percent growth over the analysis period. Saturday ridership, providing evidence of a larger number of discretionary riders, showed a substantial decline of 19.3%, with the Sunday ridership decline, though less severe, still a fairly substantial 9.8%. Ridership for the whole month declined slightly less than 2% from 1980 to 1981.

Combining the ridership and revenue figures, Table 2.2 then shows the percent change in average fares for weekdays, Saturdays and Sundays. The average fares, derived from special fare surveys conducted quarterly beginning March 1980, generally corroborate the effects observed in systemwide ridership and revenue. The average weekday fare grew 26.3% from 1980 to 1981, with larger percent increases on the average Saturday and Sunday of 34.7 and 31.3, respectively.

While the total average fares (incorporating all fare categories) grew substantially, it is interesting to compare the distribution of this growth between the cash and pass fare categories. As shown in Table 2.2, much of the growth occurred in average cash fares, with increases of over 50% for average weekdays, Saturdays and Sundays. The average pass fares, on the other hand, only rose approximately 15% for each type of day. Since the cost of all but elementary/high school student passes increased at least 30%, the relatively low growth in pass average fares indicates that the restructuring of fares has prompted riders with the greatest number of boardings per trip (i.e., transferring passengers) to shift to passes. The result is that the RTD system has become heavily dependent on passes, which has hurt revenue at least to some extent and has certain equity implications as well.

Table 2.1

PERCENT CHANGE IN TOTAL RIDERSHIP AND REVENUE

	Total Boardings (Thousands)		
Time Period	March 1980	March 1981	Percent Change
Average Weekday	1,330	1,340	+0.8%
Average Saturday	880	710	-19.3%
Average Sunday	510	460	-9.8%
Total Month**	40,100	39,350	-1.9%

	Total Revenue*		
Time Period	March 1980	March 1981	Percent Change
Average Weekday	369,147	465,721	+26.2%
Average Saturday	253,709	286,992	+13.1%
Average Sunday	163,739	202,434	+23.6%
Total Month**	11,316,025	14,089,638	+24.5%

* includes total cash, ticket and pass revenue

** based on 5-week period for all fare categories, including pass revenue.

Table 2.2

AVERAGE FARES BEFORE AND AFTER THE FARE INCREASE

Day of Week	March 1980 (before)	March 1981 (after)	Percent Change
Average Fares (All Fare Categories)*			
Average Weekday	.266	.336	+26.3%
Average Saturday	.271	.365	+34.7%
Average Sunday	.284	.373	+31.3%
Average Cash Fares*			
Average Weekday	.334	.516	+54.5%
Average Saturday	.337	.552	+63.8%
Average Sunday	.368	.562	+52.7%
Average Pass Fares*			
Average Weekday	.203	.234	+15.3%
Average Saturday	.204	.235	+15.2%
Average Sunday	.202	.236	+16.8%

* Average fares were derived using % of ridership in each category from special fare surveys conducted in March 1980 and March 1981. Pass revenue was allocated to weekdays, Saturdays and Sundays according to the average number of trips for each type of day observed in each fare survey.

The impact of the fare increase on ridership and revenue among the specific fare categories is discussed in detail in Chapter 3. The revenue and equity implications are discussed in Chapter 4.

2.2 Panel Survey Findings

Of primary interest in any study of across-the-board fare increases is the impact on the individual traveler's decision to absorb the additional cost and continue riding transit. In order to address issues regarding individual traveler impacts, a panel of RTD riders assembled "before" the fare increase were recontacted and interviewed "after" July 1980.

Trip frequency data on the travel characteristics of the survey panel show an 11.3% decline in transit trips made after the fare increase for RTD riders who were using the system before the fare change. This compares with aggregate ridership data which show a 1.9% decline in boardings. Panel survey data exhibit a larger decline in transit tripmaking than shown by aggregate ridership data due to the fact that many riders are entering and leaving the transit system at all times. While the panel survey shows a relatively significant number of riders leaving the system (with some leaving as a result of increased fares), the aggregate data include riders who have entered the system since the July 1980 fare increase and who, because of the way the panel was formed, are not represented in the interview sample.

Survey panel data present several examples of transit riders who are entering and leaving the system over time with no influence from the July 1980 fare increase. Within the total of 682 survey respondents who were successfully recontacted "after" implementation of the fare change, 5.3% were eliminated from the fare analysis survey panel because their responses indicated that they were changing travel behavior without regard to increased fares (and the survey instrument directed the interviewer to terminate the survey). These survey respondents are described below:

- 2.3% indicated that they ride the bus at least once per month "after", however, they did not do so "before"; in fact, they have entered the system. While they previously rode the bus only rarely (and on one of those trips answered a survey), they have since become regular RTD patrons. Clearly, other travelers have begun riding more regularly who were not represented in the "before" survey;

- 1.5% did not ride the bus at least once per month both "before" and "after"; they are not regular riders and only occasionally make transit trips, and are not likely to be influenced by the fare increase; and

- 1.5% discontinued riding the bus because they moved or changed jobs and convenient service for their new trips was perceived as unavailable.

In addition, survey findings presented throughout this chapter illustrate that a substantial percentage of panel members who have continued riding the

RTD after the fare increase have changed (increased or decreased) transit trip frequency over time. However, the majority of those changing their trip frequency do not appear to have been influenced by transit fares. In fact, most respondents discontinued riding or decreased their trip frequency because of external factors (i.e., different job or residence, change in personal activity). Further information on those panelists who have changed their transit use for reasons other than increased fares is discussed in Section 2.2.4.

2.2.1 Overall Ridership Impacts

It is useful to examine the relative change in before/after transit tripmaking among different market segments and trip purposes in order to identify how specific user groups were impacted by the fare increase. Such an analysis can identify which market segments left the system since July 1980 and can provide insight into which groups might have entered the system since that time.

Table 2.3 presents the changes in the panel's tripmaking by trip purpose (i.e., work/school and other trips).[1] The survey data show a substantially larger decline in transit tripmaking by people who previously made non-work trips (24.1%) than in tripmaking by persons previously using transit for their work trip (7.7%). This result implies that non-work trip transit users were more likely to have been influenced by the fare increase and consequently decreased their use. This is tempered somewhat by the finding that a slightly larger percentage of work trip riders discontinued using the RTD after the fare increase than non-work trip riders. However, for those transit patrons who did not discontinue all riding, weekly transit trip frequency actually increased after the fare change for work trip riders from 8.7 to 9.0 total weekly trips (i.e., including both work and non-work trips); while non-work transit trips decreased from 6.8 to 5.6 per week.

The comparison between trip purposes shows that, in general, the non-work trip transit rider was more directly impacted by increased fares than the work trip user. Most likely, those making transit work trips had more travel options available (as illustrated by the slightly higher percentage of discontinued riders); however, those who continued riding were apparently not sensitive to the price and actually increased transit trip frequency. On the other hand, those making non-work transit trips had few or no alternative modes available (as illustrated by the lower percentage of discontinued riders), and those who continued riding exhibited sensitivity to price by showing a significant decrease in transit trip frequency.[2] However, survey findings presented later in this chapter imply that the majority of respondents who discontinued riding or decreased frequency were not primarily influenced by the fare change.

---

[1] Note that weekly bus trips identified in Table 2.3 and included in this discussion are defined as linked trips.

[2] An alternative explanation for the larger trip frequency decrease reported by non-work trip users is simply poorer overall recall of prior non-work trips.

Table 2.3

PANEL TRIPMAKING CHANGES

		Total Survey Sample	Work (School) Trips	Non-Work (School) Trips
Number of Respondents (% of Total Sample)		646 (100%)	476 (74%)	170 (26%)
BEFORE FARE CHANGE	# weekly bus trips	5278	4119	1159
	(% of total sample)	(100%)	(78%)	(22%)
	mean # bus trips per week	8.2	8.7	6.8
AFTER FARE CHANGE	# respondents who discontinued riding	65	52*	13**
	# weekly bus trips	4684	3804	880
	(% of total sample)	(100%)	(81%)	(19%)
	Mean # weekly bus trips per "after" RTD user	8.1	9.0	5.6
% change (before to after) in weekly bus trips		-11.3%	-7.7%	-24.1%

* representing 11% of work trip riders

** representing 8% of non-work trip riders

Table 2.4

MAJOR TRANSIT PANEL USER GROUPS

	Number	Percent of Sample
Total Respondents	646	100%
Users previously making work (or school) bus trips	476	74%
- Users continuing bus use for same work (or school) trip	- 351	- 54%
- Users discontinuing bus use for same work (or school) trip	- 52	- 8%
- Users continuing a different work (or school) trip	- 73	- 11%
Users previously making other than work or school bus trips	170	26%
- Users continuing bus use for non-work trips	- 157	- 24%
- Users discontinuing bus use for non-work trips	- 13	- 2%

In order to more clearly identify and analyze the impact of increased fares on different market segments and trip purposes, the survey sample was disaggregated by user group. In addition, it became evident that the study team must distinguish between persons making identical trips in the before and after cases (i.e., same O-D, trip purpose, trip frequency, etc.) and those who have changed travel behavior due to external factors (e.g., change of job or residence). As a result of the concern to distinguish between work and non-work related transit trips and between non-fare induced changes in travel behavior, five major "user" groups within the survey sample were identified. The identified user groups and the percent of the survey sample which they represent are shown in Table 2.4.

2.2.2 Characteristics of Those Discontinuing Use of RTD Buses

Table 2.5 presents the comparison of the socioeconomic and travel characteristics of each user group as well as the total sample of panel survey respondents.

Table 2.5

PANEL CHARACTERISTICS (BY USER GROUP)

	Total Survey Sample	Work (School) Trip			Non-Work (School) Trip	
		Continued Same Trip	Discontinued Same Trip	Continued Different Trip	Continued Trip	Discontinued Trip
Number of Respondents	646	351	52	73	157	13
(% of Total Sample)	(100%)	(54%)	(8%)	(11%)	(24%)	(2%)
"BEFORE" FARE PAYMENT METHOD						
Cash & Ticket	46%	41%	63%	52%	42%	77%
Regular & Express Pass	36	49	33	26	19	-
Senior & Handicapped Pass	13	5	2	5	38	23
Student Pass	5	5	2	15	1	-
"BEFORE" RTD TRIP FREQUENCY						
Mean # RTD Trips per week	8.2	8.9	8.2	7.5	6.7	8.1
SEX						
Female	68%	67%	60%	70%	70%	92%
Male	32	33	40	30	30	8
AGE						
Under 16	3%	2%	2%	10%	3%	-
16-24	19	16	35	38	11	23%
25-44	35	42	39	37	18	23
45-64	28	34	22	8	24	31
65 and over	16	6	2	7	45	23
LICENSED DRIVERS						
Yes	44%	45%	71%	42%	34%	54%
No	56	55	29	58	66	46

(Table 2.5 continued on next page)

Table 2.5 (continued)

PANEL CHARACTERISTICS (BY USER GROUP)

	Total Survey Sample	Work (School) Trip			Non-Work (School) Trip	
		Continued Same Trip	Discontinued Same Trip	Continue Different Trip	Continued Trip	Discontinued Trip
EMPLOYMENT STATUS						
Full-Time	56%	78%	73%	48%	8%	46%
Part-Time	11	12	10	21	4	8
Student	10	8	13	29	6	8
Unemployed	5	1	2	-	16	8
Retired	13	1	2	3	49	23
Homemaker	5	1	-	-	17	8
HOUSEHOLD SIZE						
One	20%	17%	4%	7%	37%	31%
Two	25	27	10	21	27	23
Three	16	17	32	10	13	8
Four	15	16	16	19	10	8
Five or More	25	24	38	44	13	31
(Mean)	(3.00)	(3.03)	(3.72)	(3.73)	(2.35)	(2.85)
# MOTOR VEHICLES IN HOUSEHOLD						
None	36%	32%	4%	29%	58%	23%
One	38	44	35	36	24	54
Two	18	17	33	22	14	23
Three or More	8	7	27	14	4	-
(Mean)	(1.00)	(0.99)	(1.85)	(1.21)	(0.63)	(1.00)
HOUSEHOLD INCOME						
Under $10,000	49%	41%	28%	38%	67%	46%
$10,000-$19,999	31	29	41	35	24	23
$20,000-$29,999	12	13	17	14	5	8
$30,000 or over	9	8	13	13	4	15

Approximately 10% of the panel of RTD patrons assembled before the fare increase have discontinued riding the bus and are no longer considered current RTD users.[1] About 11% of the prior work or school trip users discontinued riding while about 8% of the prior users for other trip purposes stopped riding. Clearly, not all of those respondents who discontinued riding did so as a result of the increase in fares. In fact, survey findings presented later in this chapter indicate that only a small percentage of riders leaving the system directly stated that the fare increase was a reason for changing travel behavior. Upon comparing the characteristics of discontinued riders to the group of current RTD users, the following differences have been observed:[2]

Past Fare Payment Method	A higher proportion of both prior work/school and other* purpose discontinued riders paid cash fares.
Past RTD Trip Frequency	Work/school trip respondents who discontinued riding had a lower mean trip frequency compared to those who continued riding.
	Other trip purpose respondents who discontinued riding had a higher mean trip frequency than those who continued riding.
Age	A higher proportion of all discontinued riders are in the 16-24 age group.
	A lower proportion of all discontinued riders are over 65*.
Sex	A higher proportion of non-work (or school) discontinued riders are female.**

---

[1] The interview and subsequent analyses defined "current user" as one who makes at least one trip per month on the RTD.

[2] A difference of proportions test was performed; all comparisons noted here are significant at the 99% confidence level unless noted with a "*", which indicates significance at the 95% level, or a "**", which indicates significance at the 90% level. H_o: $P_1 = P_2$.

#Vehicles In Household	A lower proportion of all discontinued riders live in 0 vehicle households. A higher proportion of all discontinued riders live in households with more than two vehicles.
Licensed Drivers	A much higher proportion of discontinued work or school trip users are licensed drivers.
Employment	A higher proportion of non-work (or school) discontinued riders are now employed full-time.
Income	A lower proportion of all discontinued riders live in households making less than $10,000 annually. A higher proportion of all discontinued riders live in households making greater than $20,000 annually.*

Clearly, the comparison between discontinued riders and those members of the survey panel who remained current RTD users illustrates that most panel members who discontinued using RTD buses were primarily "choice" riders who were more likely to have autos available for their trips. The transit dependent (i.e., elderly, low income, and 0 auto households) had fewer alternative modes of travel available to them and thus, continued riding.

Survey respondents who have stopped riding RTD buses for the work or school trip were asked to state their reasons for discontinuing transit use. The responses can be summarized as follows:

58% of the respondents have new cars or now drive;

29% of the respondents now have a ride, carpool, or walk;

6% stated that bus fares are now too expensive;

6% mentioned other RTD problems (e.g., service and safety); and

12% of the respondents stated other reasons (e.g., changed job status).

Unfortunately, the implications of the stated reasons for discontinuing transit use are unclear. For example, while 58% of the respondents stated that they have either recently started driving or have purchased a car, it is unknown whether that action was taken as a result of the fare increase. On the other hand, only 6% stated that they have discontinued riding because they felt that bus fares were too expensive. Stated reasons for discontinuing work trip transit use were crosstabulated with socioeconomic characteristics (e.g., automobile ownership, household income) in order to examine any correlation between the reasons for mode shifts and economic status. Upon examination, no clear relationships were identified.

Survey respondents who have stopped riding the RTD for trip purposes other than work or school were also asked to state their reasons for discontinuing. The 13 respondents have been summarized as follows:

38% of the respondents have new cars or now drive;

77% indicated a change in personal activity (e.g, new residence, loss of job, declining health);

8% of the respondents mentioned poor RTD service; and

8% stated other reasons.

None of the survey respondents who discontinued RTD non-work trips directly mentioned the fare increase as a reason for stopping their use of the RTD. Again, it is difficult to interpret the implications of the reasons stated by respondents; in this case, the ambiguity of the responses is compounded by the very small sample size (n = 13).

2.2.3 Changes in Transit Trip Frequency

In addition to identifying the socioeconomic and travel characteristics of travelers who discontinued riding the RTD, the panel survey data have also been used to examine the change in the frequency of transit travel for those who have continued riding. All panel members riding the RTD at least once per month when interviewed after the fare increase were asked the following questions regarding trip frequency:

- number of bus trips per week (after the fare increase);
- whether that number had increased, decreased or stayed the same since the fare increase; and
- (if trip frequency changed) the number of fewer or additional trips per week.

Table 2.6 presents the percentage of "after" transit users in the survey panel who have changed (decreased or increased) RTD trip frequency since the fare increase. Among the total sample of "after" transit users, which includes respondents continuing to make the same work trip, different work trips and non-work trips by transit, approximately 19% have decreased (by an average of 4.6 one-way trips a week) and almost 15% have increased (by an average of 4.0 one-way trips a week) RTD trip frequency.

It is significant to note that almost as many members of the survey panel who continued riding after the fare change have increased RTD trip frequency as have decreased and have changed by approximately the same number of trips. This finding implies that transit passengers often change their frequency of transit use, in both the positive and negative direction, over time. While data presented in Table 2.6 shows that a relatively high percentage of the panel have decreased frequency, the fact that almost as many respondents have increased leads one to believe that a high degree of the change in frequency

Table 2.6

IMPACT ON TRANSIT TRIP FREQUENCY

	Total "After" Transit Users	Mean # of greater (fewer) trips made per week	Continued Same Work or School Trip	Continued Different Work or School Trip	Continued Non-work Trip
CHANGE IN TOTAL RTD TRIP FREQUENCY					
Decreased	18.8%	(4.6)	10.0%	39.7%	28.7%
Stayed the Same	66.6%	0	76.9%	35.6%	58.0%
Increased	14.6%	4.0	13.1%	24.7%	13.4%
Number of Respondents	581		351	73	157
(% of "AFTER" transit users)	(100%)		(60%)	(13%)	(27%)

(or use) is not due to the increase in fares. Survey findings presented later in this chapter illustrate that the majority of riders who decreased frequency did so because of changes in personal and employment activity.

Data regarding RTD trip frequency have been disaggregated by user group; upon examining Table 2.6 one can see that the percentages reflecting the change in RTD trip frequency differ significantly among user groups. The group of those who have continued to make the same work (or school) trip by transit exhibits a relatively high percentage of respondents whose frequency of RTD travel has remained the same. In sharp contrast to the rest of the survey panel, a greater percentage of this user group has increased frequency rather than decreased since the fare change.

A second group have continued making their work (or school) trip by transit, but now make a different (e.g., change in origin or destination) trip "after" the fare change from what they were making "before". As a result of these respondents' different work (or school) trip, often due to a change in job or residential location, they exhibit a substantially higher percentage of change in transit trip frequency. In fact, almost 40% of respondents in this user group have decreased the number of RTD trips they make since the fare change.

The final user group within our sample of "after" transit users includes respondents who have continued riding transit, however, do not make a work (or school) trip by bus. Survey analyses imply that non-work trip use was more

severely impacted by increased fares than work or school trip use. Data presented in Table 2.6 shows that, within this group of non-work trip users, the number of respondents who have decreased transit trip frequency is approximately twice as large as the number who have increased.

The change in RTD trip frequency has been crosstabulated by household income and the number of motor vehicles owned in order to examine any significant difference in travel behavior impacts by socioeconomic characteristics. Tables 2.7 and 2.8 present the percentage of "after" transit users in the survey panel who have changed (decreased or increased) RTD trip frequency disaggregated by income level and degree of auto ownership, respectively. In general, analysis of the data did not show many significant differences among income and auto ownership levels regarding changes in transit trip frequency. However, a higher proportion of panel members who changed trip frequency either earn more than $20,000 or live in households with two or more vehicles. While a substantial percentage of these respondents decreased transit trip frequency, it should be noted that this group also tended to increase frequency more than households with low income or few vehicles.

Consequently, the incidence of transit trip frequency appears to be related to personal mobility and availability of alternative modes, with increased fares only one of several determining factors. For example, respondents with lower incomes and fewer autos have lower rates of change in frequency. On the other hand, respondents with higher incomes and more autos available have higher rates of change, in terms of both increased and decreased frequency. (An alternative explanation of these findings is that they may simply be due to a bias of the retrospective survey technique; that is, that those respondents with higher incomes might be more likely to recall differences in tripmaking.)

Survey respondents who changed RTD trip frequency were asked to state their reasons for decreasing or increasing use. Those members of the survey panel who decreased, approximately 19% of "after" transit users, gave the following responses:

46% of the respondents now drive, ride, carpool or walk;

45% indicated a change in activity (job, school, personal);

12% mentioned bus service problems (schedule, safety);

8% stated that bus fares are now too expensive; and

5% of the respondents stated other reasons.

Once again, the fact that 46% of respondents stated that they now use a different mode is difficult to interpret. It is impossible to determine whether the mode shift is a direct result of the fare increase. Also note that stated reasons for trip frequency changes are presented as multiple responses; that is, several of the 46% indicating a different mode might have also mentioned a change in activity, increased fares, or poor service. It is quite interesting that 45% responded that they have decreased RTD trip

Table 2.7

CHANGE IN TRIP FREQUENCY BY INCOME

	Total "AFTER" Transit Users	"AFTER" Transit Users			
		Under $10,000	$10,000- $19,999	$20,000- $29,999	$30,000 and over
CHANGE IN RTD TRIP FREQUENCY					
Decreased	18.8%	16.7%	15.2%	28.3%	20.9%
Stayed the Same	66.6%	69.3%	70.9%	60.0%	60.5%
Increased	14.6%	14.0%	13.9%	11.7%	18.6%
Number of Respondents (Relative % of Sample)	581 (100%)	264 (50%)	158 (30%)	60 (11%)	43 (8%)

Table 2.8

CHANGE IN TRIP FREQUENCY BY AUTO OWNERSHIP

	Total "AFTER" Transit Users	"AFTER" Transit Users			
		0 vehicles	1 vehicle	2 vehicles	3 or more
CHANGE IN RTD TRIP FREQUENCY					
Decreased	18.8%	14.0%	19.1%	28.9%	23.1%
Stayed the Same	66.6%	71.6%	67.9%	53.6%	59.0%
Increased	14.6%	14.4%	13.0%	17.5%	17.9%
Number of Respondents (Relative % of Sample)	581 (100%)	222 (38%)	215 (37%)	97 (17%)	39 (7%)

frequency because of a change in activity due to employment, school or personal factors. This finding implies that a substantial portion of lost trips are due to external factors, not at all related to the change in fare. While 8% of respondents state that their trip frequency has decreased as a direct result of increased fares, 12% have mentioned service related transit problems as the reason.

Members of the survey panel who increased RTD trip frequency, approximately 15% of "after" transit users, gave the following reasons for increasing:

62% indicated an increase in activity (job, school, personal);

21% of the respondents no longer drive, ride, carpool;

13% stated other reasons; and

4% mentioned the increased costs of driving.

2.2.4 Summary of Panel Changes in Transit Travel Patterns

The panel survey findings confirm the hypothesis that a substantial number of travelers are entering and leaving the system or increasing and decreasing transit trip frequency, due to factors which are quite often unrelated to transit fare policy. This finding may be related to the fact that SCRTD ridership is highly transit-dependent (i.e., the availability of an auto for particular trips clearly determines mode choice and such availability can vary significantly over short time periods). In general, it appears that those persons who gain automobile mobility opt out of taking RTD buses.

By examining the actual tripmaking changes reported by the panelists, it is possible to estimate the magnitude of the turnover in SCRTD ridership. Table 2.9 summarizes the reported changes in transit use over the period from May 1980 to February 1981. The table incorporates some interpretation of the reasons for the reported changes for those cases where respondents report discontinued or decreased use. In these cases, ranges have been defined based on the minimum responses which indicated either that they were or were not influenced by the fare increase. For example, 1.4% of the respondents stated directly that the reason for either discontinuing or decreasing their use of transit was the fare increase, while another 11% of the respondents stated reasons that were totally unrelated to the fare increase such as a change in job location or school status, the maximum values of each range were then estimated by subtracting the minimum value from the total number of respondents in each change category.

These findings reveal some important observations about the stability of the RTD ridership. While about 60 percent of the respondents reported no change in use over the nine-month period, approximately 11 percent discontinued riding, 16 percent decreased their frequency of use, 12 percent increased their frequency of use, and another 2 percent went from the category of infrequent user (less than one trip a month) to become a more regular user.

Table 2.9

REPORTED CHANGES IN TRANSIT TRIPMAKING OVER A NINE MONTH PERIOD
(MAY, 1980 - FEBRUARY, 1981)

Type of Change	Percent of Panel
No change in transit trips	60%
Discontinued use (influenced by fares)	0.4% to 7%
Discontinued use (not influenced by fares)	4% to 11%
Decreased frequency of use (influenced by fares)	1% to 9%
Decreased frequency of use (not influenced by fares)	7% to 15%
Increased frequency of use	12%
New Riders	2%
Number of Panelists	N = 682

Thus, a full 40 percent of the respondents changed their frequency of use of transit, with about two-thirds of these decreasing their use.[1] It also appears that the fare increase had little impact on decisions to decrease transit usage; if the minimum of each range is used (representing the only "hard" or direct numbers from which estimates can be made), respondents were approximately ten times more likely to mention non-fare-related reasons for decreasing use than fare-related reasons.

The implications of these findings are possibly wide-ranging: since transit operators have generally assumed that their ridership was very stable and with little turnover, they have been reluctant to introduce even small changes which might negatively impact even the smallest user group. The Los Angeles evidence suggests that transit riders may enter and leave the system at a high rate with little regard to transit service and fare levels. This implies that operators should be more aggressive in pursuing strategies which may improve the efficiency and cost-effectiveness of their systems as long as such strategies do not adversely affect the majority of their riders (but even if various small user groups are inconvenienced). Of course, political problems might remain in pursuing such a course; however, operators apparently need not fear large system-level ridership impacts of their efforts to modify fare and service levels.

[1] It should be noted that the nature of the panel interview precluded contact with all but a few new riders since the respondents all were initially intercepted on-board RTD buses in July, 1980.

CHAPTER 3: IMPACT ON FARE PAYMENT CATEGORIES

In addition to the aggregate ridership impacts of the July 1980 fare increase, an important issue, given the nature of the fare increase, is its impact on the relative shares of riders using each fare payment method. As was discussed in Chapter 1, the changes entailed several shifts in the overall fare structure. The most significant of these are the following:

- the cash fare for transferring passengers increased significantly more than the fare for non-transferring passengers, although monthly pass costs were increased at the same rate for both groups;
- the cash fare discount for college and vocational students was eliminated, although they still enjoy a significant, although lesser, discount (23%) if they purchase a monthly pass;
- pass purchases became much more attractive (greater discounts) for longer distance riders (e.g., transferring passengers, longer express trips) while local one-bus and shorter distance express riders had pass value reduced slightly; and
- while elderly and handicapped fares were increased by 50%, the overall discount from full fares was changed only slightly and elderly/handicapped fares (especially monthly passes) remain a substantial bargain.

3.1 The Trend in Pass Use

Some of these changes, particularly the relative attractiveness of passes for longer distance or frequently transferring riders, served to reinforce the general trend of the past two years.[1] Figure 3-1 shows systemwide pass, cash and total revenue (average monthly per quarter) since the beginning of 1979. As was discussed in Chapter 2, total revenue shows strong growth, with some leveling off over the final three quarters. Farebox revenue, however, shows declines of 2.2% in the fall of 1980 and of 2.9% in the winter of 1981,

[1] It should be noted once again that this analysis did not include a rigorous time-series analysis to determine the effect of exogenous factors on the fare structure and its use.

FIGURE 3-1

AVERAGE MONTHLY TOTAL, FAREBOX AND PASS REVENUE PER QUARTER

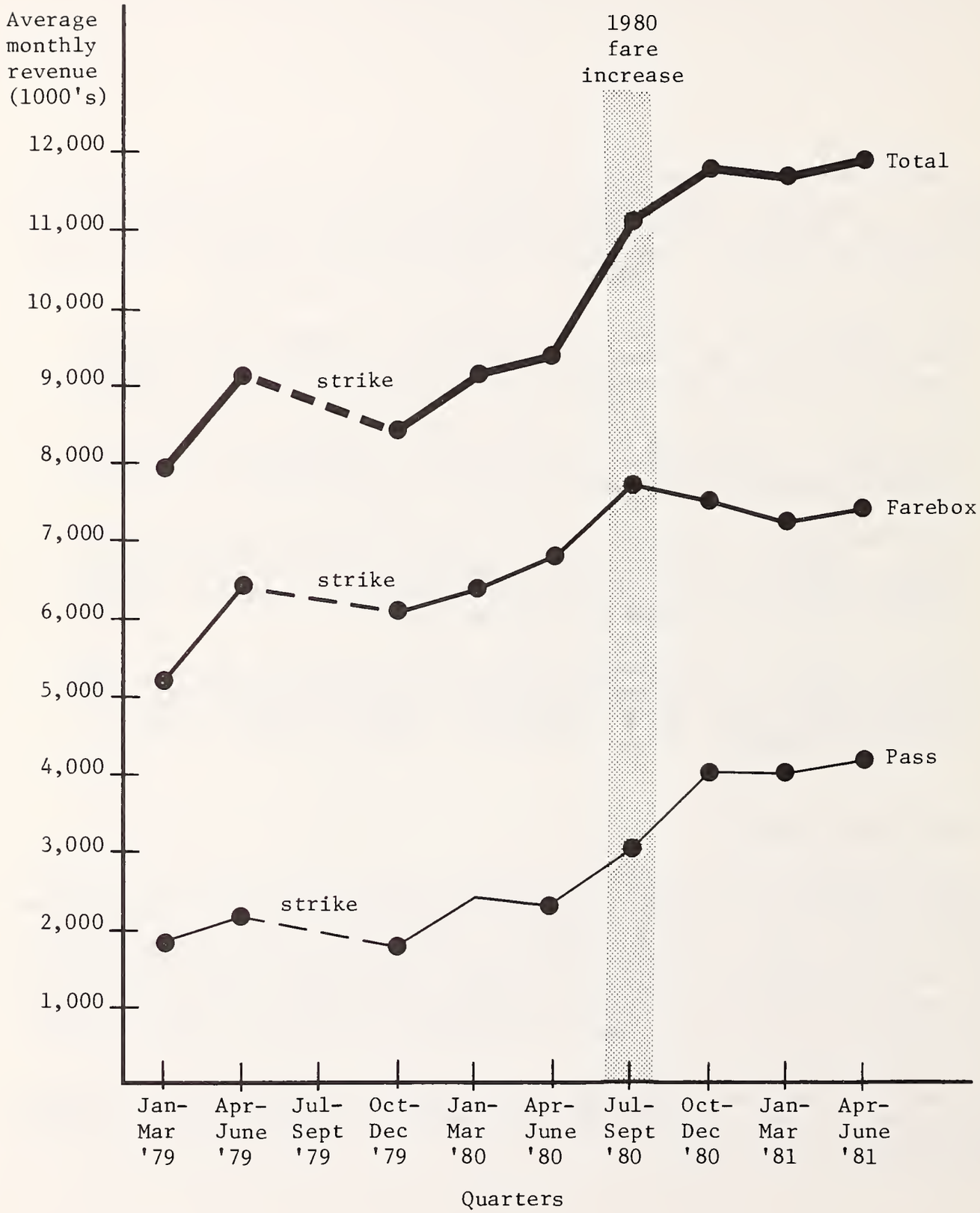


Table 3.1

CHANGE IN REVENUE BY FARE CATEGORY: MARCH 1980 - MARCH 1981

Fare Category	March 1980	March 1981	Percent Change
Farebox	7,730,991	8,560,521	+10.7%
Tickets	262,939	345,267	+31.3%
Passes*	3,322,095	5,223,850	+57.2%
Total	11,316,025	14,089,638	+24.5%

* Factored up to reflect 5-week period.

and a modest 1.3% rise in the spring of 1981. On the other hand, pass revenue, which had been growing fairly continuously over the past two years due to SCRTD pass marketing efforts, continued to rise. Specifically, the growth in pass revenue resulting from the fare increase in the summer quarter continued into the fall of 1980 with an increase of 33.0%, followed by a drop of less than 1.0% in the winter quarter and a rise of 5.3% in the spring of 1981.

The March 1980 to March 1981 comparisons included in Table 3.1 provide further evidence of the increasing importance of pass revenue relative to cash fares, with the former growing 57.2%, compared to only 10.7% for the latter. The first column of Table 3.2 shows this even more clearly, as the share of total revenue attributable to passes jumped from approximately 26% before the fare increase to over 34% afterwards.

Pass revenue growth reflects both the cost of purchasing a pass and the actual number of passes sold. Pass sales increased approximately 15% from March 1980 to March 1981, although this is down from the 27% growth over the March 1979 to March 1980 period. (Again, the historical pass growth trend was not analyzed in detail so that related factors such as pass promotion marketing efforts could have had a significant impact on pass sales at various times.) In part this reduction in the rate of growth is attributable to the larger base upon which the rate is calculated. In addition, however, it appears to reflect the slowing down of overall ridership growth. To control for this effect, the second column of Table 3.2 shows pass sales as a percent of average daily boardings from the winter of 1979 to spring of 1981. As in the previous measures, pass sales as a percent of total boardings shows general overall growth, and a specific jump from under 14% before the fare increase to over 15% in the quarters following it.

One likely explanation for at least part of the shift from cash payment to pass use is the increase in the cost of a transfer from 5¢ for an unlimited use transfer to 20¢ for one that could be used only once. Although the panel survey results discussed later in this chapter provide the most direct evidence of such a shift, it is also supported systemwide by the changes in the percent of total boardings in each fare weekday boardings category shown

Table 3.2

PERCENT INCREASE IN PASS REVENUE AND PASS SALES PER QUARTER

Time Period	Pass Revenue/ Total Revenue	Pass Sales/Ave. Daily Boardings
Jan. - Mar. 1979	23.9%	13.0%
Apr. - June 1979	23.5%	11.9%
July - Sept. 1979	*	*
Oct. - Dec. 1979	23.2%	12.8%
Jan. - Mar. 1980	26.8%	14.7%
Apr. - June 1980	25.8%	13.7%
July - Sept. 1980**	26.8%**	13.9%**
Oct. - Dec. 1980	34.0%	15.6%
Jan. - Mar. 1981	34.4%	15.9%
Apr. - June 1981	35.3%	16.2%

* 23-day strike in September, 1979
** Fare increase.

in Table 3.3. Statistically significant shifts are observed in the drop in the percent of transfers received from approximately 21% to 12% of total boardings, and in the rise in the percent of regular and express pass boardings from approximately 20% to 30%. Although the other types of cash and pass boardings do not show statistically significant changes, the direction of the change is as expected. Senior and handicapped cash boardings declined modestly from 3.5% to 2.3%, with corresponding growth in pass boardings for the same group from 9.4% to 11.0%. Similarly, student cash fares held constant (a very slight drop from 0.13% to 0.09%), while student pass boardings rose from 9.5% to 13.9%. Taken as a whole, the decline in cash boardings from approximately 56% to 40% and the rise in pass boardings from 39% to 55% were highly statistically significant.

Further evidence of increasing pass use is shown by changes in the average number of boardings per pass in circulation by pass category and day of week (average weekday, Saturday, and Sunday). As shown in Table 3.4, the trend in the number of boardings per pass in circulation has generally been upward

Table 3.3

PERCENT OF TOTAL BOARDINGS IN EACH FARE CATEGORY BEFORE AND AFTER FARE INCREASE

Fare Category	Percent of Total Boardings March 1980	Percent of Total Boardings March 1981	Statistically Significant Change at 95% confidence?
Cash Boardings:			
Regular	29.61%	24.96%	no
Express	2.10	0.98	no
Senior/Hcp	3.50	2.28	no
Student	0.13	0.09	no
Transfers Rec'd	20.59	11.85	yes
Other	0.04	0.11	-
Subtotal	55.97	40.27	yes*
Pass Boardings:			
Regular & Express	20.18	29.67	yes
Senior/Hep	9.38	11.05	no
Student	9.54	13.89	no
Unknown	-	0.11	-
Subtotal	39.10	54.72	yes*
Free Boardings:	3.25	3.45	no
Tourist Pass Boardings:	0.20	0.25	no
Ticket Boardings:	1.35	1.31	no

* Significant at 99% confidence. H_o: $u_1 = u_2$

since March 1980, with increases of from 3.6 to 4.0 for the average weekday, from 2.0 to 2.6 for Saturday, and a slight drop from 1.0 to 0.8 for Sunday. By aggregating weekday, Saturday and Sunday figures, data indicate that weekly boardings per pass in circulation increased by 16.3% from 16.6 before the fare increase to 19.3 after. As such, the overall increase in the number of boardings per pass in circulation further supports the notion that new pass users tend to be those who transfer most frequently. The panel survey data which is discussed in the following section confirms the finding that new pass users tend to be those who transfer more frequently.

Table 3.4

AVERAGE BOARDINGS PER PASS IN CIRCULATION: MARCH 1980, OCTOBER 1980 AND MARCH 1981[1]

MARCH 1980

Pass Category	Boardings per Pass in Circulation		
	Ave. Weekday	Saturday	Sunday
Regular/Express	3.6	2.0	1.2
Senior/Hcp.	2.0	1.6	1.2
Student/Youth	2.6	0.9	0.6
Total	2.8	1.6	1.0

OCTOBER 1980

Pass Category	Boardings per Pass in Circulation		
	Ave. Weekday	Saturday	Sunday
Regular/Express	3.5	2.2	1.0
Senior/Hcp.	2.4	1.7	1.2
Student/Youth	3.2	1.1	0.5
Total	3.2	1.8	0.9

MARCH 1981

Pass Category	Boardings per Pass in Circulation		
	Ave. Weekday	Saturday	Sunday
Regular/Express	4.0	2.6	0.9
Senior/Hcp.	2.3	1.8	0.9
Student/Youth	3.3	1.4	0.5
Total	3.3	2.0	0.8

[1] Derived from special fare surveys conducted in each month.

In addition, referring to the aggregate average weekday, Saturday and Sunday ridership figures in Table 2.1, it is interesting to note that while both weekday and weekend pass use increased, the increase in boardings per pass on an average weekday corresponds to weekday ridership that remained fairly constant (increasing less than one percent from March 1980 to March 1981); however, the increase in boardings per pass on Saturdays corresponds to a 19% drop in overall Saturday ridership. This suggests that the number of discretionary non-pass riders on Saturday has fallen off substantially as compared to a weekday. Sunday ridership appears to have declined slightly in all categories.

Finally, although the number of weekly boardings per pass increased from March 1980 to March 1981, the ratio of Saturday and Sunday to weekday uses per pass has remained fairly constant. In both years, weekday use accounted for approximately 84% to 85% of total pass use; Saturday accounted for from slightly under 10% to slightly over 10%; and Sunday use dropped from 6% to 4% of total pass use. This, in conjunction with the data on reduced transfer use, suggests that the increase in pass use may not be due to a greater number of linked (total) trips, but instead to the number of unlinked trips made by each passholder. Clearly, this has significant revenue implications, as the riders who are switching to passes are those for whom passes offer the greatest discount.

3.2 User Panel Findings

Panel survey data have also been used to examine changes in the method of fare payment used by panel members who continued to use the RTD system after the July 1980 fare change. The group of "after" transit users examined in this portion of the analysis includes RTD riders who have:

- continued the same transit work or school trips;
- continued different transit work or school trips; and
- continued making transit trips for other trip purposes.

Table 3.5 presents fare category breakdowns contained in the user panel data; "before" fare categories are shown for the entire user panel, while "before" and "after" breakdowns are exhibited for panel members who have continued to ride the RTD following the increase in fares. (Again, no information is available regarding fare payment preferences of new riders.) After examining the before/after change among continued riders, there does not appear to be any significant shift in fare payment method in an aggregate sense.

Table 3.5
USER PANEL FARE CATEGORIES

	Total Survey Sample	"After" Transit users	
	"Before"	"Before"	"After"
Fare Category			
Cash	44.7%	42.3%	41.1%
Ticket	0.5	0.5	0.9
Regular Pass	33.4	34.6	33.4
Express Pass	2.5	2.4	2.1
Senior Pass	11.5	12.0	14.5
Handicapped Pass	1.5	1.7	1.7
Student Pass	4.5	4.8	5.3
Other	1.4	1.5	1.0
Number of Respondents	646	581	581

Three factors may account for this counterintuitive result (which also runs contradictory to the aggregate data trends discussed previously):

- the user panel is made up of a disproportionate number of passholders and cash users are significantly underrepresented;
- the proportions shown in Table 3.6 relate to the fare payment methods used by persons, not the percent of total boardings; and
- people who recently began riding RTD buses (after the fare increase) are not represented in the panel.

While the first of these factors cannot be easily remedied (short of discounting the responses of the prior passholders), estimates have been made of the change in total boardings by fare payment method for those panelists who have continued riding after the fare increase.[1] Table 3.6 shows these estimates, which once again reflect a much higher pass use than found in the

[1] It should be noted that these estimates are somewhat suspect since the survey design did not provide complete data for all "after" users and since the estimates of total boardings involves two data items (weekly one-way trips and transfer activity) which are likely to be somewhat inaccurate given the retrospective nature of the survey.

Table 3.6

ESTIMATED USER PANEL DISTRIBUTION OF BOARDINGS BY FARE CATEGORY BEFORE AND AFTER THE FARE INCREASE

Fare Category	Percent of Total Boardings "Before"	"After"
Cash & Ticket	23.6%	18.0%
Transfer Received	12.5%	10.5%
All Passes	62.0%	70.3%
Regular Pass	40.9%	44.4%
Express Pass	3.2%	3.7%
Senior/HCP Pass	13.0%	15.5%
Other	1.9%	1.2%
Total Weekly Boardings	7,525	6,980
Total User Respondents	646	581

general SCRTD rider population. However, the shifts in payment methods as a percent of total boardings are generally much closer to the shifts shown in Table 3.3 which presented the changes reflected in the systemwide random average fare category count. Even with a large passholders population, pass use increased noticeably and cash, ticket and transfer use dropped.

Given that the panel seems to have responded, in the aggregate, much like the general SCRTD population, it is interesting to examine what types of users switched their payment methods. Table 3.7 shows the panel shifts by prior fare category. There is no great difference in the percent of prior cash and pass users who switched to another payment method, suggesting that the shift in the distribution of total boardings towards pass use is due primarily to more frequent boarders (e.g., transferring passengers) switching to the pass while less frequent boarders (e.g., one bus users) switched to cash payment. In addition, about 25 percent of those who switched fare payment methods also changed their work trip in some way suggesting that the change in fare category for these users had little to do with the fare structure change. (A full 32% of this user group shifted fare categories.) The two other user groups (those continuing to make the same work trip on transit and those making non-work trips) shifted to new fare payment methods to about the same extent (approximately 15%) as did all "after" users.

A breakdown of the shift in fare payment methods by user transfer activity is shown in Table 3.8. This information is presented only for those making

Table 3.7
USER PANEL SHIFTS IN FARE CATEGORY

Change in Fare Payment Method	Number (Percent) of Total "After" Transit Users
TOTAL RESPONDENTS	581 (100%)
• No change	481 (83%)
• Change	91 (16%)
• No Answer	9 (2%)
PRIOR CASH & TICKET FARES	249 (43%)
• No Change	207 (83%)
• Change to Pass	40 (16%)
• Change to Other Cash	2 (1%)
PRIOR REG. & EXP. PASS	215 (37%)
• No Change	175 (81%)
• Change to Cash	29 (13%)
• Change to Other Pass	11 (5%)
PRIOR SENIOR/HCP. PASS	80 (14%)
• No Change	77 (96%)
• Change to Cash	2 (3%)
• Change to Other Pass	1 (1%)
PRIOR STUDENT PASS	28 (5%)
• No Change	20 (71%)
• Change to Cash	5 (18%)
• Change to Other Pass	3 (11%)

the same work trip by transit (and, thus, those making the same number of transfers) both before and after the fare increase. As expected (and confirming the aggregate data trends), those users who transfer tended to switch to using passes and those users riding only a single bus to work tended to not change their method of fare payment.

Another way to look at the transfer issue is to examine the impact of the fare change on total weekly boardings made by both pass and cash users. Estimates were made of the change in total boardings by fare payment method for those panelists who have continued riding after the fare increase.[1]

[1] Estimates were made by combining survey data on weekly one-way bus trips and transfer activity.

Table 3.8

USER PANEL SHIFTS IN FARE CATEGORY BY TRANSFER ACTIVITY

Change in Fare Payment Method	No Transfer	One Transfer	Two Transfers	Three Transfers	Total "After" Work Trip Users
TOTAL RESPONDENTS	156 (100%)	134 (100%)	47 (100%)	13 (100%)	350 (100%)
• No Change	140 (90%)	105 (78%)	39 (83%)	13 (100%)	297 (85%)
• Change	15 (10%)	25 (19%)	8 (17%)	-	48 (14%)
• No Answer	1	4	-	-	5
PRIOR CASH & TICKET FARES	63 (40%)	57 (43%)	21 (45%)	2 (15%)	143 (41%)
• No Change	58 (92%)	44 (77%)	15 (71%)	2 (100%)	119 (83%)
• Change to Pass	5 (8%)	12 (21%)	6 (29%)	-	23 (16%)
• Change to Other Cash	-	1 (2%)	-	-	1 (1%)
PRIOR PASSHOLDERS	92 (59%)	73 (54%)	26 (55%)	11 (85%)	202 (58%)
• No Change	82 (89%)	61 (84%)	24 (92%)	1 (100%)	178 (88%)
• Change to Cash	9 (10%)	6 (8%)	1 (4%)	-	16 (8%)
• Change to Other Pass	1 (1%)	6 (8%)	1 (4%)	-	8 (4%)

These estimates showed that weekly boardings per passholder increased by 10% after the fare increase, approximately the same amount as the increase (16%) in pass boardings reflected in the systemwide fare count. In addition, panel data indicated that total weekly boardings per cash rider decreased by almost 13% since the fare increase. While these findings are not conclusive evidence, they do support the nation that a substantial number of passengers who transfer may have switched from cash payment to pass use.

The only surprising finding shown in Table 3.8 is the indication that many work trip users who have to transfer still pay cash (when a pass would presumably save them significant sums if they used the bus every day). This suggests (if these relatively small samples can be believed) that the market for passes remains large and, at the same time, SCRTD might experience an overall revenue loss if the number of passholders continues to climb.[1]

The change in fare payment method was also crosstabulated with respondents' socioeconomic characteristics and travel behavior. Analysis illustrated no significant differences among those panel members who changed fare category and those who did not change when related to household income and auto ownership. On the other hand, the analysis did detect a correlation between the respondents who shifted fare category and changed transit trip frequency. The user panel data indicated that a higher proportion of travelers who began using an alternative method of fare payment had also changed (increased or decreased) their frequency of transit travel. Within the group of respondents who changed both fare category and trip frequency, a high proportion have decreased transit activity.

---

[1] The structure of the survey and the small samples involved did not allow a detailed examination of this potential market by frequency of use to determine if, in fact, use of a pass would result in significant swings to these users.

CHAPTER 4: CONCLUSIONS AND FUTURE RESEARCH IMPLICATIONS

4.1 Conclusions

The July, 1980 SCRTD fare increase and rate restructuring initiative seems to have had a lasting, although not necessarily major, impact on the system's revenue sources and ridership patterns. Although revenue showed strong growth pursuant to the fare increase, the ridership growth curve which RTD witnessed for several prior years was halted. Revenue subsequently also stabilized and levelled out in the months following the fare increase, although some will argue that the region's energy and economic conditions had much more influence on this occurrence than did the fare increase. The impacts were generally of a subtle character, but the evidence is strong enough that they should be seriously considered. In particular, the changes in the structure of the system's fares seem to have caused regular users to change their method of fare payment, a finding that certainly has implications not only on system revenues, but on operations and service planning as well.

Specific conclusions which are of general interest include the following:

- The increase in average fare of 27.3% corresponds to a drop in ridership of 1.9% from March 1980 to March 1981. However, while the direction of the ridership change is as could be expected, no firm conclusion is possible regarding the impact of the fare increase per se. The comparison is based on a single point in time, and may be heavily influenced by factors other than the fare increase, such as changes in travel patterns, gasoline prices, income, auto ownership, and other factors.

- All of the data point to a loss due to the fare increase of non-work, off-peak discretionary trips which probably were made by regular, but infrequent users who have other modes of travel available; weekend ridership was impacted much more severely than weekday ridership.

- Monthly pass sales jumped substantially and about two-thirds of the new revenue generated by the fare increase came in the form of new pass sales.

- Newly attracted pass purchasers primarily are made up of previous cash paying users who regularly take trips for which they must transfer from one bus to another. Thus, the regular transferring passenger is avoiding, for the most part, the new transfer charge by purchasing a pass. It can be argued that this feature is the cause of lost revenue; however, the imposition of stiff transfer charges is not totally consistent with SCRTD's gradual but steady transition towards a grid (as opposed to a radial) route network.

- Expected shifts of prior one-bus pass users to cash fare payment (because of a higher relative pass price) and significant new express bus riders to use of monthly passes were apparent but not strongly indicated; however, this might be due more to a lack of an accurate data base to measure small changes (e.g., none of the available route or individual user data sources included appreciable express bus information).

While the systemwide revenue and ridership figures discussed in Chapter 2 show a substantial and relatively stable increase in revenues without undue ridership loss, the shifts in fare payment method discussed in Chapter 3 and summarized above have clear implications for the revenue-generating capacity of the new fare structure. The shifts in fare payment method - from cash payments to pass use for longer trips with one or more transfers - indicates that the substantial increase in the cost of a transfer was largely mitigated by shifts in fare payment method. In addition, the relatively larger increases in cash fares in relation to comparable pass prices may tend to depress the use of transit by discretionary riders. Offering substantial discounts to passes, while softening the blow of increased fares on frequent users, also tends to offer discounts to those riders least likely to be driven away from the system pursuant to a fare increase. Clearly, these considerations will need to be carefully weighed in designing additional fare increases.

An issue which cannot easily be addressed as a result of this analysis is the separation of the impacts of the change in SCRTD fare levels from the impacts of the changes in fare structure. A more "across-the-board" fare increase would not have included such a steep increase in the cash transfer charge and, therefore, would not have introduced the situation where passes became much more attractive to transferring passengers. Undoubtedly, revenues are easier to project in cases where the fare structure is not significantly altered. In the SCRTD case, however, it is extremely difficult to determine if revenues today would be higher or lower if all fare components were increased more or less uniformly by, say, 25 percent. The change in fare structure often is motivated by a perception that some user market is under- or over-paying, or because of operational considerations (e.g., the problem of transfer abuse). This research confirms that transit managers and governing boards should recognize that such structural changes can have substantial and sometimes unexpected overall revenue and ridership impacts.

Perhaps the most important finding of the analysis, though, has little direct relationship to the evaluation of the fare increase impacts. The analysis of the retrospective interview of a panel of SCRTD riders showed a surprisingly large number of riders (approximately 40%) entering and leaving

the system or increasing and decreasing (by significant margins) their frequency of system use. From questions aimed at obtaining the reasons for these changes, it became apparent that most of the shifts in transit use had nothing to do with the fare increase, but were caused by changes in personal activity (and, thus, the number and nature of the trips being made) or the availability of an alternative mode to make the same trips. The implications of this finding could be far reaching for large systems like the SCRTD; with a large, constant, and frequent turnover of riders, a property's managers obviously have much more flexibility in shaping their system's service and fare policies in a way which will increase overall efficiency and cost-effectiveness.

This finding implies that the operator can be more aggressive in modifying service and, probably to a more limited extent, fare levels to meet pre-defined objectives, especially if the property has a good monitoring mechanism in place to track ridership and revenue impacts of such changes. The only caution which must be made is found in an inherent weakness of the data used in this analysis; the interview data included only two points in time (about nine months apart) and it remains to be seen whether the 60% who did not change their transit use patterns would continue to remain the same or whether the turnover would pervade all but a small "hard-core" group of transit users.

4.2 Implications For Future Research

With the apparent need for the farebox to continue to contribute the same or an increasing share of the operating costs of most public transit systems, managers and their Boards will continue to feel pressure to regularly increase fares. This analysis has shown that significant changes occur even in the case of moderate fare hikes and changes in fare structure, which entail cause and effect relationships that operators need to understand as they plan for further changes. Two types of research can be suggested to the industry to increase this understanding. The first includes a compilation and analysis of the recent fare related experiences of systems across the country, while the second is focused on the individual property and the need to monitor changes in system usage patterns.

On the industry level, there is an urgent need to compile, sift through, and distribute reliable information on the recent experiences of most large and small properties which have imposed significant fare hikes during the past two to three years. The analyses need not be as elaborate as the one presented in this report; of greatest importance is the need to document the information that is available, especially that information which relates to the changes in fare structure (as opposed to simple across-the-board fare increases). The effort to do this probably involves more than a mailout survey of operators, but need not require much more than telephone conversation and follow-up correspondence with operators who have available information. (In many cases operators have performed their own analysis of fare changes and detailed data awaits an industry or UMTA-sponsored analyst to compile and compare the impacts.)

The second area of research falls to individual properties; it is imperative that they begin to examine their own systems in a manner much like

the analysis presented in this report. Two types of data collection stand out as promising sources of fare-related information: the random systemwide fare category count and the use of repeated panel surveys. The periodic fare category count allows an operator to use revenue data to estimate ridership accurately from month to month, year to year, and before and after a fare change. With so many fare changes being implemented, operators must regularly monitor a random sample of fare category data to have even the slightest hint (without doing systematic route by route counts) of the actual impact of such changes.

User panels can provide further information on the types of individual changes made in transit travel behavior in response to fare modifications. By keeping in contact with a well-defined and representative set of system riders, an operator can easily monitor the response to virtually any type of service and fare change. Because of the problem of a large turnover of transit riders (discovered in this research), it is important to augment panels which may be formed by periodically adding a "fresh" sample of similarly representative users. In addition, an analysis of any fare or service change can benefit from full "before" and "after" surveys or interviews, both to avoid the problems inherent in a "retrospective" survey as well as to capture information about new system users.

Further basic research needs to be performed to determine the best (and least costly) methods by which to initially survey, augment, and keep in contact with system users, as well as the sample sizes required for such panels to ensure reliable findings. While this research is being performed under UMTA or industry sponsorship, operators also may want to experiment with their own riders to determine their willingness to participate in a regular series of interviews or surveys. The use of such panels promises to expand greatly the forecasting and overall planning capabilities of operators who are willing to use this proven market research technique.

APPENDIX A: DOCUMENTATION OF ON-BOARD SURVEY AND PANEL INTERVIEW

In anticipation of the July 1980 fare increase, the SCRTD conducted a short "before" on-board survey on a few randomly selected bus lines. The primary purpose of this survey effort was to obtain the pertinent personal information of a sample of RTD riders who would be willing to participate in a telephone interview to be conducted after implementation of the fare increase.

"Before" On-Board Survey

In the first two weeks of July 1980, RTD personnel administered a short survey among riders on specified bus lines. Unfortunately, since RTD management conducted this survey quickly in order to obtain information before fares were actually increased, accurate records of administration procedures were not maintained. It was estimated that approximately 5000 surveys were distributed in total, primarily on four bus lines. Most of the surveys were distributed by traffic checkers performing normal ride checks, although it is known that at least some were distributed at bus boarding points by checkers conducting point checks. Approximately 1500 responses were received, 1203 of which contained a respondent's phone number and bus line identification. Respondents agreed to participate in a telephone interview and indicated a preferred calling time.

A tally count of the survey response is presented in Table A.1. Note that the majority of respondents (86%) have identified four specific bus lines (2, 7, 39 and 175). Upon examination, these lines do in fact appear representative of the SCRTD service area. Line # 2 can be classified as "Heavy Urban," serving a low-income population and high-density service area to the south and east of the CBD. Line # 7 is also "Heavy Urban" to the south of the CBD, however, it does serve a suburban, middle to high income area to the north. Line #39 extends from the CBD north through a predominantly suburban service area. Finally, Line #175 serves suburban and beach communities on the western periphery of the Los Angeles service area.

Due to the lack of documentation regarding the administration of the July 1980 on-board survey and the low number of lines involved in the effort to assemble a panel of RTD riders, measures have been taken to ensure the representativeness of the survey sample. A comparison was made between the response to the July 1980 on-board survey and the response to an earlier survey conducted by the RTD.

Table A.1

JULY 1980 SURVEY RESPONSE

Bus Line	Total Responses*	English Speaking	Spanish Speaking
2	258	190 (73.6%)	68 (26.4%)
7	146	133 (91.1%)	13 (8.9%)
39	505	435 (86.1%)	70 (13.9%)
175	128	106 (82.8%)	22 (17.2%)
Other Line #'s	166	131 (78.9%)	35 (21.1%)
TOTALS	1203	995 (82.7%)	208 (17.3%)

* Approximately 1500 responses were received from the July 1980 survey. However, in tabulating the responses, those listing neither the respondent's telephone number nor the bus line number were eliminated. As a result, only 1203 responses have been verified. 166 surveys listed bus line numbers other than #'s 2, 7, 39 and 175. These numbers may have represented another bus line which the passenger used that day, surveys distributed at point check locations, or simply may have been an error on the part of the respondent. Nonetheless, no one bus line included in this "Other" group was listed more than twelve times.

In March 1979, origin-destination surveys were conducted on twenty-two bus lines serving the western and northern Los Angeles Sectors. SCRTD schedule checkers handed a questionnaire to every rider boarding an assigned bus trip. Overall, 13,419 surveys were distributed; 7,551 responses were received, for a 56.3% response rate. Analysis by SCRTD planning staff concluded that the March 1979 survey response had relatively high statistical accuracy and was fairly representative of ridership on the surveyed lines.[1] Therefore, a comparison of the two survey responses should indicate the relative representativeness of the July, 1980 effort.

Two of the four bus lines included in the July 1980 survey were also included in the March 1979 surveying effort. The study team made a comparison between the two survey responses for bus lines 2 and 39, as well as for the total response to the two surveys. Table A.2 examines the percentage of Spanish speaking respondents and indicates that the two independent samples are, in fact, relatively similar in composition. Table A.3 presents this comparison according to the frequency of transit use as stated by the survey

[1] Note that confidence intervals constructed for sample data from each of the 22 surveyed lines exhibited a precision of ±10% or less at the 90% confidence level (assuming the population being surveyed is riders on the surveyed lines on the survey day only, not all users on these same routes) for virtually every question on the March 1979 survey.

Table A.2

COMPARISON BETWEEN MARCH 1979 & JULY 1980 SURVEY RESPONSES

Bus Line #	Survey Date	Daily Boardings	Sample Size	% Spanish Speaking
2	March 79	12,271	403 (3.3%)	33.3%
2	July 80	15,355	258 (1.7%)	26.4%
39	March 79	8,744	263 (3.0%)	14.4%
39	July 80	10,883	506 (4.6%)	13.9%
Total Response	March 79	284,578	7551 (2.7%)	19.4%
Total Response	July 80	47,262	1203 (2.5%)	17.3%

Table A.3

COMPARISON BETWEEN FREQUENCY OF TRANSIT USE

Bus Line #	Survey Date	Response by Frequency of Transit Use (days per week) 5	4	3	2	1	1	Total Response
2	March 79	83.0%	4.0%	6.1%	3.2%	1.3%	2.4%	377
2	July 80	83.7%	5.4%	3.1%	3.5%	0.8%	3.5%	258
39	March 79	73.5%	7.4%	9.3%	3.4%	2.9%	3.4%	204
39	July 80	81.8%	5.7%	4.0%	2.8%	4.2%	1.6%	506
Total Response	March 79	79.1%	6.1%	6.4%	3.5%	2.2%	2.7%	6873
Total Response	July 80	77.7%	6.0%	5.6%	4.2%	3.9%	2.6%	1203

respondent. Upon examination, it is clear that the two independent samples exhibit relatively similar breakdowns. Statistical comparison of the proportions for each sample resulted in acceptance of the hypothesis that they are the same at the p = .05 confidence level (except for one frequency category on Line 39). In particular, the total responses for the two surveys appear quite similar in terms of stated frequency of transit use.

As a result of the similarity between the two survey samples and the lack of evidence to the contrary, the study team accepted the assumption that the panel of RTD riders assembled from the July 1980 survey response is fairly representative of SCRTD ridership.

"After" Telephone Interview

The panel of RTD riders assembled before the July 1980 fare change were recontacted and interviewed in February 1981. The "after" telephone interview was designed and administered in order to provide retrospective data on changes in transit trip frequency, travel patterns and fare payment methods made by panel members between before and after the fare change. The survey instrument is presented in Appendix B.

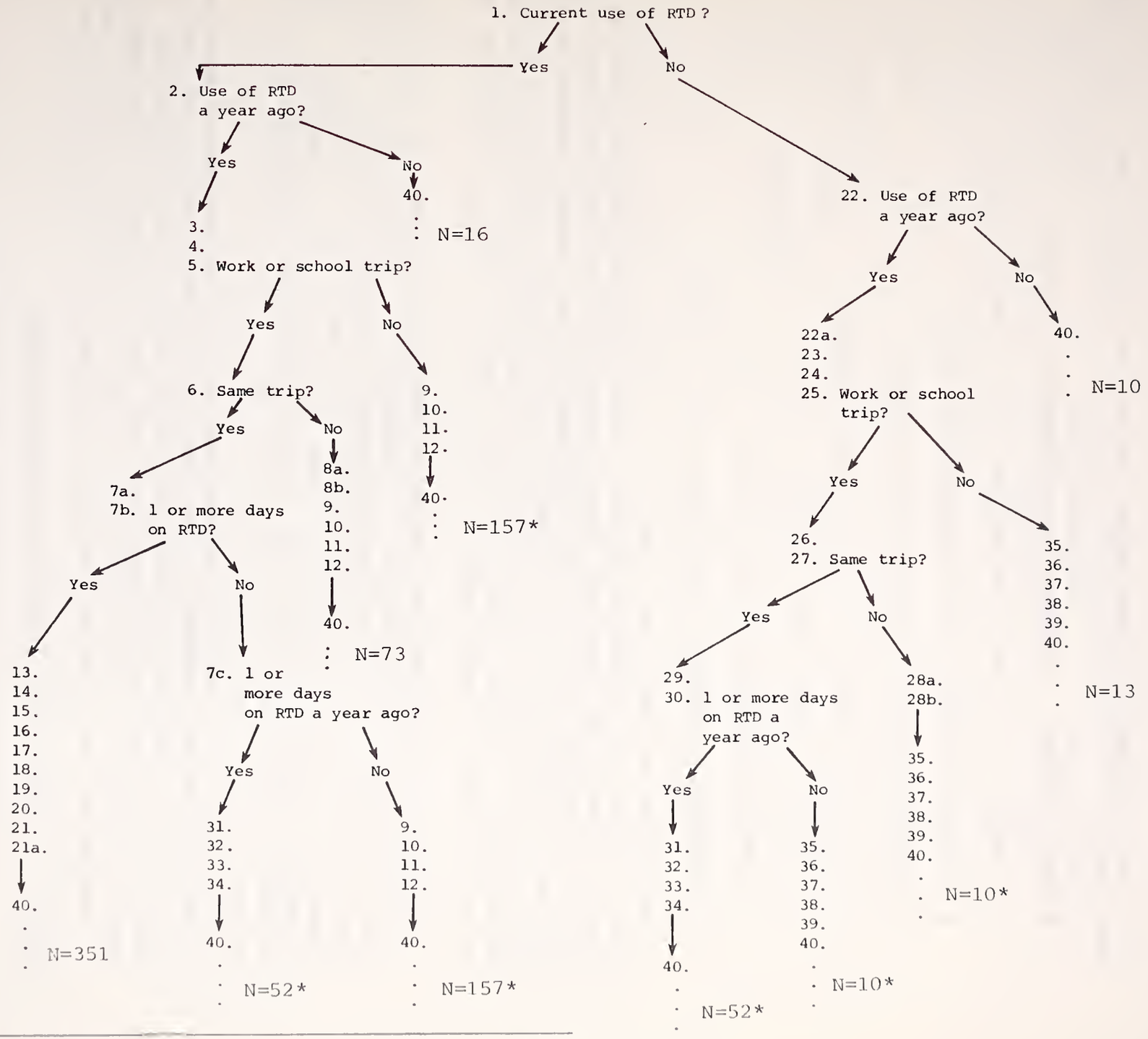
The SCRTD selected a data collection contractor located in Los Angeles to administer and code all telephone interviews. Over a two day period in early February, 1981 a pretest was performed in order to assess the interview instrument in terms of its rate of successful completion, the wording and/or subject matter of the questions, and the ability of respondents to recall travel behavior and trip patterns of a year ago. The pretest was quite successful; out of 98 attempts to contact 95 panel members, 39 completed interviews were obtained. The interviews averaged about eight minutes each so that there was no problem with people terminating early. Respondents seemed to recall well their transit trip patterns of last year. A few minor problems were detected with the wording on a small number of questions; the solution to these problems were incorporated into the final interview design.

The interview instrument was translated into Spanish and administered throughout the end of February and beginning of March, 1981. A total of 682 completed interviews were obtained from the sample of 1203 panel members who responded to the before on-board survey. Therefore, the telephone interview yielded a response rate of 57%.

The telephone interview was intended to provide retrospective data on changes in travel behavior among different user groups and market segments. Consequently, the interview instrument was designed to disaggregate the respondents into groups of transit users by creating survey branches. In turn, relevant questions were addressed to the respondents within each branch. Figure A-1 presents the interview branch tree and illustrates how each user group has been defined. Branches were created on the basis of the following questions:

- "After" RTD trip frequency (to distinguish between regular and occasional users);
- "Before" RTD trip frequency;
- Transit trip purpose (i.e., work, school, other);

FIGURE A-1: FINAL INTERVIEW BRANCH TREE



* Interview branch accounts for a portion of this user group.

- (if respondent makes work or school trips) was the same trip made last year; and

- (if the same trips were made last year) what was the "Before" RTD trip frequency?

As a result of the interview branch design, the following user groups were identified:

- Regular "After" riders/occasional "Before" riders (N=16)

- Occasional riders both "Before" and "After" (N=10)

- Continued different work trip by transit (N=73)

- Continued same work trips by transit (N=351)

- Discontinued same work trips by transit (N=52)

- Continued non-work trips by transit (N=157)

- Discontinued non-work trips by transit (N=13)

- Discontinued different work trip by transit (N=10)

Due to the relatively small sample, the interview response was examined in order to assess its representativeness. First, interview response rates were compared between the four RTD lines surveyed in the July, 1980 on-board. Analysis showed that they were all relatively similar, ranging from 45% to 55% response for individual lines. Secondly, the sample was compared to aggregate SCRTD statistics in terms of percentage of boardings by fare category in the spring quarter of 1980, before the fare change. Table A.4 presents the comparison of fare category data.

Boardings representing the interview sample were computed by converting the survey data from passengers to boardings by incorporating responses regarding "before" fare method, trip frequency and transfer activity. In some cases, when certain user groups within the sample did not specify trip frequency or transfer activity by fare method, certain assumptions were introduced by applying factors from survey findings for other user groups in the sample.

In addition, the analysis addressed the utility of retrospective questions in the panel survey technique. This approach depends upon the ability of respondents to accurately estimate past travel behavior and transit use. In order to test the recall capabilities of panel respondents, the average frequency of pass use for the sample (in terms of boardings per week per pass) was compared to the aggregate SCRTD data. The comparison is presented below:

Before SCRTD: 16.6 boardings per pass per week

Interview: 13.5 boardings per pass per week

1.23 = Ratio of SCRTD: Interview

Table A.4

COMPARISON OF FARE CATEGORY DATA

Fare Category	Percent of Total Boardings*	
	SCRTD March 1980 Fare Category Count	Survey March 1980 User Panel
Cash Boardings	36.2	23.4
Transfers Received	20.5	12.5
Subtotal	56.7	35.9
Tickets	1.2	0.2
Pass Boardings:		
Regular & Express	19.2	44.1
Senior & Handicapped	10.3	13.0
Student	8.3	4.9
Subtotal	37.8	62.0
Other Fare	3.8	1.8

* Boardings from both SCRTD and user panel data represent an average week, including five average weekdays, one Saturday and one Sunday.

After SCRTD: 19.3 boardings per pass per week

Interview: 14.8 boardings per pass per week

1.30 = Ratio of SCRTD: Interview

The frequency of pass use stated by interview respondents is lower than the SCRTD aggregate data in both the before and after cases. However, in regards to the retrospective issue, the comparison shows that the differences between aggregate and interview frequencies are relatively similar before as well as after. Therefore, it appears that respondents have not had difficulty in accurately recalling past behavior and have not introduced a bias into the before data.

APPENDIX B: SURVEY INSTRUMENT: THE RETROSPECTIVE PANEL INTERVIEW

1-4 ID
267-005 5-10
(1101) 2/81 11-14

SCRTD FARE INCREASE

DATE:_____ TIME:_____ NAME:_____

ADDRESS:_____ PHONE:_____ DAY TRAVEL PER WEEK:_____

BUS LINE #:_____ INTERVIEWER:_____ TIMES ATTEMPTED: 1 2 3 4

Hello. This is _____. May I please speak to _____?
I'm calling for the Southern California Rapid Transit District regarding the survey which you filled out on an RTD bus several months ago. May I have a few minutes of your time to ask you some questions about your daily travel patterns so that RTD can plan better service?

IF TIME IS BAD, ARRANGE TO CALL RESPONDENT AT A BETTER TIME. CONFIRM IF HOME ADDRESS IS THE SAME AS ON THE CARD. IF RESPONDENT HAS MOVED MORE THAN 1/4 MILE, END INTERVIEW AT THIS POINT.

1. Do you currently use RTD bus service at least once a month?
   Yes ---------- 1
   No ---------- 2(SKIP TO Q.22) (GOLDENROD)

2. Thinking back to a year ago, did you then ride RTD buses at least once a month?
   Yes ---------- 1
   No ---------- 2(SKIP TO Q.40) (WHITE)

3. I'm going to ask you a few questions about how many <u>one-way</u> trips you usually take. A one-way trip occurs whenever you travel from one place to another. For example, travelling from home to work and then from work to home equals <u>two</u> one-way trips.

   Last week, approximately how many <u>one-way</u> trips did you make on RTD buses?
   #_____

4. Compared to a year ago, has the number of weekly RTD bus trips which you take INCREASED, DECREASED, or STAYED THE SAME?
   Increased ------ 1 \
   Decreased ------ 2 / (ASK Q.4a.)
   Stayed the Same --------- 3 (SKIP TO Q.5)

(IF "INCREASED OR DECREASED" IN Q.4, ASK:)

4a. How many (MORE OR FEWER) (FILL-IN) weekly one-way bus trips do you take now compared to a year ago?
   #_____

4b. What are the most important reasons for this change in bus use over the past year?

_____ _____

_____ _____

_____ _____

5. Do you currently go to work or go to school on a regular basis?

Go to work regularly ----- 1
Go to school regularly --- 2
Both work and go to school regularly ------- 3
Neither work nor go to school regularly---- 4 (SKIP TO Q.9)

INTERVIEWER CONTINUE USING THE GIVEN RESPONSE (WORK OR SCHOOL) FOR ALL THE FOLLOWING QUESTIONS; IF THE RESPONDENT ANSWERS BOTH "WORK" AND "SCHOOL", USE "WORK" IN ALL OF THE FOLLOWING QUESTIONS.

(IF "WORK, SCHOOL OR BOTH" IN Q.5, ASK:)

5a. Currently, how many days a week do you typically travel to work (school)? # of Days:_____

6. Thinking back to a year ago, did you then make this same trip to work (school), that is, from the same starting point to the same destination?

Yes ---------- 1(ASK Q.7a)
No ---------- 2(ASK Q.8a)

(IF "YES" IN Q.6, ASK:)

7a. How many days a week did you typically make this trip to work (school) a year ago? # of Days:_____

7b. How many days a week do you currently use an RTD bus to travel to work (school)? # of Days:_____

(IF "1 OR MORE", SKIP TO Q.13)(BLUE)
(IF "0 OR LESS THAN 1", SKIP TO Q. 7c.)

(IF "0 OR LESS THAN 1" IN Q.7b, ASK:)

7c. A year ago, how many days a week did you typically use an RTD bus to travel to work (school)? # of Days:_____

(IF "1 OR MORE" SKIP TO Q.31) (GREEN)
(IF "0 OR LESS THAN 1" ASK Q.9) (YELLOW)

(IF "NO" IN Q.6, ASK:)

8a. Why is that?

_____ _____

_____ _____

_____ _____

8b. How many days a week do you currently use an RTD bus to travel to work (school)? # of Days:_____(SKIP TO Q.9)
(YELLOW)

9. At the present time, what method of fare payment do you use to ride RTD buses?

Cash Fare ---------- 1
Ticket Fare ---------- 2 (ASK Q.10a)

Regular Monthly Pass --- 3
Monthly Express Pass --- 4
Senior Citizen Pass ---- 5 (ASK Q.10c.)
Handicapped Pass -------- 6
Student Pass ---------- 7

Other(Specify)

_____ ------- X (SKIP TO Q.11)

(IF "CASH FARE OR TICKET FARE" IN Q.9, ASK:)

10a. What cash (ticket) fare amount do you pay for your most frequent RTD bus trip? _____¢

10b. What is the current cost of that trip using a pass? _____$ - SKIP TO Q.11)

(IF CODES "3 THROUGH 7" IN Q.9, ASK:)

10c. What is the current cost of that pass? $_____

10d. What is the cash (ticket) fare amount for this same trip? _____¢

11. Thinking back to a year ago, what method of fare payment did you use then to ride RTD buses?

Cash Fare ---------- 1 (ASK Q.12a)
Ticket Fare ---------- 2

Regular Monthly Pass ---- 3
Monthly Express Pass ---- 4
Senior Citizen Pass ---- 5 (ASK Q.12b.)
Handicapped Pass ------- 6
Student Pass ---------- 7

Other(Specify)

_____------ X (SKIP TO Q.40)(WHITE)
Does Not Recall --------- 0

(IF "CASH FARE OR TICKET FARE" IN Q.11, ASK:)

12a. Do you recall what cash (ticket) fare you paid for your most frequent trip then? _____¢
Does not recall -------- 0(SKIP TO Q40) (WHITE)

(IF CODES "3 THROUGH 7" IN Q.11,ASK:)

12b. Do you recall what the pass cost was then? _____
Does not recall ------ 0 (SKIP TO Q.40)(WHITE)

13. Which bus line(s) do you use on your trip to work (school)?

_____ First Bus _____

_____ Second Bus _____

_____ Third Bus _____

_____ Fourth Bus _____

14. What type of fare do you use for your trip to work (school)? (PROBE FOR AMOUNT OF FARE AS WELL AS TYPE.)

Cash fare of_____¢ ------- 1
Ticket fare of_____¢ ----- 2
$_____Senior Citizen Pass ---- 3
$_____Handicapped Pass-------- 4
$_____Student Pass ---------- 5
$_____Regular Monthly Pass---- 6
$_____Monthly Express Pass--- 7
$_____Tourist Pass ---------- 8
Other(Specify)
_____ ---------- X

15. How many days a week do you currently travel to work (school) by other means of travel? (PROBE FOR DAYS PER WEEK FOR EACH MODE USED.)

Drive alone- Days Per Week
_____ ---------- 1

Drive with others-Days Per Week_____ ------- 2

Ride with others- Days per Week_____ ------ 3

Vanpool- Days Per Week
_____ ---------- 4

Walk-Days Per Week
_____ ---------- 5

Taxicab - Days Per Week
_____ --------- 6

Other(Specify)Days Per Week_____-- X
None ---------- 0

16. Compared to a year ago, has the number of days per week that you currently use an RTD bus to travel to work (school) INCREASED, DECREASED, OR STAYED THE SAME?

Increased ---------- 1(ASK
Decreased ---------- 2 Q.17)

Stayed the Same ---------- 3(SKIP TO Q.19)

17. How many (MORE OR FEWER) (FILL IN) days per week do you typically take the bus now compared to a year ago?

# of Days:_____

18. Within the past year, why have you (INCREASED OR DECREASED) your usage of RTD buses to travel to work (school)?

_____ ____

_____ ____

_____ ____

19. When making this trip to work (school) a year ago by RTD bus, did you use the same bus lines that you currently use to travel to work (school)?

Yes ---------- 1 (SKIP TO Q.21)
No ---------- 2(ASK Q.20)

(IF "NO" IN Q.19, ASK:)

20. Which bus lines did you use a year ago?

_____ ____
First Bus

_____ ____
Second Bus

_____ ____
Third Bus

_____ ____
Fourth Bus

21. When making this trip to work (school) a year ago by bus, did you use the same type of fare to ride the bus as you currently use to make this trip?

Yes -------- 1 - SKIP TO Q.40 WHITE)
No -------- 2 - ASK Q.21a.)

(IF "NO" IN Q.21, ASK:)

21a. What type of fare, then, did you use a year ago? (PROBE FOR AMOUNT OF FARE AS WELL AS TYPE.)

Cash fare of_____¢ ---- 1
Ticket fare of_____¢ ---- 2
$___Senior Citizen Pass--- 3
$___Handicapped Pass ----- 4
$___Student Pass --------- 5

$___Regular Monthly Pass --6
$___Monthly Express Pass-- 7
$___Tourist Pass -------- 8
Other(Specify)

_____ ---------- X
Don't Recall---------- 0

| NOW SKIP TO Q.40 |

22. Thinking back to a year ago, did you use RTD bus service at least once a month then?

Yes ---------- 1(ASK Q.22a.)
No ---------- 2(SKIP TO Q.40)
(WHITE)

(IF "YES" IN Q.22, ASK:)

22a. At that time how many one-way trips did you make a week on RTD buses? A one-way trip occurs whenever you travel from one place to another. For example, travelling from home to work and then from work to home equals <u>two</u> one-way trips?

Number of One-Way Trips:_____

23. Do you recall when you stopped or cut back your riding of RTD buses?

Yes, during
_____
(fill in month) ----- 1

No ---------- 2

24. Why did you stop riding or cut back?

_____ _____

_____ _____

_____ _____

25. Do you currently go to work or go to school on a regular basis?

Go to work ------- 1
Go to school ----- 2
Go to both work and school on a regular basis ---- 3
Neither go to work or school on a regular basis----- 4- SKIP TO Q.35 PINK

INTERVIEWER: CONTINUE USING THE DESIGNATED DESTINATION FOR ALL THE FOLLOWING QUESTIONS; IF THE RESPONDENT ANSWERS BOTH "WORK" AND "SCHOOL", USE "WORK" IN ALL THE FOLLOWING QUESTIONS.

26. Currently, how many days a week do you typically make this trip to work (school)?

Of Days:_____

27. Thinking back to a year ago, did you make this same trip to work (school), that is, from the same starting point to the same destination?

Yes ---------- 1(SKIP TO Q.29)
No ---------- 2(ASK Q.28a)

(IF "NO" IN Q.28, ASK:)

28a. Why is that?

_____ _____

_____ _____

_____ _____

28b. A year ago, how many days a week did you make this trip to work (school)?

# of Days:_____(SKIP TO Q.35) (PINK)

29. How many days a week did you typically make this trip to work (school) a year ago?

Of Days:_____

30. A year ago, how many days a week did you typically use an RTD bus to travel to work (school)?

# of Days:_____

(IF "1 OR MORE" CONTINUE)
(IF "0 OR LESS THAN 1", SKIP TO Q.35) (PINK)

31. Please list each bus line which you used to take this trip to work (school) a year ago?

First Bus	_____
Second Bus	_____
Third Bus	_____
Fourth Bus	_____

32. What type of fare did you use for this trip to work (school) a year ago? (PROBE FOR AMOUNT)

Cash fare of ____¢ ------	1	(ASK
Ticket fare of ____¢ ---	2	Q.33a)
$____Senior Citizen Pass---	3	
$____Handicapped Pass ------	4	
$____Student Pass ---------	5	(ASK
$____Regular Monthly Pass---	6	Q.33B)
$____Monthly Express Pass---	7	
$____Tourist Pass ---------	8	
Other(Specify)		
_____ --------	X	(SKIP TO
Don't Recall ----------	0	Q.40) (WHITE)

(IF "CASH OR TICKET" IN Q.32, ASK:)

33a. Do you know what the cash (ticket) fare is now for that same trip to work (school)?

_____¢		
Does not recall ----------	0	(SKIP TO Q.34)

(IF PASS" IN Q.32, ASK:)

33b. Do you know what the pass cost is now for that same trip to work (school)?

$_____	
Does not recall ---------	0

34. Why have you discontinued using the bus for this trip to work (school)?

_____ _____

_____ _____

_____ _____

(SKIP TO Q.40 WHITE)

35. Thinking back to a year ago, what type of fare did you use to ride RTD buses?

Cash Fare	1	(SKIP TO
Ticket Fare	2	Q.38)
Regular Monthly Pass	3	
Monthly Express Pass	4	(ASK Q. 36)
Senior Citizen Pass	5	
Handicapped Pass	6	
Student Pass	7	
Other(Specify)		
_____	X	(SKIP TO Q.40)

(WHITE)

(IF "PASS" IN Q.35, ASK:)

36. Do you recall how much that pass cost a year ago?

$_____
Does not know ------- 0

37. Do you know how much that pass costs now? (PROBE FOR AMOUNT)

$_____
Does not know ------- 0

(SKIP TO Q.40)

38. Do you recall what cash (ticket) fare you paid for your most frequent bus trip a year ago?

_____¢
Does not know -------- 0

39. Do you know what the cash fare is now for that same trip?

_____¢
Does not know -------- 0

40a. Within the past year, have you noticed any change in the quality of RTD bus service?

Yes ---------- 1 (ASK Q.40b.)
No ---------- 2

(IF "YES" IN Q.40a, ASK:)

40b. What changes have you noticed?

_____ _____

_____ _____

40c. In general, is the present quality of RTD service better, worse, or the same than at this time last year?

Better service ----- 1
The same ---------- 2
Worse service ------- 3

41. Do you have any suggestions for improving the quality of the present service?

(RECORD UP TO 3 SUGGESTIONS)

_____ _____

_____ _____

_____

_____

42. Finally, I would like to ask a few questions concerning you and your household. This information is only used for statistical purposes - it will be kept strictly confidential.

(INTERVIEWER: RECORD RESPONDENT'S SEX:)

Female ---------- 1
Male ---------- 2

43. Within which of the following categories is your age?

Under 16 ---------- 1
16 - 24 ---------- 2
25 - 44 ---------- 3
45 - 64 ---------- 4
65 and over --------- 5

44. Including yourself, how many members are there in your household?

One ---------- 1
Two ---------- 2
Three ---------- 3
Four ---------- 4
Five or more --------- 5
Don't Know/no answer--- Y

45. How many motor vehicles are owned or operated by members of your household?

None ---------- 0
One ---------- 1
Two ---------- 2
Three or more ------- 3
Don't Know/No Answer--- Y

46. Do you have a driver's license?

Yes ---------- 1
No ---------- 2

47. Which of the following best describes you? (CIRCLE ONE) (READ LIST)

Employed full-time ---- 1
Employed part-time ---- 2
Student ---------- 3
Unemployed ---------- 4
Retired ---------- 5
Homemaker ---------- 6
Other(Specify)

_____ ------ X

48. Is your annual household income greater than or less than $20,000?

Less than ---------- 1 (ASK Q.48a.)
Greater than ---------- 2 (ASK Q.48b.)

(IF "LESS THAN" IN Q.48, ASK:)

48a. Is your income greater than or less than $10,000?

Less than ---------- 1
Greater than ------- 2

(IF "GREATER THAN" IN Q.48, ASK:)

48b. Is your income greater than or less than $30,000?

Less than ---------- 1
Greater than --------- 2

Thank you very much for taking the time to answer these questions. Your cooperation is greatly appreciated.

APPENDIX C

REPORT OF NEW TECHNOLOGY

A thorough review of the work performed under this contract has revealed no significant innovations, discoveries, or inventions at this time. In addition, all methodologies employed are available in the open literature. However, the findings in this document do represent new information and should prove useful throughout the United States in designing and evaluating future transportation demonstrations.

300 copies

☆ U. S. GOVERNMENT PRINTING OFFICE: 1982--600-130--230

tment
rtation

and
rograms
ration

ssachusetts 02142

Official Business
Penalty for Private Use $300

Postage and Fees Paid
Research and Special
Programs Administration
DOT 513

U.S. MAIL