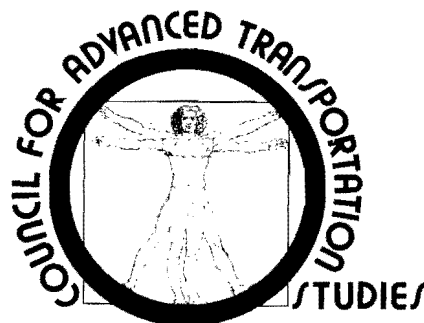


# **SURVEY OF GROUND TRANSPORTATION PATTERNS AT THE DALLAS/FORT WORTH REGIONAL AIRPORT**

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SURVEY OF GROUND TRANSPORTATION PATTERNS  
AT THE DALLAS/FORT WORTH REGIONAL AIRPORT

PART I

DESCRIPTION OF STUDY

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August 1975

RESEARCH REPORT

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## EXECUTIVE SUMMARY

### Introduction

This report describes a survey of ground transportation at the Dallas/Fort Worth Regional Airport (DFW) conducted on May 16 and 20, 1975, as part of an analysis of the impact of Dallas/Fort Worth on ground transportation in the area.

In line with project objectives, data requirements were designed so as to develop comparisons between phenomena at DFW and those at the previous airport, Love Field, and to explore relationships between air and ground traffic. This effort will facilitate drawing conclusions as to the impact on ground transportation of relocating a major or regional air facility, as well as suggest a means of enhancing the future airport planning process.

### Problem Studied

Within these general aims, the orientation of this project has been toward the utilization of modeling techniques for interrelating air and ground traffic, as well as analyzing changes resulting from shifting the location of the regional airport from Love Field to DFW.

The travel survey described in this report was undertaken to generate data for developing and calibrating such models, and to provide information on ground transportation that can be related to standard measures of air traffic activity.

### Results Achieved

It was found most expedient to conduct separate surveys of: (1) employees located at DFW; (2) Surtran (airport bus) riders; and (3) automobile and family vehicle occupants. The employee and Surtran surveys were of the written, self-executed questionnaire type, while the auto occupant survey was of the personal interview type.

Each of the three surveys is described in detail. Questions asked included ground trip origin and/or destination, place of residence;

usual mode of access to DFW; estimation of ground travel time and distance; ground route information (for auto occupants); purpose of airport trip; frequency of airport usage; airline flight information (where applicable); previous usage of Love Field; and personal data on age, occupation and income. Each survey was also correlated with the time of the airport-related trip.

Written questionnaires were distributed to over 13,000 employees and some 5,400 Surtran riders, and approximately 900 auto occupant interviews were conducted. Response rates for written questionnaires were 23.6% for employees and 17.2% for Surtran riders. Total auto interviews corresponded to approximately a 5% sample size. Problems encountered, such as misleading questionnaire formulations, are also discussed.

Traffic counts were conducted to determine traffic volumes by direction and vehicle type on the various access roads to the airport. Both machine and manual counts were employed. The traffic counting procedure is described in detail.

A preliminary travel survey using similar questions and methods was conducted at Austin Municipal Airport prior to the DFW survey in order to test proposed procedures. This survey and its results are also discussed.

Despite some weaknesses, the survey generated data sufficient to accomplish the initially prescribed research objectives. In addition, valuable experimental information on survey techniques was also acquired.

### Utilization of Results

This research is intended to produce a relevant contribution to transportation impacts analysis, particularly of airports, and to provide greater quantitative insight and knowledge of changes in ground transportation patterns that can be expected to accompany the implementation of major new airports or airport improvements. Disaggregate behavioral models aimed at estimating route and mode choice can be developed, with a view towards both augmenting impacts analysis research and enhancing the long-range planning of airport groundside facilities as well.

Thus, the data generated by the DFW Travel Survey can lead to a means of estimating and modeling airport trip generation, effect a comparison of behavioral and standard route and mode choice models, and allow an examination of the spatial distribution of off-airport trip-ends to determine if there has



been an identifiable change in the distribution of trip-ends concomitant with the shift from Love Field to DFW. Traffic count data can be used for comparison with previous counts at Love Field to determine the impact that the new airport is having on vehicular volumes crossing airport boundaries. These data can also be used to develop models for predicting future traffic volumes, and can provide the basis for mathematically expanding the auto survey sampling.

Information based on the survey experience can be useful in planning future travel surveys of this type. To this end, a series of preliminary observations and recommendations is included in the report.

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## PREFACE

This is the fifteenth in a series of research reports describing activities and findings as part of the work done under the research project entitled "Transportations to Fulfill Human Needs in the Rural/Urban Environment." The project is divided into six topics, and this is the third research report under Topic IIIB, "Monitoring the Effects of the Dallas/Fort Worth Regional Airport."

This project is sponsored by the Office of University Research, U. S. Department of Transportation.

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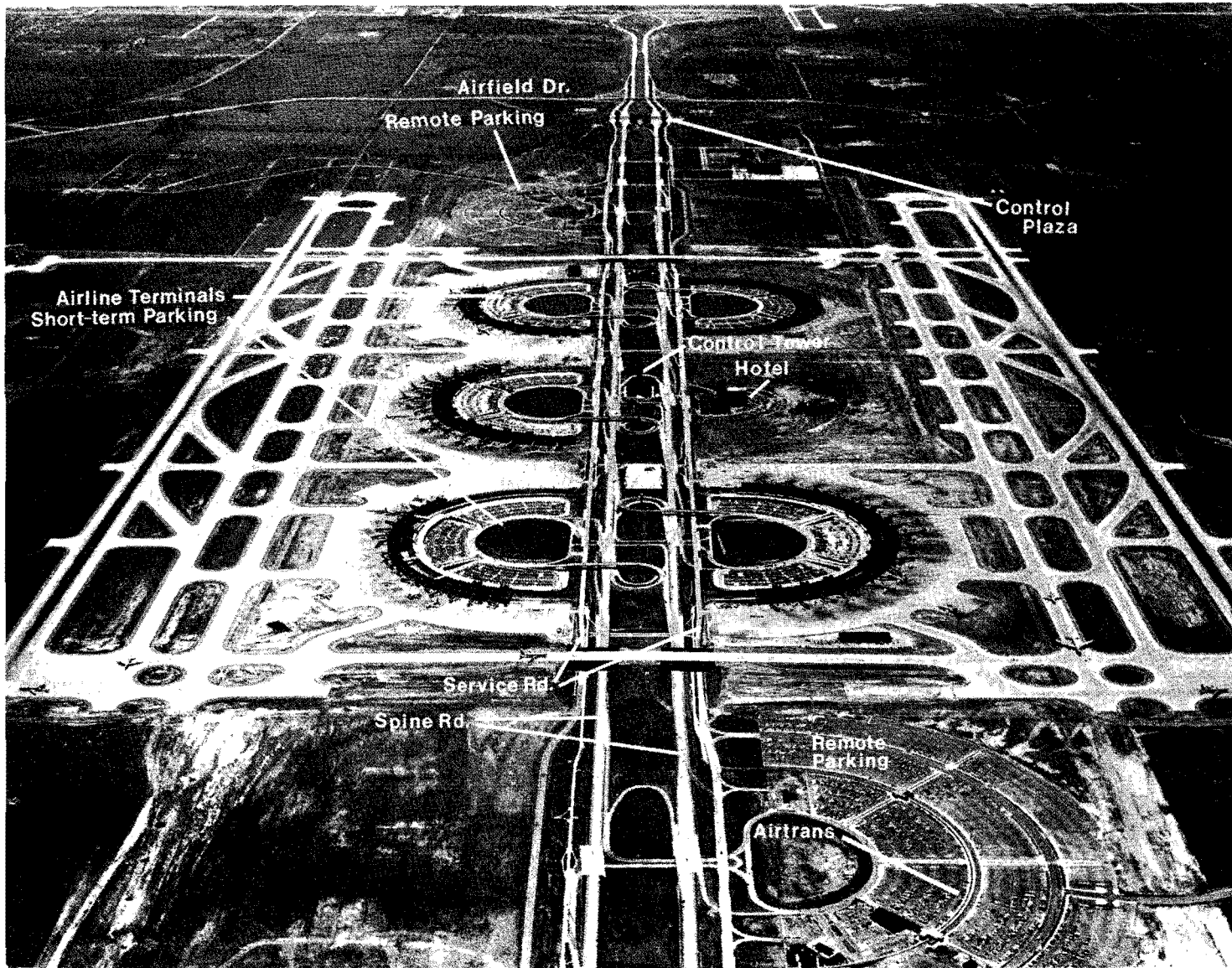
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- (2) Ben Tonic and Richard Jarret of Surtran, Inc.;
- (3) Roy E. Bayless, Director of Aviation, City of Austin;
- (4) Gary P. Smith, Robert R. Heath and William M. Parker of the North Central Texas Council of Governments;
- (5) Main Office and Fort Worth Office of the State Department of Highways and Public Transportation; and
- (6) The Center for Highway Research of The University of Texas at Austin.

In addition we are grateful to the various employers and employees of the Dallas/Fort Worth Regional Airport for their cooperation.



Frontispiece. Dallas/Fort Worth Regional Airport Principal Ground Transportation Features.

## ABSTRACT

This report describes a survey of ground transportation at the Dallas-Fort Worth Regional Airport conducted to obtain data for calibrating models of airport trip generation, and also models of route and mode choice to the airport. Due to the special nature of the data required for this purpose, significant modifications had to be made to the usual procedures of conducting airport-specific access surveys described in previous studies.

A separate survey was made of each of the three principal components of ground traffic at the airport: (1) air passengers and visitors riding in automobiles; (2) air passengers and visitors riding on public transportation (Surtran); and (3) airport employees. In addition, counts of passengers and vehicles were obtained for use in determining and expanding the sample. Detailed descriptions of the instruments and procedures used in each type of survey are contained in the report.

This report, Part I, describes the methodology and performance of the physical travel survey itself. A preliminary analysis of results is provided in a companion report, Part II, which is forthcoming.

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## INTRODUCTION

### Project Background

This report describes a survey of ground transportation at the Dallas/Fort Worth Regional Airport (DFW) conducted on May 16 and 20, 1975, in furtherance of the objective of this research, namely, developing an analysis of the impact of the Dallas/Fort Worth Regional Airport on ground transportation patterns in the regional area. This project is intended to produce a relevant contribution to transportation impact analysis research (on airports in particular) and it will provide greater quantitative insight and knowledge of changes in ground transportation patterns that can be expected to accompany the implementation of a major new airport or airport improvements.

While the bulk of other studies in this field have concentrated on airport access problems from the standpoint of ground traffic demand projections, our own efforts have been directed, in part, towards augmenting the relatively little research into the other side of this coin: namely, assessing the impact of new or expanded airport facilities on ground transportation patterns. In addition, previous studies of airport access have mainly been directed toward determining ground access requirements for a specific airport. This research seeks to develop models for estimating ground transportation volumes as a function of aircraft and/or airline passenger activity in general.

In line with our stated purpose of monitoring the effects of the Dallas/Fort Worth Regional Airport, and dovetailing with the ground transportation impact research described above, we have endeavored to develop comparisons between phenomena at the new DFW airport and those at Dallas Love Field through the design of our data requirements, e.g., traffic counts and origin-destination data. This effort will enable us to draw conclusions as to the impact on current transportation of relocating a major regional air facility.

### Previous Work

Two previous reports have presented the results of foregoing research of this project. A Preliminary Analysis of the Effects of the Dallas/Fort Worth Regional Airport on Surface Transportation and Land Use, by Mr. Harry Wolfe,

presented an overview of the role of DFW in the extension of the regional highway network and DFW's effect upon public transit, as well as its impact on commercial, industrial, and residential development including land use projects, land values, and zoning restrictions in the airport vicinity (ref. 41). Towards Estimating the Impact of the Dallas/Fort Regional Airport on Ground Transportation Patterns (Research Memo 17), by Dr. William J. Dunlāy and Mr. Lyndon Henry, was a policy-oriented study directed at isolating changes in ground transportation patterns attributable to the new airport by developing a methodology for identifying and measuring its impact in this regard (ref. 9). Problems of conceptualizing overall research and deriving an appropriate methodology were presented, and the project staff's initial efforts to generate data for formulating relationships between air and ground transportation were discussed.

The research efforts described in this research report represent a continuation and extension of preceding work on the project as reported in the above documents. The survey of ground travel characteristics of airport users was made to provide a further basis for analysis of DFW's impact on regional transportation patterns.

### Objective

Within the general aim of assessing DFW's impact on ground transportation, our orientation has been toward the utilization of modeling techniques for interrelating air and ground traffic, as well as analyzing changes resulting from the shift in regional airport location from Love Field to DFW. Disaggregate behavioral models aimed at estimating route and mode choice will be developed for such an analysis. Not only will these models be intended for analyzing the specific impact of DFW, but, in addition, it is hoped that they will prove to be useful tools for airport planners in the long-range planning of ground-side facilities, such as access and parking installations at other airports.

Therefore, the DFW travel survey described herein was undertaken with the objective of generating adequate data for calibrating the above models, and for certain subsidiary purposes. The primary purpose of the survey has been to provide information on ground transportation that can be related to standard measures of air traffic activity and thus provide a means of estimating airport trip generation. The data is intended to enable the development of models for:

- (1) airport trip generation analysis,
- (2) route choice,
- (3) mode choice, and
- (4) a comparison of behavioral models and standard models of route and mode choice.

The survey was also intended to allow an examination of the spatial distribution of off-airport trip ends to determine if there has been an identifiable change in the distribution of trip-ends concomitant with the decision to undertake the opening of DFW.

### Scope

The survey of ground transportation at DFW was designed to obtain the most complete record possible of all trips either beginning or ending at the airport. For purposes of the survey, trips to and from the airport were classified as follows: (1) trips made in private automobiles, using the spine road; (2) trips made on public transportation (Surtran and otherwise); and (3) trips using the service road, including employees, service vehicles, and pickup and delivery vehicles. Each of these three classes of trips, which generally are mutually exclusive, was investigated separately.

The survey was restricted to only two days rather than a full week because of financial constraints. In order to take best advantage of this restriction on the amount of data to be gathered, the two days were selected on the basis of passenger volumes and the predominant direction of air trips. Friday was chosen as one day because most business trips terminate at the end of the week; in addition, most weekend travelers leave Friday afternoon. Tuesday was chosen as the other day because it is a day when many business trips begin. These conclusions were reached in consultation with DFW authorities. It was felt that these two days gave the most representative sample of travel for the week as a whole.

This report, Part I of a two-part series, describes the methodology and actual physical performance of the travel survey. Our Part II report, companion to this volume, provides a preliminary analysis of results produced from processing the data generated by the survey.

## OVERVIEW OF DFW GROUND TRANSPORTATION SYSTEM

### Highway Access

Ground access by automobile to the DFW Regional Airport is provided by several distinct roadway systems, the most dominant of which is the north-south "spine highway" (International Parkway) which passes directly through the center of the airport connecting to east-west state highways at its north and south ends (Figure 1). Secondary access roads are also available on the east and west sides of the airport. The minor roads are used predominantly by vehicles visiting the more peripherally-located airport facilities such as the administration building and the air freight complex.

The spine highway system itself is composed of the highspeed, limited-access International Parkway and a physically separated service road system flanking the Parkway on each side. This separation can be clearly seen in Figure 2. The service road system also includes a number of interconnecting roadways, the most important of which is Airfield Road which constitutes almost a complete loop around the airport except for a gap in the northeast (see Figure 3).

Access via International Parkway is controlled by means of "control plazas" at the north and south entrances to the airport, each consisting of eight "control booths" (Figure 4). Control booths for inbound parkway lanes issue time and date-stamped parking tickets; outbound booths collect parking fees based on lengths of stay at the airport as determined from the tickets. Between the north and south control plazas, International Parkway is a multi-lane, 50 mph, divided, limited-access expressway serving the airline terminals and other airport facilities via access/egress ramps. For the general public, International Parkway and its ancillary roadways (primarily the airline terminal access roadways) constitute a closed system, accessible only through the control plazas. That is to say, the control plazas serve as in-and-out-gates to and from the various airport parking facilities.

The parking facilities are divided into remote, or long-term, areas and short term areas close to the various individual terminals. Enplaning and deplaning roadway ramps adjacent to the terminal buildings allow for loading and unloading of airline passengers and their luggage. A typical



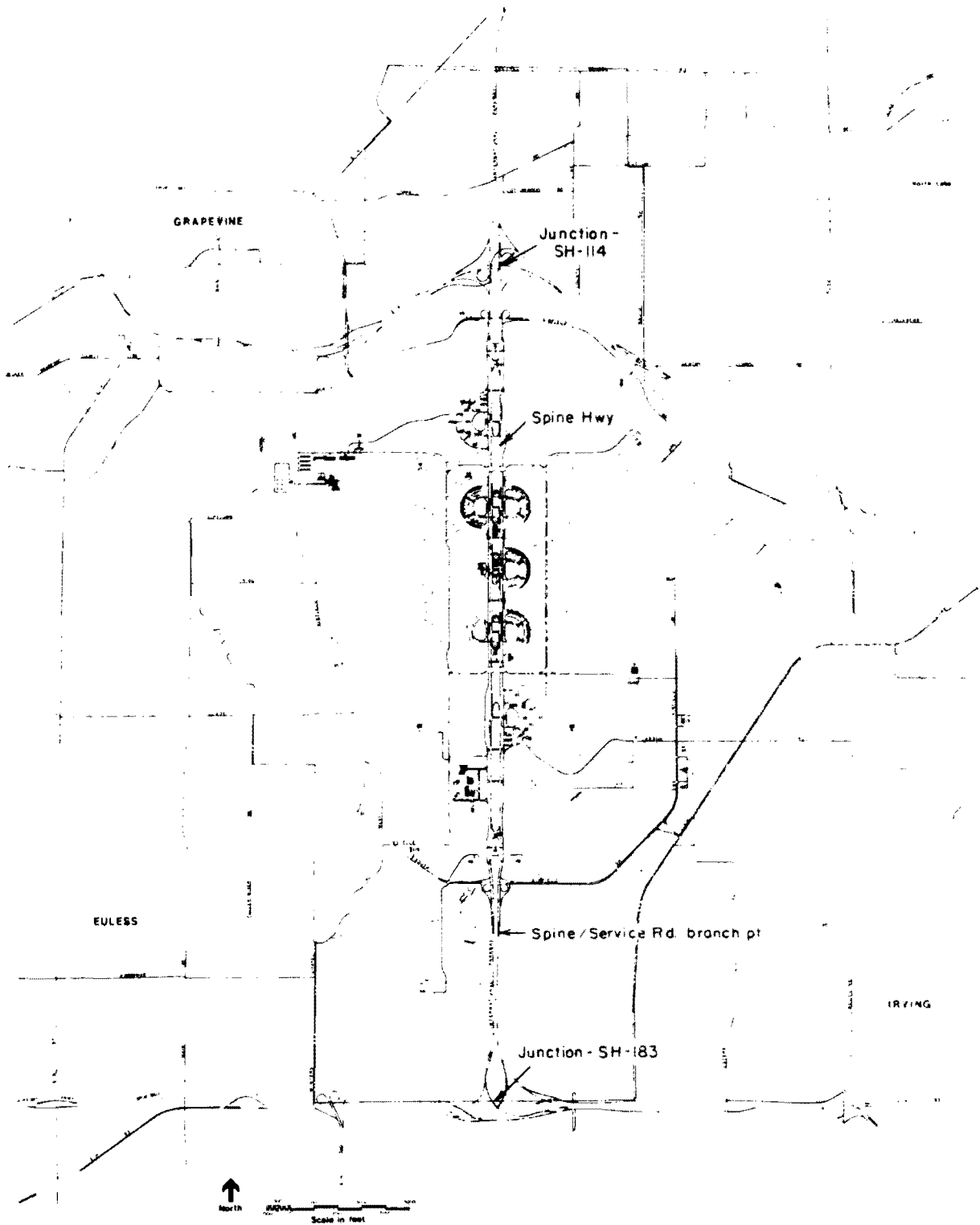


Figure 1. DFW Airport Plan Showing Highway Connections.

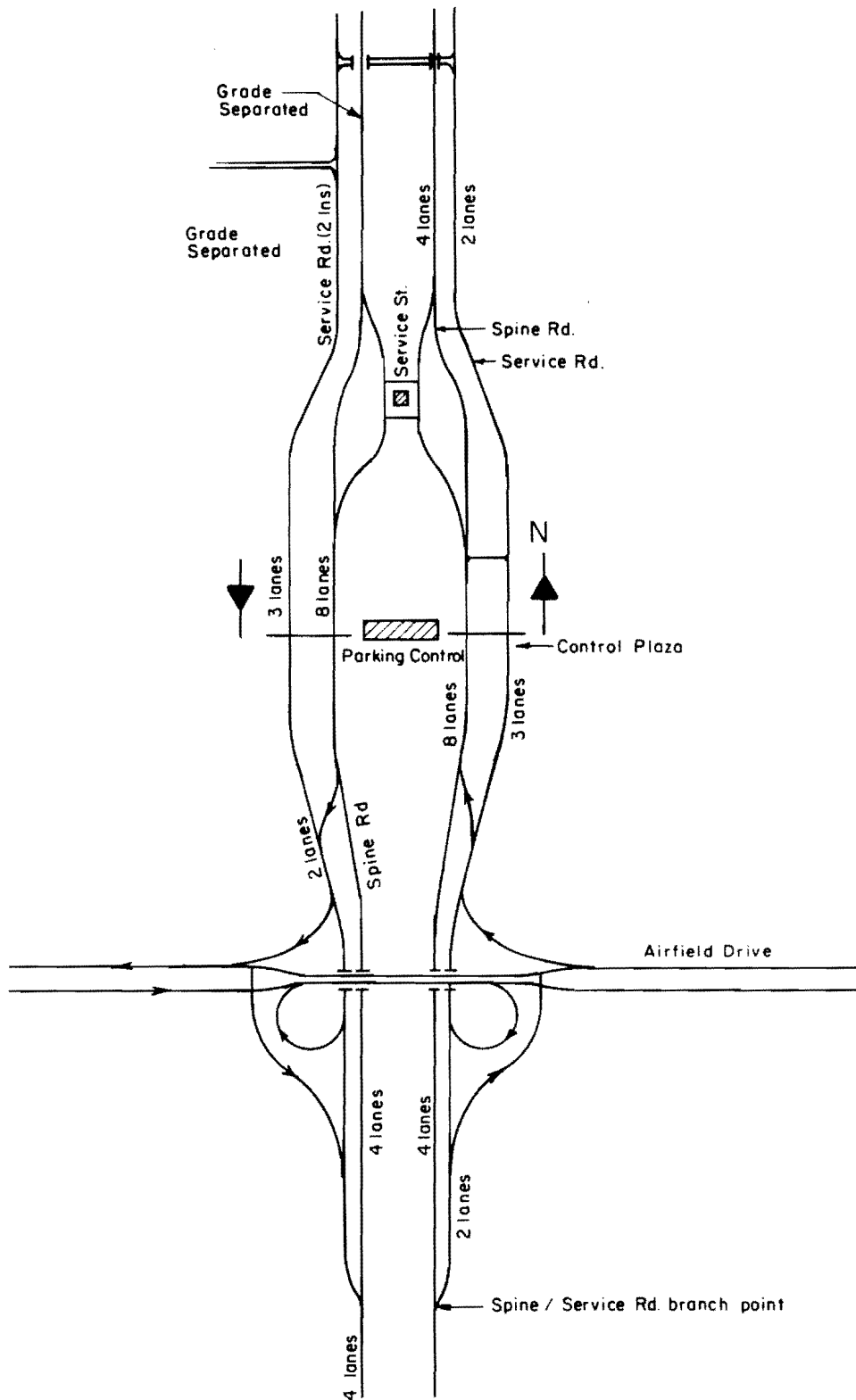


Figure 2. Detail Plan of Roadway System Near Typical Control Plaza Area.

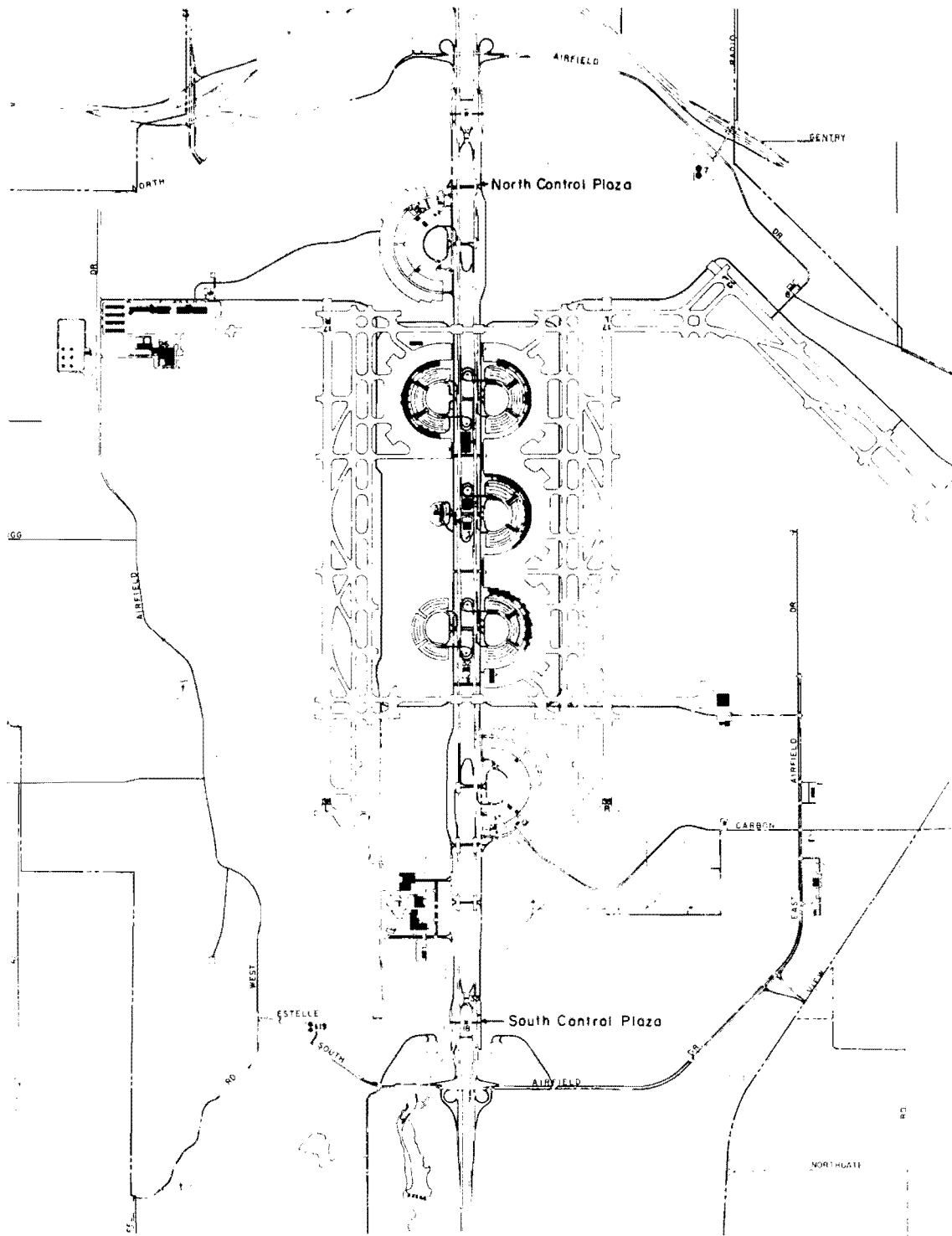


Figure 3. Detail Plan Showing DFW Internal Roadway System.



Figure 4. Typical Control Plaza (With Survey Personnel Shown).

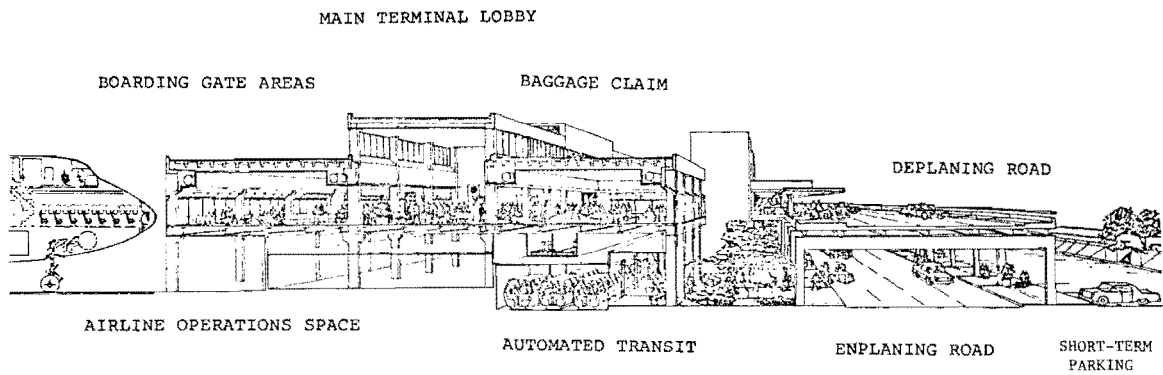


Figure 5. Cross-Section of Terminal Area.

terminal, with short term parking, is shown in Figure 5. The remote parking on the other hand, is a considerable distance from any of the terminals, and transportation between the remote lots and the airline terminals is provided by Airtrans (an automated, electrically-propelled "people mover" system operating on a fixed guideway) and various intra-airport bus services and shuttles.

The system of service roads is used mainly by employees and commercial, maintenance, and similar service-type vehicles which have business at the airport facilities. The service roads begin as branches from the spine highway just outside the control plazas at each end of the airport (Figure 2). Prior to the branching point there is no separation between general public and service traffic.

Adjacent to the control plaza areas there are control booth facilities on the north-south service roads similar to those for International Parkway; however, during the time the survey was performed these were not in operation, and hence there was no control of vehicles entering and leaving the airport grounds on the service roads. However, as mentioned above, beyond the branch points from International Parkway, the service roads are physically separated from International Parkway and other roadways for use by the general public. There is a system of interconnection points between the two roadway systems; however, these are controlled by gates activated by magnetically-encoded cards issued only to selected individuals by the Airport Board.

The north-south service roads are two-lane, limited access roadways. There is one signalized intersection at the southeast where the northbound service road intersects the road to the employee parking facility. Most other intersections are controlled by stop or yield signs, or are grade-separated, such as the junction of the spine service roads with Airfield Drive at the north and south ends.

#### Intra-Airport Transportation Other Than Highway

Intra-airport transportation service other than private auto consists of buses and the automated, fixed guideway Airtrans system, as previously mentioned. Bus services fall into three categories: (1) small, minibus shuttle-type services provided mainly by various car rental agencies and the Airport Marina Hotel to convey patrons between these business places

and the airline terminals, (2) buses operated under contract between the airlines and the Dallas Transit System for the provision of connector-type service between the various airline terminals and other facilities, a service initiated partly because of problems encountered with the automated Airtrans system, and (3) buses operated under contract between various airport employers and the City of Fort Worth's Citran Transit System for the provision of intra-airport circulatory service to employees, another service which Airtrans was designed to provide but was not performing at the time of the survey.

The Airtrans system (Figure 6) consists of about 13 miles of grade-separated concrete guideways and other facilities for small, 24-passenger electrically-propelled, rubber-tired vehicles controlled automatically by a central computer. Airtrans was originally designed to provide the basic intra-airport transport service for passengers and employees, and also to carry baggage, mail, supplies and trash. At the time of the survey, however, the system was operating only as a passenger carrier. While Airtrans is now serving this intra-airport passenger movement with a reliability better than 95%, it is evident from the above discussion that past technical problems have led to the introduction of the various forms of supplementary bus services.

#### Public Transportation Access

Public transportation to and from the airport is provided by bus, limousine, and taxi services. Private taxi carriers can drop off patrons at the airport but are prohibited from picking up riders leaving the airport. A quasi-public corporation, Surtran, created by the cities of Dallas and Fort Worth, has an exclusive franchise to provide express bus service to and from the airport. Surtran is described in greater detail later in this report. Outbound passengers can use the limousine/taxi service provided by Surtran Taxi, Inc., a franchised firm owned by the Dallas Yellow Cab Co. and Fort Worth Cab and Baggage Co. Surtran Taxi is prohibited from conveying riders to DFW but has the exclusive right to carry passengers away from the airport (ref. 28). In addition, shuttle bus service is provided by various hotels using small minibuses or vans that carry passengers in both directions between DFW and their establishments.



Figure 6. Airtrans People-Mover on Guideway.

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## EMPLOYEE TRAVEL SURVEY

### Background

A subject of major interest in the airport travel survey was the travel habits of employees at the airport. The 13,600 employees making work trips to and from the airport contribute significantly to the total traffic volume. A general classification of employees by type of industry and the number in each classification is shown in Table 1:

TABLE 1. NUMBERS OF EMPLOYEES BY TYPE OF INDUSTRY

---

1.	Airlines	8,364
2.	Air Cargo	1,139
3.	General Aviation	100
4.	Food Service	1,406
5.	Maintenance (Excluding airline employees)	379
6.	Security and police	378
7.	Rent-A-Car firms	268
8.	Miscellaneous	<u>1,334</u>
	TOTAL	13,368

---

The Miscellaneous category of Table 1 includes the U. S. Air Mail facility, the Federal Aviation Administration, the Dallas/Fort Worth Regional Airport Board (excluding security and maintenance employees), the Airport Marina Hotel, and others. An attempt was made to send survey forms to all employees through their respective employers.

### Employee Access

Employee access by auto to the airport is mainly via the service road, which provides access to designated employee parking lots. A significant number

of employees use the spine road, but since the service road connects with the spine road beyond the parking control plazas through card-activated gates, freeway access is by the same system.

One of our objectives in surveying employee travel was to examine the times at which employee traffic volumes peak vis-a-vis the peaking times of other traffic at the airport. If employee peaks correspond largely to the peak traffic periods of passengers, the effects of these two peaking times are additive.

The travel and residential choice behavior of the airport employees should constitute a significant portion of the overall impact of DFW on its surrounding area. Analysis of these data can determine how shifting the location of this large center of employment has affected traffic volumes on the surrounding street network, as well as on public transportation facilities to and from the airport. This information can be correlated with the changes in the origins and destinations of employee work trips, both at the airport and at the home end. Preliminary tabulation of the returned employee questionnaires shows that as many as 15% of employees who had previously worked at Love Field have changed their residential location as a result of the shift to DFW. This residential land use impact of the new airport will be analyzed along with changes in commercial and industrial land uses in subsequent reports of this research.

#### Previous Research

There have been a large number of studies in the past of airport travel patterns, but the employee component has received little attention. Where employee travel time has been surveyed, it has usually been found that at least 80% of airport-related employee travel is by private auto (ref. 38). One objective of our research is to examine the modal split of employee travel between auto and Surtran at the Dallas/Fort Worth Regional Airport, and the associate elasticities in cost and level of service for airport employees.

#### The Survey Form

The survey form itself consists of a short introductory paragraph followed by eleven questions (see Figure 7). We first asked for the employee's present home address, allowing the option of answering either by street address or by



# DALLAS / FORT WORTH AIRPORT EMPLOYEE TRAVEL SURVEY

Dear DFW Employees:

This survey is being conducted for the purpose of increasing our knowledge of airport-related travel.

Information from these questionnaires will be used to prepare plans and programs for the future development of transportation services to the DFW Airport so we can provide you with the best possible service.

Please take a few minutes to fill out the following questions and give the form to your supervisor.

Thank you.

1. WHAT IS YOUR PRESENT STREET ADDRESS?

(Street No.) (Street name) (City or Town) (Zip)

OR

(Nearest Street Intersection) (City or Town) (Zip)

2. YOUR TRAVEL DISTANCE (PLEASE ESTIMATE)

A. Approximately how many miles long would you guess your total trip to or from the airport to be? About \_\_\_\_\_ miles.

B. How many miles would your trip be to the old airport, Dallas Love Field? About \_\_\_\_\_ miles.

3. YOUR TRAVEL TIME (PLEASE ESTIMATE)

A. Approximately how many minutes does your total trip to or from the airport take? About \_\_\_\_\_ minutes.

B. How many minutes would a trip to Love Field take? About \_\_\_\_\_ minutes.

4. TYPE OF VEHICLE TAKEN TO AND FROM WORK:

\_\_\_ Driving my own vehicle \_\_\_ Taxi

\_\_\_ Riding in a carpool \_\_\_ SURTRAN

\_\_\_ Being dropped off by someone \_\_\_ Other (Please specify) \_\_\_\_\_

5. YOUR PREVIOUS AIRPORT EMPLOYMENT:

A. Did you work at Dallas Love Field before the opening of the new Dallas-Fort Worth Regional Airport? Yes No

B. IF YES, have you changed your place of residence or do you plan to change because of your shift to the new airport? Yes No  
If you have moved, what was your previous street address?

(Street No.) (Street Name) (City or Town) (Zip)

OR

(Nearest Street Intersection) (City or Town) (Zip)

C. Type of vehicle taken to Love Field:

\_\_\_ Driving my own vehicle \_\_\_ Taxi

\_\_\_ Riding in a carpool \_\_\_ Public bus

\_\_\_ Being dropped off by someone \_\_\_ Other (Please specify) \_\_\_\_\_

6. TIME THAT YOU ARRIVE AND LEAVE WORK:

A. What time did you arrive at the airport TODAY? \_\_\_\_\_ A.M. P.M.

B. What time did your work shift start TODAY? \_\_\_\_\_ A.M. P.M.

C. What time will you get off work TODAY? \_\_\_\_\_ A.M. P.M.

D. What time will you leave the airport TODAY? \_\_\_\_\_ A.M. P.M.

7. FREQUENCY OF YOUR TRAVEL:

Please check the days of the week you work at the airport.

\_\_\_ Sunday \_\_\_ Tuesday \_\_\_ Thursday \_\_\_ Saturday

\_\_\_ Monday \_\_\_ Wednesday \_\_\_ Friday

8. YOU ARE: \_\_\_ Male \_\_\_ Female

9. YOUR AGE: (PLEASE CHECK ONE)

\_\_\_ Under 21 \_\_\_ 35-44 \_\_\_ 55-64

\_\_\_ 21-34 \_\_\_ 45-54 \_\_\_ Over 65

10. YOUR OCCUPATION: (PLEASE CHECK ONE)

\_\_\_ Professional \_\_\_ Craftsman, Foreman \_\_\_ Other Labor

\_\_\_ Clerical \_\_\_ Technician/Operator \_\_\_ Service (Please check one)

\_\_\_ Sales \_\_\_ Maintenance food/airline/custodian

11. YOUR FAMILY INCOME IS: (PLEASE CHECK ONE)

\_\_\_ Under \$6,500 \_\_\_ \$13,000 - \$20,000 \_\_\_ \$26,000 - \$32,000

\_\_\_ \$6,500 - \$13,000 \_\_\_ \$20,000 - \$26,000 \_\_\_ Over \$32,000

PLEASE DO NOT MARK IN THIS BOX.

1 2 3 4

5 6 7

8 9

10 11

12 13

14 15

16

17

18

19 20 21 22

23 24 25

26

27 28 29 30

31 32 33 34

35 36 37 38

39 40 41 42

43 44 45 46

47 48 49

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51

52 53

54

55 56 57 58

Figure 7. Employee Survey Form.

nearest street intersection. This option was designed to allow the response to be less personal and to encourage a response from persons who are reluctant to give their addresses.

The next two questions dealt with how the employee perceived the distance and travel time between his home and DFW. The answers to these questions can be compared with the true distance and travel time as calculated by a minimum-path algorithm applied to the road network of the surrounding area (ref. 22). They can also be compared to the respondent's estimate of distance and time from his home to Dallas' Love Field, and the corresponding true values. In the design of these two questions we debated various ways of reducing the influence of one answer on the other, based on the fact that a person could conceivably base his estimate of distance on the time his trip required, particularly for trips just completed. However, it was decided that preservation of a logical order in the survey form was more important in order for the respondent to complete the form with the least possible effort.

In question number four we asked the employee to indicate the type of vehicle he uses in his work trip. This was straightforward, and all plausible alternatives were included in the check list.

The next topic of interest, question five, was whether the employee had worked at Love Field before DFW opened. This was followed by a question on whether the indicated change in employment location, i.e., the shift to the new airport, prompted a change in the employee's residential location. This decision could be related to the actual travel time and distance between DFW and his new home versus his old home, and/or to his perceived travel time and distance. The employee was then asked to indicate the mode of transportation he used in his work trips to Love Field.

The next series of questions, numbers six and seven, were intended to get a sample of the employee's "normal" work day in terms of the time of the shift, the number of hours worked, and the number of work days per week. The sample size was assumed to be large enough to offset the effect of asking for starting and quitting times for a specific day. Asking for actual times on a specific day was judged more useful for our purposes than having the respondent merely state that his shift was variable.

The survey form ended with some requests for personal (demographic) data. This can be used to relate the travel behavior of employees to standard,

identifiable demographic characteristics, similar to those gathered in the U.S. Census. The age-group brackets were designed to encompass standard phases of the personal and family life cycle (e.g., adolescence, young family, mature family, retirement). The occupational breakdown followed the guidelines of census data, but was simplified somewhat for the convenience of the respondent. The family income brackets shown on the form are the same as those used in the previous survey at Love Field by Alan M. Voorhees, Inc. in 1969, but adjusted upward for inflation using the increase in the region's Consumer Price Index.

In designing the form, attention was paid to the subsequent task of coding the data for computer analysis. On each survey form, space was provided for the transfer of the responses to coding boxes, in order to greatly facilitate the keypunching operation. The employees' street addresses can be converted to North Central Texas Council of Governments Regional Analysis Areas, of which there are about 550 in the Dallas/Fort Worth area.

#### Survey Method

The distribution and collection of the employee survey forms proved to be a time consuming task, as seventy-one (71) airport-related employers were contacted. The vast majority of survey forms were distributed through the mail. A letter of introduction was included which explained the purpose of the survey (Figure 8). In addition, a set of detailed instructions was compiled for the employers, suggesting a particular distribution and collection procedure (Figure 9). We also included in the packet of information sent to employers a few copies of a bulletin board flyer suitable for posting, announcing the study. The survey forms were distributed through the employee supervisors. Distribution and collection instructions for the supervisors were printed on the manila envelope containing the forms (Figure 10). For larger employers, the forms were separated into batches of either 50 or 25 per envelope, with a yellow divider sheet inserted halfway in the stack for easy counting. We felt this system would make the distribution as simple as possible. Very small employers simply received enough forms for their reported number of employees.

In the case of the larger employers (mainly the airlines and the DFW Airport Board, a total of about 20), we estimated that the cost of mailing the forms would be excessive, so we elected to hand-deliver the forms on the day



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THE UNIVERSITY OF TEXAS AT AUSTIN  
COUNCIL FOR ADVANCED TRANSPORTATION STUDIES  
AUSTIN, TEXAS 78712

Suite 2.6 ECJ Hall  
Phone (512) 471-4433

May 12, 1975

Dear Employer:

We wish to request your cooperation on a DFW Airport Travel Survey on Friday, May 16, 1975, being conducted by a project sponsored by the Council for Advanced Transportation Studies with the cooperation of the Dallas/Fort Worth Regional Airport Board. Separate surveys are being conducted of SURTRAN passengers, motorists, and DFW employees.

We are requesting your assistance both in notifying your employees of the survey and in distributing the forms to them this Friday, May 16. (Forms should be completed and returned as soon as possible.)

The following materials are enclosed:

1. An instruction sheet with a short form at the bottom to be returned to us.
2. Notices explaining the survey to your employees.
3. Sample copies of the survey forms. Packages of forms sufficient for the survey will be personally delivered to you on Thursday, May 15, 1975.

We hope that the enclosed instructions are clear and adequate. If you have any questions regarding them, please notify Mr. Michael Sganga, Director of Planning of the Dallas-Fort Worth Regional Airport Board, 214/574-3132, and he will pass your questions on to us so we can contact you ahead of time.

The data gathered in this survey can be used to improve traffic and transportation services for everyone who uses DFW. Your cooperation is essential to its success. Please be assured that we will strongly appreciate your assistance.

Sincerely,

Dr. William G. Dunlay, Jr.  
Assistant Professor of Civil Engineering

rca

Figure 8. Letter to Employers.

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# DFW AIRPORT TRAVEL SURVEY

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## EMPLOYER:

M

Please take a few minutes of your time to help us conduct this survey of travel to and from the DFW Airport. Data gathered in this survey can be used to improve traffic and transportation services for everyone who uses DFW.

### INSTRUCTIONS

1. Please notify your employees in advance of the DFW Airport Travel Survey by posting the enclosed notices as soon as you receive this material.
2. Please distribute the enclosed packages of survey forms to your supervisory employees on Friday, May 16, 1975. (Be sure to take enough forms for yourself and immediate staff.)
3. It is important that every full and part-time employee on every shift receive a form. Supervisors are requested to distribute the forms to the employees under their supervision.
4. Please encourage supervisors and employees to complete the form. It is important that they be completed and returned as soon as possible.
5. Supervisors are requested to collect the completed forms, put them back in the manila envelopes, and return them to the main office by 11:00 AM, Friday, May 23, 1975.
6. Please collect the packages of completed forms from your supervisors and place them in the enclosed large return-mail envelope.
7. Please complete the short form at the bottom of this sheet giving the total number of employees currently on your payroll. Enclose this sheet in the return-mail envelope containing the completed forms.
8. Mail the return-mail envelope containing the completed forms and this sheet back to us by Friday, May 23, 1975. This envelope is pre-addressed and postage is prepaid.

Thanks for your help!

COUNCIL FOR ADVANCED TRANSPORTATION STUDIES  
UNIVERSITY OF TEXAS AT AUSTIN

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Please complete and return this form.

Company or Agency \_\_\_\_\_

Number of Employees \_\_\_\_\_

Figure 9. Instructions to Employers.

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# DFW AIRPORT TRAVEL SURVEY

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## **SUPERVISORS:**

Please take a few minutes of your time to help us conduct this survey of travel to and from the DFW Airport. Data gathered in this survey can be used to improve traffic and transportation services for everyone who uses DFW.

### INSTRUCTIONS

1. Please distribute the enclosed survey forms to the employees under your supervision on Friday, May 16, 1975.
2. Make sure every full and part-time employee on every shift receives a form. Don't forget yourself!
3. Please encourage employees to complete the form. It is important that they be completed as soon as possible.
4. Collect the completed forms back from your employees and put them back in the manila envelope.
5. Return the completed forms to your main office at DFW by 11:00 AM, Tuesday, May 20, 1975. They will be returned to us from there.
6. Send any "straggler" forms, received later, on to your main office at DFW.

THANKS FOR YOUR HELP!

Council for Advanced Transportation Studies  
The University of Texas at Austin

Figure 10. Instructions to Supervisors.



before they were to be distributed. However, we did send advance notice similar to that contained in the above mentioned packet.

Collection of the completed questionnaires was accomplished in the exact reverse order of the distribution. The individual employee gave his form to a supervisor, who returned it to the central office of the employer. The employer then mailed the forms back to us in a pre-paid mailing envelope provided in the original packet. For the larger employers, we picked up what forms had been completed on Wednesday, May 21, at which time we also left pre-paid mailing envelopes to return the remainder of the forms. On the whole, the distribution and collection of the employee forms went smoothly.

### Service Road Counts

The data gathered in the employee survey can be related to the traffic counts of employee traffic, both on the service roads and on the main road, described later in this report. A classification count on the service road segregated private employee vehicles from larger pickup and delivery trucks. From the data on the hourly shift changes and car pooling requested in the employee survey form, a reliable prediction of peak and average hourly service road traffic volumes can be obtained.

### Problems Encountered in Employee Survey

From the results examined so far, it appears that the overall design of the survey form was good, and usable data were obtained. There was little or no confusion on most of the questions asked. However, the wording of a few questions could be improved, and suggestions for this are given below.

Problems with the form itself involved wording, length, and the fact that the Airport Board had recently conducted a survey of its own which contained several similar questions. Thus, some employees may have been irritated by the necessity of executing yet another survey form, and this may have lowered our response rate. The travel survey was also relatively long and complicated, e.g., the questions asking for time and distance estimations, and thus were somewhat demanding on the respondents.

The initial confusion in the employee survey was due to delays in delivering the packages of forms to employers by the postal service. In some cases, the packages of forms were not delivered until the day they were supposed to be filled out. This allowed no time for employers to adequately organize their distribution effort. In addition, delays in some intra-airport communication channels resulted in management personnel receiving the forms as late as the following Monday or Tuesday, May 19 and 20. Since the instructions requested that employers and supervisors "distribute the enclosed survey forms to the employees under your supervision on Friday, May 16," some employers who received their forms after May 16 assumed that it was too late to distribute the forms. The project staff subsequently had to contact these employers and encourage them to distribute the forms to their employees.

In question one, we asked for the zip code as part of the address. This proved to be a valuable piece of information, as some respondents left out their city name but included their zip code.

A small number of respondents interpreted question two as asking for a round trip distance. This could easily have been avoided by specifying a one-way distance. Also, a few respondents may have misinterpreted question 2B as asking for the distance between DFW and Love Field since they were filling out the form at DFW. It is possible to spot-check this error by locations of the two airports relative to their homes.

Question four could be improved by asking for the vehicle taken "most often" or "usually," as we got several multiple responses.

Another troublesome question was the one that requested employees to classify themselves by occupation (professional, clerical, sales, craftsman/foreman, technician/operation, maintenance, other labor, service). It was deemed preferable to give the respondent a check list for this purpose to avoid nebulous and illegible answers which would defy interpretation by the project staff. However, it turns out that the wording of such a list may also be conducive to misinterpretation by the respondent. In addition, a question of this type actually solicits the respondent's perceived self-classification. That this can produce problems has been recognized by the incongruities found between responses to the question vis-a-vis responses to related questions, e.g., a "clerical" worker with income "\$26,000 - \$32,000." The occupational

breakdown used was selected in consultation with the North Central Texas Council of Governments, which is doing a study of basic and non-basic industry in the Dallas/Fort Worth region.

Sample Size

The number of survey forms returned to us has been rather low. Of the 13,368 employee forms sent, 3,157 have been returned, which gives a 23.6 percent rate of return.

## PUBLIC TRANSPORTATION (SURTRAN) SURVEY

### Description of System

Access to DFW by public transit is provided via Surtran (SURface TRANs-  
portation), an express bus system exclusively franchised by the cities of  
Dallas and Fort Worth to serve the airport. Surtran buses operate to and  
from the airport from five outlying passenger terminals--three in Dallas, one  
in Fort Worth, and one in Arlington. The Surtran route configuration is  
shown in Figure 11. The two passenger terminals in Dallas (North Central and  
Love Field) and the one in downtown Fort Worth provide parking facilities.  
Downtown Dallas patrons are served at various hotels and at the new Dallas  
Transportation Center (formerly Dallas Union Terminal). Arlington patrons are  
served at several hotels. At DFW, Surtran buses stop at all airline terminals  
and the Airport Marina Hotel. Minimum bus headways range from 10 to 15 minutes  
and these extend to 20 minutes and longer during off peak hours and late-night  
"owl service". Figure 12 shows a typical Surtran schedule.

Surtran uses General Motors long distance motor coaches (Figure 13) con-  
figured with 30 seats, which furnishes a wide and comfortable interior for  
passengers. One exception to this is Arlington, which is served by small  
minibusses donated by participating hotels.

### Background

Surtran was created based on a recommendation contained in a feasibility  
study by Arthur D. Little & Co. which indicated a strong potential ridership  
for a public transportation express service to the airport (ref. 18). A  
publicly-owned system was selected, and the system is presently owned jointly  
by the cities of Dallas and Fort Worth. Initial organization and management  
of the system was undertaken by the Dallas Transit System and Fort Worth's  
city-owned Citran. Later, Surtran's own management was established, with  
offices in Arlington, to supervise a staff of approximately 100 drivers, main-  
tenance workers, ticket clerks, and other personnel.

Surtran ticket clerks dispense tickets at the various Surtran terminal  
locations (the outlying stations as well as kiosks within the DFW airline

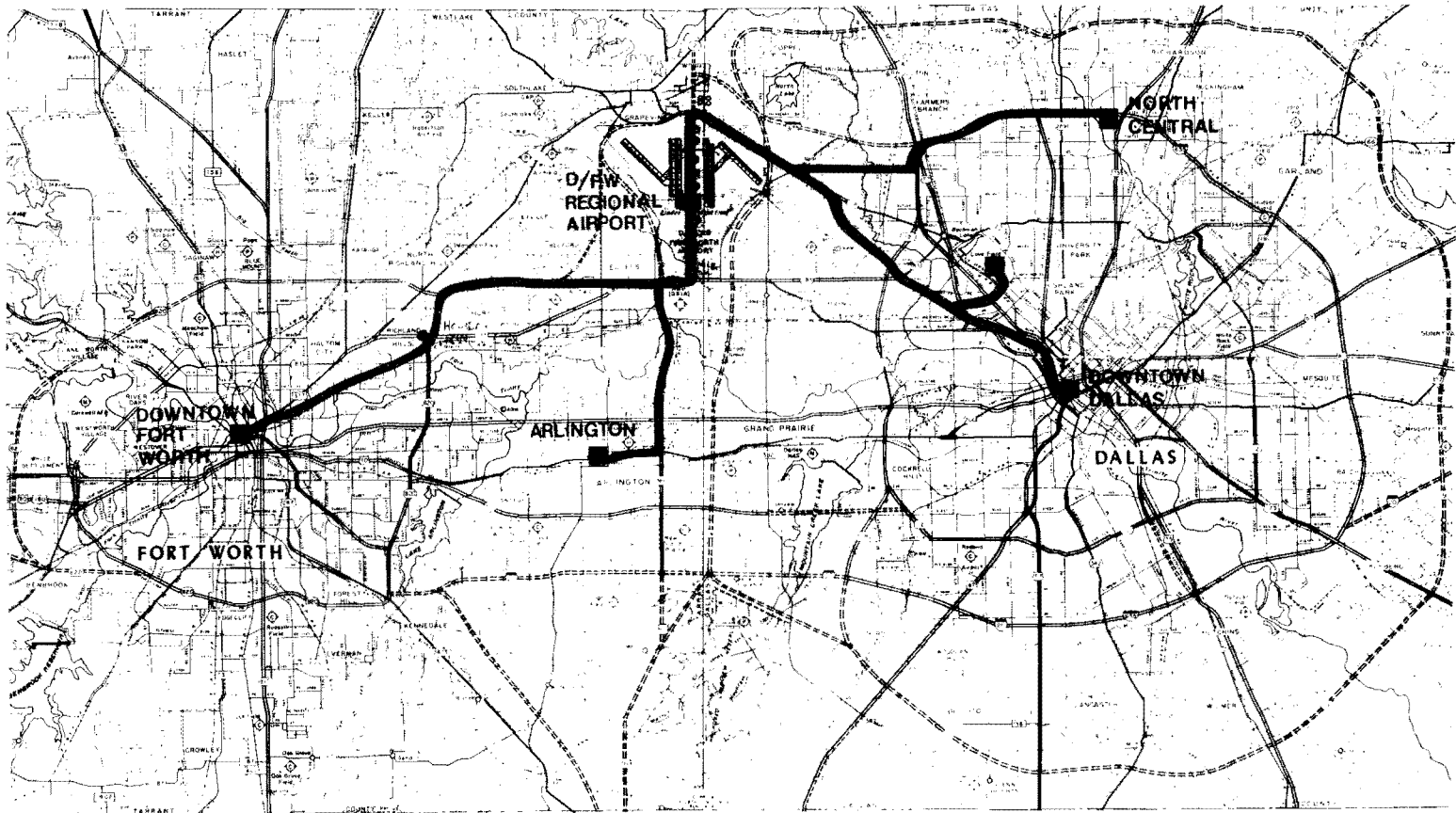


Figure 11. Surtran Route Map.

**DOWNTOWN DALLAS SCHEDULE  
TO AIRPORT**

	B COACHES			A COACHES	
	Depart Downtown Terminal	Arrive Braniff Mesicana Metroflight	Arrive TI Frontier Dzark	Arrive American Eastern	Arrive Delta Continental
a.m.	4:45	5:10	5:15	5:20	5:25
	5:00			5:35	5:40
	5:15	5:35	5:45	5:50	6:00
	5:30	6:05	6:15	6:20	6:30
	5:45	6:35	6:45	6:50	7:00
	6:00	6:35	6:45	6:50	7:00
	6:15			7:20	7:30
	6:30	7:05	7:15	7:20	7:30
	6:45	7:35	7:45	7:50	8:00
	7:00	7:35	7:45	7:50	8:00
	7:15			8:20	8:30
	7:30	8:05	8:15	8:20	8:30
	7:45			8:50	9:00
	8:00	8:35	8:45	8:50	9:00
	8:15			9:20	9:30
	8:30	9:05	9:15	9:20	9:30
	8:45			9:50	10:00
	9:00	9:35	9:45	9:50	10:00
	9:15			10:20	10:30
	9:30	10:05	10:15	10:20	10:30
	9:45			10:50	11:00
	10:00	10:35	10:45	10:50	11:00
	10:15			11:20	11:30
	10:30	11:05	11:15	11:20	11:30
	10:45			11:50	12:00
	11:00	11:35	11:45	11:50	12:00
	11:15			12:20	12:30
	11:30	12:05	12:15	12:20	12:30
	11:45			12:50	1:00
p.m.	12:00	12:35	12:45	12:50	1:00
	12:15			1:20	1:30
	12:30	1:05	1:15	1:20	1:30
	12:45			1:50	2:00
	1:00	1:35	1:45	1:50	2:00
	1:15			2:20	2:30
	1:30	2:05	2:15	2:20	2:30
	1:45			2:50	3:00
	2:00	2:35	2:45	2:50	3:00
	2:15			3:20	3:30
	2:30	3:05	3:15	3:20	3:30
	2:45			3:50	4:00
	3:00	3:35	3:45	3:50	4:00
	3:15			4:20	4:30
	3:30	4:05	4:15	4:20	4:30
	3:45			4:50	5:00
	4:00	4:35	4:45	4:50	5:00
	4:15			5:20	5:30
	4:30	5:05	5:15	5:20	5:30
	4:45			5:50	6:00
	5:00	5:35	5:45	5:50	6:00
	5:15			6:20	6:30
	5:30	6:05	6:15	6:20	6:30
	5:45			6:50	7:00
	6:00	6:35	6:45	6:50	7:00
	6:15			7:20	7:30
	6:30	7:05	7:15	7:20	7:30
	6:45			7:50	8:00
	7:00	7:35	7:45	7:50	8:00
	7:15			8:20	8:30
	7:30	8:05	8:15	8:20	8:30
	7:45			8:50	9:00
	8:00	8:35	8:45	8:50	9:00
	8:15			9:20	9:30
	8:30	9:05	9:15	9:20	9:30
	8:45			9:50	10:00
	9:00	9:35	9:45	9:50	10:00
	9:15			10:20	10:30
	9:30	10:00	10:10	10:20	10:30
	9:45			10:50	11:00
	10:00	10:30	10:40	10:50	11:00
	10:15			11:20	11:30
	10:30	11:00	11:10	11:20	11:30
	10:45			11:50	12:00
	11:00	11:30	11:40	11:50	12:00
	11:15	11:50	11:55	11:55	12:00
a.m.	12:00	12:30	12:35	12:40	12:45
	12:50	1:20	1:25	1:30	1:35
	2:10	2:40	2:45	2:50	2:55
	3:30	4:05	4:00	3:55	3:50

**DOWNTOWN DALLAS SCHEDULE  
FROM AIRPORT**

Depart TI Frontier Dzark	Depart Braniff Mesicana Metroflight	Depart Delta Continental	Depart American Eastern	Arrive Downtown Terminal
5:15	5:10	5:25	5:20	5:55 a.m.
		5:40	5:35	6:10
5:50	6:00	6:05	6:15	6:35
6:20	6:30	6:35	6:45	7:05
6:50	7:00	7:05	7:15	7:20
7:20	7:30	7:35	7:45	7:50
7:50	8:00	8:05	8:15	8:05
8:20	8:30	8:35	8:45	8:20
8:50	9:00	9:05	9:15	8:35
9:20	9:30	9:35	9:45	8:50
9:50	10:00	10:05	10:15	9:05
10:20	10:30	10:35	10:45	9:20
10:50	11:00	11:05	11:15	9:35
11:20	11:30	11:35	11:45	9:50
11:50	12:00	12:05	12:15	10:05
12:20	12:30	12:35	12:45	10:20
12:50	1:00	1:05	1:15	10:35
				10:50
1:20	1:30	1:35	1:45	11:05
1:50	2:00	2:05	2:15	11:20
2:20	2:30	2:35	2:45	11:35
2:50	3:00	3:05	3:15	11:50
3:20	3:30	3:35	3:45	12:05
3:50	4:00	4:05	4:15	12:20
4:20	4:30	4:35	4:45	12:35
4:50	5:00	5:05	5:15	12:50
5:20	5:30	5:35	5:45	1:05
5:50	6:00	6:05	6:15	1:20
6:20	6:30	6:35	6:45	1:35
6:50	7:00	7:05	7:15	1:50
7:20	7:30	7:35	7:45	2:05
7:50	8:00	8:05	8:15	2:20
8:20	8:30	8:35	8:45	2:35
8:50	9:00	9:05	9:15	2:50
9:20	9:30	9:35	9:45	3:05
9:50	10:00	10:00	10:10	3:20
10:15	10:25	10:30	10:40	3:35
10:45	10:55	11:00	11:10	3:50
11:15	11:20	11:30	11:40	4:05
11:45	11:55	12:10	12:15	4:20
12:00	12:05	12:10	12:15	4:35
1:25	1:30	1:35	1:40	4:50
2:45	2:40	2:55	2:50	5:05
4:00	4:05	3:50	3:55	5:20

NOTE: Upon request, Surtran provides coach limousine service to and from the following Dallas hotels: Adolphus, Baker, Fairmont, Holiday Inn Downtown, Marriott Motor Hotel, Ramada Inn Convention Center, Sheraton, Statler Hilton.

Figure 12. Typical Surtran Schedule.



Figure 13. Surtran Motor Coach.

terminals). At other areas, however, sale of Surtran tickets is subcontracted to hotel employees at hotels served in downtown Dallas and in Arlington, where patrons simply buy their tickets at the hotel main desks.

It was deemed important to survey Surtran riders for several reasons. First, they constitute a significant proportion of trips to and from the airport--about 12% of total passengers compared with about 4% carried by transit to and from Dallas' Love Field (refs. 39, 32). This amounts to about 3,000 daily passengers. Furthermore, demographic characteristics of Surtran riders may differ significantly from those of persons making auto trips to/from the airport. These differences might affect the general conclusions of the survey as well as subsequent modeling criteria and modal split analysis techniques.

#### Previous Public Transportation Surveys

No previous survey aimed specifically at public transit riders at Dallas Love Field could be found; the only related survey was an on-board survey of airline passengers performed in 1969 by Alan M. Voorhees & Associates, in which a question on mode of travel to the airport was asked (ref. 39). However, we did have access to a previous Surtran rider survey that was performed by the Surtran management itself. This was a written questionnaire type survey of each passenger, distributed and collected by Surtran employees. A copy of the questionnaire is shown in Figure 14. Response to this previous Surtran survey was good, with approximately 82 percent total return. The formulation of several of these questions was used as a guide for developing our own survey form.

#### The Surtran Survey Form

The Surtran survey presented the challenging problem of designing a survey form which could be completed easily by Surtran riders while riding to or from the airport. These riders comprise a very diverse group in that they include people who are not airline passengers, e.g., airport employees and others, and airline passengers who are both residents and non-residents of the Dallas-Fort Worth area. The problem is further complicated by whether the rider is bound for the airport or leaving it, e.g., a resident of the area who is bound for the airport will return home at sometime in the future, whereas a non-resident probably flew in at some time in the past. For these reasons, it was decided to design two separate forms, one for buses bound for the



## Welcome aboard SURTRAN.

In order for us to provide you with the best possible service on future trips, we ask that you take a few minutes to fill out the following questions and give the card to the Coach Captain when you reach your final destination.

Thank you.

### Where did you board SURTRAN?

- airport     Downtown Dallas Hotel  
 Downtown Dallas Terminal     Love Field Terminal  
 Downtown Fort Worth Terminal     Arlington Terminal  
 North Dallas Terminal (Coit Rd.)

### Your destination is:

- Airport     North Dallas Terminal  
 Downtown Dallas    (Coit Road)  
 Downtown Ft. Worth     Love Field Terminal  
 Arlington Terminal

### Was your coach on time?

- yes     no, How late? \_\_\_\_\_ mins.

### If your trip originated at an off-airport terminal, how did you get there?

- your car     family or friend brought you  
 taxi     courtesy car     city bus

### Why did you decide to take SURTRAN?

- Just to try it     Energy Crisis     Friend's  
 Save money     Convenience     recommendation  
 Save time    Other (SPECIFY): \_\_\_\_\_

### What is the purpose of your trip?

- Business     Pleasure  
 Other (SPECIFY): \_\_\_\_\_

### Is this your first visit to the Dallas/Fort Worth area?

- yes     no

### What time did you board SURTRAN?

- \_\_\_\_\_ AM     \_\_\_\_\_ PM

### Your airline reservations were/are on:

- Braniff     Frontier  
 Mexicana     American  
 Metroflight     Eastern  
 Texas International     Delta  
 Ozark     Continental

### You travel by air at least:

- once a week     6 times a year  
 once a month     less

### What SURTRAN advertising have you seen or heard?

- newspaper     TV     displays  
 outdoor posters     radio     brochure

### Was the advertising self explanatory?

- yes     no

### What is your impression of SURTRAN?

- excellent     good     fair     poor

### You are:

- married     single

### Are you an employee of the airport or an airline?

- yes     no

### What is your profession? \_\_\_\_\_

### Your family owns:

- 1 car     2 cars     more than 2

### Your age is:

- under 21     36-40     56-60  
 21-25     41-45     61-65  
 26-30     46-50     over 65  
 31-35     51-55

### You are:

- male     female

### Your income is:

- under \$10,000     15,000 to 20,000     25,000 to 30,000  
 10,000 to 15,000     20,000 to 25,000     over 30,000

### You live in:

- Dallas     Mid Cities  
 Fort Worth     other

### Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(over)

**surtran**

airport, and the other for busses leaving the airport (see Figures 15 and 16). This design cut the number of possibilities in half, and did not unduly complicate the distribution procedure.

Each Surtran survey form was divided into twelve sections, each logically separated from the next (Figures 15-16). The first series of questions concerned the other end of the rider's ground trip. We gave three options for answering part A of question one: (1) street name and number, (2) nearest street intersection, or (3) the company name or business location. This allowed unfamiliar riders and reluctant respondents the maximum degree of freedom in responding. We then asked the respondent to identify the land use at the other trip end by marking one item of a check list of the more common uses. For land uses not on the check list, there is a provision for an "other" response to this question.

Question one, part C, asked what city or town the rider is a resident of. We considered asking simply, "Are you a resident of Dallas/Fort Worth Area?", but this wording was complicated by the possibility of differing interpretations of the precise bounds of this area. Our intention was to find out if the Surtran rider was a resident of the geographic area served by the airport, the precise bounds of which are not well known (the results of this survey may shed some light on this). We debated how to phrase the question, and finally decided to ask outright for the traveler's home town. Part D of question one asked for the type of vehicle used to interface with Surtran. This is deemed an important factor in the mode split analysis, and in determining characteristics of people who use Surtran.

The respondent's perceived travel distance was the subject of question two. In parts A and B we asked for the total distance between their ground trip end and the DFW airport and Love Field, respectively. The perception of distance and travel time (requested in question three) should govern their overall travel behavior, both on the ground and in their decision to fly. Question two, parts C and D, were added at the request of the Surtran management for their information. The role of Surtran in this survey will be discussed later in this chapter.

In question four, the type of vehicle taken to Love Field prior to the opening of DFW can be related causally to the type of vehicle taken now, and to the other characteristics of the traveler. The results of question four

# surtran

## DFW AIRPORT TRAVEL SURVEY

Dear Surtran Rider:

This survey is being conducted for the purpose of increasing our knowledge of airport-related travel.

Information from these questionnaires will be used to prepare plans and programs for the future development of transportation services to the DFW Airport so that we can provide you with the best possible service.

Please take a few minutes to fill out the following questions and give the card to your Coach Captain when you reach your final destination.

Thank you.

1. A. WHERE IN THE DALLAS-FORT WORTH AREA DID YOU FIRST START YOUR TRIP TO THE SURTRAN TERMINAL?

\_\_\_\_\_  
 (Street Name & Number, OR Nearest Intersection) (City or Town) (Zip)

OR  
 \_\_\_\_\_  
 (Company Name or Business Location) (City or Town) (Zip)

B. THE ABOVE ADDRESS IS:

- |   |  |                                      |
|---|--|--------------------------------------|
| <input type="checkbox"/> Your home                    | <input type="checkbox"/> Your work place           | <input type="checkbox"/> Hotel/Motel |
| <input type="checkbox"/> Someone else's home          | <input type="checkbox"/> Another place of business | <input type="checkbox"/> Shopping    |
| <input type="checkbox"/> Other (please specify) _____ |  |                                      |

C. WHAT CITY OR TOWN ARE YOU A RESIDENT OF?

\_\_\_\_\_  
 (City or Town) (State) (Zip)

D. WHAT TYPE OF VEHICLE DID YOU TAKE TO THE SURTRAN TERMINAL? (Please Check One)

- |                                     |   |
|-------------------------------------|---|
| <input type="checkbox"/> Public Bus | <input type="checkbox"/> Drove my own vehicle         |
| <input type="checkbox"/> Limousine  | <input type="checkbox"/> Delivered by someone         |
| <input type="checkbox"/> Taxi       | <input type="checkbox"/> Other (please specify) _____ |

2. YOUR TRAVEL DISTANCE (Please Estimate)

- A. Approximately how many miles would you guess your total trip to be from your original starting place (as stated in question 1) to the airport? About \_\_\_\_\_ miles.
- B. How many miles would your trip be from your original starting place to the old airport, Dallas Love Field? About \_\_\_\_\_ miles.
- C. How many miles was your trip from your original starting point to where you boarded SURTRAN? About \_\_\_\_\_ miles. (If you stayed at a hotel where you boarded SURTRAN, check here  and skip part D.)
- D. Was the location where you boarded SURTRAN (Check one):  
 very convenient  convenient, OR  inconvenient for you?

3. YOUR TRAVEL TIME (Please estimate)

- A. Approximately how many minutes will your trip take from your original starting place to the airport? About \_\_\_\_\_ minutes.
- B. How many minutes would a trip to Love Field have taken? About \_\_\_\_\_ minutes.

4. WHEN LOVE FIELD WAS THE MAIN AIRPORT, WHAT TYPE OF VEHICLE DID YOU USE MOST OFTEN? (Please Check Only One)

- |                                       |   |
|---------------------------------------|---|
| <input type="checkbox"/> City Bus     | <input type="checkbox"/> Drove my own vehicle         |
| <input type="checkbox"/> Limousine    | <input type="checkbox"/> Dropped off by someone else  |
| <input type="checkbox"/> Taxi         | <input type="checkbox"/> Rent-A-Car                   |
| <input type="checkbox"/> Courtesy Bus | <input type="checkbox"/> Other (please specify) _____ |

5. PURPOSE OF YOUR TRAVEL TO THE AIRPORT (Please Check One)

- |  |   |
|--|---|
| <input type="checkbox"/> Airline Passenger         | <input type="checkbox"/> Airport employee             |
| <input type="checkbox"/> Greeting someone          | <input type="checkbox"/> Business at airport          |
| <input type="checkbox"/> Seeing someone off        | <input type="checkbox"/> Visitor                      |
| <input type="checkbox"/> Pick up an airline ticket | <input type="checkbox"/> Other (please specify) _____ |

6. FREQUENCY OF YOUR TRAVEL TO THE AIRPORT

- A. How many times have you traveled to the new airport recently? About \_\_\_\_\_ times last month, OR about \_\_\_\_\_ times last year.
- B. How often did you make trips to Love Field before the new airport opened? About \_\_\_\_\_ times per month, OR about \_\_\_\_\_ times per year.
- C. Do you still use Love Field now?  Yes  No  
 IF YES, how often? About \_\_\_\_\_ times last month, OR about \_\_\_\_\_ times last year  
 What type of aircraft do you fly?  Commercial  Private

(OVER)

Figure 15. Surtran Survey Form (To Airport)

7. FOR AIRLINE PASSENGERS ONLY
- A. What airport are you flying to? \_\_\_\_\_  
(Airport and/or City)
- B. What airline flight are you departing on?  
Airline (Please check one) Flight No. \_\_\_\_\_
- |                                      |                                      |   |
|--------------------------------------|--------------------------------------|---|
| <input type="checkbox"/> American    | <input type="checkbox"/> Eastern     | <input type="checkbox"/> Ozark                        |
| <input type="checkbox"/> Braniff     | <input type="checkbox"/> Frontier    | <input type="checkbox"/> Texas International          |
| <input type="checkbox"/> Continental | <input type="checkbox"/> Metroflight | <input type="checkbox"/> Other (please specify) _____ |
| <input type="checkbox"/> Delta       | <input type="checkbox"/> Mexicana    |   |
- C. What time is your flight scheduled to depart? \_\_\_\_\_  A.M.  P.M.
- D. What is the purpose of your air trip?
- |  |   |
|--|---|
| <input type="checkbox"/> Business/Employment | <input type="checkbox"/> Visiting family or friends   |
| <input type="checkbox"/> Vacation            | <input type="checkbox"/> Military                     |
| <input type="checkbox"/> Convention          | <input type="checkbox"/> School                       |
| <input type="checkbox"/> Personal Affairs    | <input type="checkbox"/> Other (please specify) _____ |
- E. Please indicate the duration of your air trip:
- |                                     |                                      |                                       |
|-------------------------------------|--------------------------------------|---------------------------------------|
| <input type="checkbox"/> 1 day      | <input type="checkbox"/> 5 - 7 days  | <input type="checkbox"/> 3 - 4 weeks  |
| <input type="checkbox"/> 2 - 4 days | <input type="checkbox"/> 1 - 2 weeks | <input type="checkbox"/> Over 1 month |
- F. If you *are* a resident of the Dallas-Fort Worth area, how will you return home?  Fly back  Drive back  Other  
If you *are not* a resident, how did you come here?  Flew in  Drove in  Other
- G. How many other people are flying in your party? \_\_\_\_\_
8. SURTRAN INFORMATION
- A. How did you first find out about the services provided by SURTRAN?
- |                                |                                    |                                       |  |
|--------------------------------|------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> TV    | <input type="checkbox"/> Newspaper | <input type="checkbox"/> Brochures    | <input type="checkbox"/> Inflight Magazine       |
| <input type="checkbox"/> Radio | <input type="checkbox"/> Display   | <input type="checkbox"/> Ticket Booth | <input type="checkbox"/> Personal Recommendation |
- Other (please specify) \_\_\_\_\_
- B. Why did you take SURTRAN? (Please rank the following in the order of importance to you.)
- |                                  |   |
|----------------------------------|---|
| _____ Avoid traffic              | _____ Avoid trip to airport for person delivering you |
| _____ Avoid parking cost         | _____ No auto available                               |
| _____ Avoid confusion at airport | _____ Save time                                       |
- \_\_\_\_\_ Other (please specify) \_\_\_\_\_
- C. Is this your first trip on SURTRAN?  Yes  No
- D. In the future—as a portion of all your trips to DFW Airport—will you ride SURTRAN on: (please check one)
- |   |   |
|---|---|
| <input type="checkbox"/> most of your trips | <input type="checkbox"/> only a few of your trips           |
| <input type="checkbox"/> some of your trips | <input type="checkbox"/> won't be going back to DFW Airport |
- WHATEVER your response to the previous question, please tell us WHY?  
\_\_\_\_\_
9. YOU ARE:  Male  Female
10. YOUR AGE: (Please Check One)
- |                                   |                                  |
|-----------------------------------|----------------------------------|
| <input type="checkbox"/> Under 21 | <input type="checkbox"/> 45-54   |
| <input type="checkbox"/> 21-34    | <input type="checkbox"/> 55-64   |
| <input type="checkbox"/> 35-44    | <input type="checkbox"/> Over 65 |
11. YOUR OCCUPATION:
- A. Position:
- |   |   |
|---|---|
| <input type="checkbox"/> Professional         | <input type="checkbox"/> Student              |
| <input type="checkbox"/> Clerical             | <input type="checkbox"/> Retired              |
| <input type="checkbox"/> Sales                | <input type="checkbox"/> Service (circle one) |
| <input type="checkbox"/> Craftsman/Technician | Food Domestic Other                           |
- Other (please specify) \_\_\_\_\_
- B. Type of Industry:
- |   |  |
|---|--|
| <input type="checkbox"/> Construction           | <input type="checkbox"/> Communications & Utilities        |
| <input type="checkbox"/> Manufacturing          | <input type="checkbox"/> Public Administration             |
| <input type="checkbox"/> Transportation         | <input type="checkbox"/> Finance, Insurance, & Real Estate |
| <input type="checkbox"/> Wholesale/Retail Trade | <input type="checkbox"/> Education                         |
- Other (please specify) \_\_\_\_\_  Military
12. YOUR ANNUAL FAMILY INCOME:
- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Under \$6,500    | <input type="checkbox"/> \$13,000-\$20,000 | <input type="checkbox"/> \$26,000-\$32,000 |
| <input type="checkbox"/> \$6,500-\$13,000 | <input type="checkbox"/> \$20,000-\$26,000 | <input type="checkbox"/> Over \$32,000     |

Figure 15. (Continued)



DFW AIRPORT TRAVEL SURVEY

Dear Surtran Rider:

This survey is being conducted for the purpose of increasing our knowledge of airport-related travel.

Information from these questionnaires will be used to prepare plans and programs for the future development of transportation services to the DFW Airport so that we can provide you with the best possible service.

Please take a few minutes to fill out the following questions and give the card to your Coach Captain when you reach your final destination.

Thank you.

1. A. WHERE IN THE DALLAS-FORT WORTH AREA WILL YOU FINALLY END YOUR TRIP AFTER YOU LEAVE SURTRAN?

Form with fields for Street Name & Number, OR Nearest Intersection, City or Town, Zip, and Company Name or Business Location, City or Town, Zip.

B. THE ABOVE ADDRESS IS:
Your home, Someone else's home, Your work place, Another place of business, Hotel/Motel, Shopping, Other (please specify)

C. WHAT CITY OR TOWN ARE YOU A RESIDENT OF?
City or Town, State, Zip

D. WHAT TYPE OF VEHICLE WILL YOU TAKE FROM THE SURTRAN TERMINAL?
(Please Check One)
City bus, Limousine, Taxi, Drove my own vehicle, Picked up by someone, Other (please specify)

2. YOUR TRAVEL DISTANCE (Please Estimate)

A. Approximately how many miles would you guess your total trip to be from the airport to your final destination (as stated in question 1)? About \_\_\_\_\_ miles.
B. How many miles would your trip be from the old airport, Dallas Love Field, to your final destination? About \_\_\_\_\_ miles.
C. How many miles is the trip from where you will get off SURTRAN to your final destination? About \_\_\_\_\_ miles. (If you are staying at a hotel where you will leave SURTRAN, check here and skip part D.)
D. From where you will get off SURTRAN, is your final destination (Check one):
very convenient, convenient, OR inconvenient for you.

3. YOUR TRAVEL TIME (Please Estimate)

A. Approximately how many minutes will your total trip take from the airport to your final destination? About \_\_\_\_\_ minutes.
B. How many minutes would a trip from Love Field have taken? About \_\_\_\_\_ minutes.

4. WHEN LOVE FIELD WAS THE MAIN AIRPORT, WHAT TYPE OF VEHICLE DID YOU USE MOST OFTEN? (Please Check Only One)

City Bus, Limousine, Taxi, Rent-A-Car, Drove my own vehicle, Picked up by someone, Other (please specify)

5. PURPOSE OF YOUR TRIP TO THE AIRPORT (Please Check One)

Airline Passenger, Greeting someone, Seeing someone off, Pick up an airline ticket, Airport employee, Business at airport, Visitor, Other (please specify)

6. FREQUENCY OF YOUR TRAVEL TO THE AIRPORT

A. How many times have you traveled to the new airport recently? About \_\_\_\_\_ times last month, OR \_\_\_\_\_ time last year.
B. How often did you make trips to Love Field before the new airport opened? About \_\_\_\_\_ times per month, OR \_\_\_\_\_ times per year.
C. Do you still use Love Field now? Yes No
If YES, how often? About \_\_\_\_\_ times last month, OR about \_\_\_\_\_ times last year.
What type of aircraft do you fly? Commercial Private

(OVER)

Figure 16. Surtran Survey Form (From Airport).

7. **FOR AIRLINE PASSENGERS ONLY**

A. What airport did you fly from? \_\_\_\_\_  
(Airport and/or City)

B. What airline flight did you arrive on?  
Airline (Please check one) Flight No. \_\_\_\_\_

<input type="checkbox"/> American	<input type="checkbox"/> Eastern	<input type="checkbox"/> Ozark
<input type="checkbox"/> Braniff	<input type="checkbox"/> Frontier	<input type="checkbox"/> Texas International
<input type="checkbox"/> Continental	<input type="checkbox"/> Metroflight	<input type="checkbox"/> Other (please specify) _____
<input type="checkbox"/> Delta	<input type="checkbox"/> Mexicana	

C. What time did your flight arrive? \_\_\_\_\_  A.M.  P.M.

D. What was the purpose of your air trip?

<input type="checkbox"/> Business/employment	<input type="checkbox"/> Visiting family or friends
<input type="checkbox"/> Vacation	<input type="checkbox"/> Military
<input type="checkbox"/> Convention	<input type="checkbox"/> School
<input type="checkbox"/> Personal Affairs	<input type="checkbox"/> Other (please specify) _____

E. Please indicate the duration of your air trip:

<input type="checkbox"/> 1 day	<input type="checkbox"/> 5 - 7 days	<input type="checkbox"/> 3 - 4 weeks
<input type="checkbox"/> 2 - 4 days	<input type="checkbox"/> 1 - 2 weeks	<input type="checkbox"/> Over 1 month

F. If you are a resident of the Dallas-Fort Worth area, how did you leave here?  Flew out  Drove out  Other  
If you are not a resident, how will you return home?  Fly back  Drive back  Other

G. How many other people flew with you, in your party? \_\_\_\_\_

8. **SURTRAN INFORMATION**

A. How did you first find out about the services provided by SURTRAN?

<input type="checkbox"/> TV	<input type="checkbox"/> Newspaper	<input type="checkbox"/> Brochures	<input type="checkbox"/> Inflight Magazine
<input type="checkbox"/> Radio	<input type="checkbox"/> Display	<input type="checkbox"/> Ticket Booth	<input type="checkbox"/> Personal Recommendation
<input type="checkbox"/> Other (please specify) _____			

B. Why did you take SURTRAN? (Please rank the following in the order of importance to you.)

_____ Avoid traffic	_____ Avoid trip to airport for person delivering you
_____ Avoid parking cost	_____ No auto available
_____ Avoid confusion at airport	_____ Save time
_____ Other (please specify) _____	

C. Is this your first trip on SURTRAN?  Yes  No

D. In the future—as a portion of all your trips to DFW Airport—will you ride SURTRAN on: (please check one)

<input type="checkbox"/> most of your trips	<input type="checkbox"/> only a few of your trips
<input type="checkbox"/> some of your trips	<input type="checkbox"/> won't be going back to DFW Airport

WHATEVER your response to the previous question, please tell us WHY?  
\_\_\_\_\_

---

9. YOU ARE:  Male  Female

10. YOUR AGE: (Please Check One)

<input type="checkbox"/> Under 21	<input type="checkbox"/> 45-54
<input type="checkbox"/> 21-34	<input type="checkbox"/> 55-64
<input type="checkbox"/> 35-44	<input type="checkbox"/> Over 65

11. YOUR OCCUPATION:

A. Position:

<input type="checkbox"/> Professional	<input type="checkbox"/> Student
<input type="checkbox"/> Clerical	<input type="checkbox"/> Retired
<input type="checkbox"/> Sales	<input type="checkbox"/> Service (circle one)
<input type="checkbox"/> Craftsman/Technician	food domestic other
<input type="checkbox"/> Other (please specify) _____	

B. Type of Industry:

<input type="checkbox"/> Construction	<input type="checkbox"/> Communications & Utilities
<input type="checkbox"/> Manufacturing	<input type="checkbox"/> Public Administration
<input type="checkbox"/> Transportation	<input type="checkbox"/> Finance, Insurance, & Real Estate
<input type="checkbox"/> Wholesale/Retail Trade	<input type="checkbox"/> Education
<input type="checkbox"/> Other (please specify) _____	<input type="checkbox"/> Military

12. YOUR ANNUAL FAMILY INCOME:

<input type="checkbox"/> Under \$6,500	<input type="checkbox"/> \$13,000 - \$20,000	<input type="checkbox"/> \$26,000 - \$32,000
<input type="checkbox"/> \$6,500 - \$13,000	<input type="checkbox"/> \$20,000 - \$26,000	<input type="checkbox"/> Over \$32,000

Figure 16. (Continued)

can be compared to the previous on-board Surtran survey conducted in late June, 1974 by the Surtran management which asked for the same information.

The purpose of the trip to the airport requested in question five can yield information that is very important in the analysis of mode choice. We also hoped that the information requested in question six, the frequency of travel to the airport, would play a significant role in explaining mode choice. The rider's present and past frequency of using Love Field, requested in part C of question six, promised some interesting results, particularly in relation to perceptions of travel distance and time and the rider's personal characteristics.

Question seven was directed specifically at airline passengers. First, we asked for the airport or city at the other end of the air trip. Then we asked for airline and flight number, and, as a backup question for cases where the flight number is either left blank or illegible, the time that the flight was scheduled to arrive or depart. The purpose of the air trip was the next piece of information requested. This would prove valuable in relation to other characteristics of the rider requested on the survey form. The duration of the air trip was requested next because this factor may affect the decision to take public transportation to the airport versus driving. Part F of question seven requests mode of long-distance travel on the return leg of the trip, which is potentially significant to the consideration of intercity mode choice. The number of people traveling in a group (Part G) was also considered potentially significant to ground mode choice and in relating airport passenger activity to volumes of ground traffic.

Question eight deals exclusively with Surtran patronage, and most of the questions in this section were added at the request of the Surtran management. The media communications question is not of great concern in this project; however, the ranking of the factors affecting mode choice is of primary interest in our analysis. A knowledge of the traveler's frequency of use of Surtran can facilitate our determination of the most important attributes of the system.

The last series of questions (numbers nine through twelve) solicited some standard demographic characteristics of the Surtran rider. The occupational breakdown was patterned after the U. S. Census breakdown. However, in order to make a basic versus non-basic industries breakdown, a separate categorization

had to be included for industrial affiliation. This breakdown scheme was developed in consultation with the North Central Texas Council of Governments.

The tabulated results of the Surtran survey can allow us to run a gross comparison with results from the previous on-board survey conducted by the Surtran management in late June 1974. The types of data which are comparable include: (1) type of vehicle used to interface with Surtran, (2) factors in the mode choice decision, (3) purpose of the air trip, (4) airline used, (5) air travel frequency, and (6) demographic characteristics. The results of the previous survey should also serve as a general check on the accuracy of our sample.

#### Interaction with Surtran Management

The design of the survey form was done in close cooperation with the Surtran management. In the process, we discovered that they were planning a similar on-board survey for later in the same summer. This was to be part of a comprehensive marketing analysis, for which they had contracted with Briley and Associates, a Dallas-based consulting firm specializing in market and economic feasibility studies. As a result, we also interacted with Briley and Associates. They reviewed our questionnaire and, after further consultation with them and the management of Surtran, we agreed to incorporate the marketing survey into our survey. This was done with only minimal additions.

Close consultation with Briley and Associates followed, regarding specific details of the survey form. They made many valuable suggestions and recommendations on the format and wording of our questions, and we feel that the survey form was greatly improved by this interaction.

Specifically, the questions added to our form as a result of the above interaction were question two, parts C and D, and parts A, B and C of question eight. The type of interaction involved was typified by our discussions of question eight B, the factors affecting mode choice. Mr. Briley expressed concern that we could not surmise all of the factors deemed important by Surtran riders to include in our checklist. It is a common precept of survey form preparation that the alternatives provided in a multiple-choice question strongly influence the responses (ref. 12). Mr. Briley preferred an open-ended question such as "Why did you ride Surtran?" which would avoid any possible coloring of responses. On the other hand, we were concerned that the



responses to this type of question would be too ambiguous to allow any concrete conclusions for our purposes. The previous Surtran survey of 1974 had included a similar question, and the most frequent response was "convenience." We preferred to seek more specific responses, so we broke the category into four sub-categories. We also provided an "other" response for miscellaneous factors that were not included in the check list. In addition, the validity of the responses to this question can be cross-checked by comparisons with the answer to the second part of question eight, part D, which is open-ended. In its final form, we feel that the survey form will provide an accurate indicator of Surtran rider characteristics and attitudes.

#### Previous Studies of Public Transportation To Airports

From our search of the literature, we found that our survey of public transportation passengers to airports had few examples to follow in the way of previous studies. In past studies that did include public transportation, very little detail was given on the survey methods and content of materials. One noteworthy exception was the airport-access-by-transit studies in the New York area, conducted by the MIT Civil Engineering Systems Laboratory in 1970-71 (ref. 8). The types of data gathered in the MIT survey were similar to ours, but the method of administering the survey form was different. The MIT group actually rode the buses with the riders and supervised the completion of the survey form. A 1968-69 Cleveland study utilized on-board airline passenger surveys, transit rider surveys, employee questionnaires, and interviews in parking lots and terminals (ref. 7). In contrast, we chose a strictly self-administered questionnaire handed out at ticket counters in order to reduce manpower requirements.

#### Survey Form Distribution and Collection

The Surtran management was extremely cooperative in the distribution and collection of the survey forms. The method of purchasing tickets was very conducive to the process of handing out forms in that before boarding Surtran a rider must purchase a ticket at a ticket counter. Therefore, we decided to distribute the survey forms by having the ticket clerk hand out the forms to passengers, and also provide pencils if necessary (not providing pencils might weight returns in favor of those who carry pencils). The rider then boarded

the bus, and completed the form while in transit. The survey form was printed on heavy paper to facilitate this on board completion. As passengers exited the bus, the driver collected the forms, bundled and labeled the stack.

Surtran bus drivers routinely maintain a count of riders. Therefore, when the driver had bundled the completed forms, he wrote down the run number and the corresponding time of day on the top sheet of the bundle. From the above description, it is clear that the distribution and collection of the Surtran forms involved very little effort on the part of the project staff.

### Problems Encountered

One problem encountered was in the process of survey form distribution and collection. Because of a misunderstanding between the bus drivers and the project staff, most of the bundles of forms were labeled with only the run number, while the corresponding time of day was not recorded. Since a scheduled "run" extends over eight hours, it has been difficult (but not impossible) to distinguish the completed survey forms by the time of day. This problem could be avoided in future studies by attaching a special form to the front of each bundle that provides clearly labeled blanks for desired information on run number and time of day. Although the above difficulty hinders the calculation of dwell time of riders in the airport terminal, we still have been able to guess fairly accurately which bus a passenger rode from the time that his flight was scheduled to arrive or depart.

Our initial data analysis indicates that the design of the survey form itself was successful. Very little confusion was evident in the returned forms. However, it was found that part A of questions two and three could be improved by specifying "DFW," rather than just "the airport." A few respondents apparently interpreted the question to refer to the airport at the opposite end of their flight. Similar confusion occurred in a few cases in part A of question seven. In question eight, which deals with factors affecting mode choice, very few people attempted to rank the alternatives listed; instead, most just checked off one or two items. Perhaps only the most important factor should have been requested. Despite the above minor confusions with the survey form, we found the results to be useful for our purposes.

### Sample Size

The overall rate of response was fair. For 5,432 passengers riding Surtran on May 16th and 20th, there were 934 forms returned. This represents a 17.2 percent rate of return. Although this might be improved by various techniques, we feel that, for the expense incurred, this sample size is satisfactory.

## ROADSIDE SURVEY OF AUTO OCCUPANTS

### Previous Research

Most past surveys of travel to and from major airports have been accomplished with questionnaires distributed to airline passengers on board the aircraft for them to complete during their flight (refs. 4, 23, 24, 25, 39). Standard techniques for conducting such surveys have been compiled and synthesized by Barton Aschman Associates, Inc., in their Airport Travel Survey Manual (ref. 3). The same Manual also briefly describes roadside interview techniques similar to the one used in this research. However, the manual recommends that the personal interview technique be limited to airports " . . . where activity levels are low or where the trip makers to be surveyed are concentrated at a small number of points." The manual also points out that "Personal interviewing is most applicable when certain aspects of the questionnaire would not be understood by respondents, or when the line of questioning followed is dependent on the response to specific questions" (ref. 3). Our selection of the roadside interview technique for our survey of auto passengers was based, in part, on the above recommendations.

### Selection of Survey Type

Based upon our data requirements, and subsequent model calibration needs, in our study we decided that a roadside interview procedure would be preferable to on-board surveys, self-administered survey forms distributed at the airport, or mail-back survey cards. An on-board survey would tell us less about certain driver characteristics in which we are vitally interested, especially the route the driver actually took and his perceived travel times and distances. Self-administered survey forms distributed and collected by survey personnel at the airport were considered infeasible in our study because of the time required for respondents to fill out and return the survey form and the size of the staff required. The idea of mail-back survey cards was also discarded for the above reasons, and also because of the postage expense involved. In short, we felt that much of the information sought, especially auto occupancy, perceived time and distance, and the specific route taken to and from the airport, could best be determined in a personal interview on the roadside.

Budget limitations were another factor in choosing the roadside survey technique. We estimated that the cost of the post cards coupled with manpower costs for handing out the forms would be nearly double the cost of the roadside interview. A final factor in deciding on roadside interviews was reservation expressed by the DFW Airport Board that persons handing out cards at the control booths would cause additional confusion at the airport gates.

### Scope of Roadside Survey

In designing our roadside interview, we decided to limit interviews to vehicles on the outgoing lanes of the airport spine roads, i.e., not to interview incoming autos. This decision was made under the hypothesis that travelers leaving the airport would be less reluctant to stop for an interview than persons on their way to catch a flight. In addition, attempting to interview people who are in a hurry would reduce the quality of the interviews. The performance of the interviewers is also affected by the necessity to rush through an interview in that they tend to rush through the questions, write sloppily, and phrase the questions improperly. Feedback from the interviewers did suggest that the above assumptions were correct.

Due to the high volume of traffic using the spine roadways, and our agreement with the DFW Airport Board not to create traffic congestion, only one car at a time was stopped at each interview station. All others were flagged past the station. Although this procedure limited our sample size, especially during peak periods, it did result in excellent cooperation from the people interviewed. The variation in sample size between peak and off-peak periods will be considered later in the data analysis.

### Location of Interview Stations

The roadside interview stations were located just outside the control plazas, one on each side of the outgoing spine roads at each end of the airport, for a total of four interview stations. This was the maximum number deemed appropriate given our budgetary constraints and the physical configuration of the airport exits (see Figure 17).

In addition to traffic cones and identification signs, each station contained a large board-mounted map to assist interviewees in describing their route patterns.

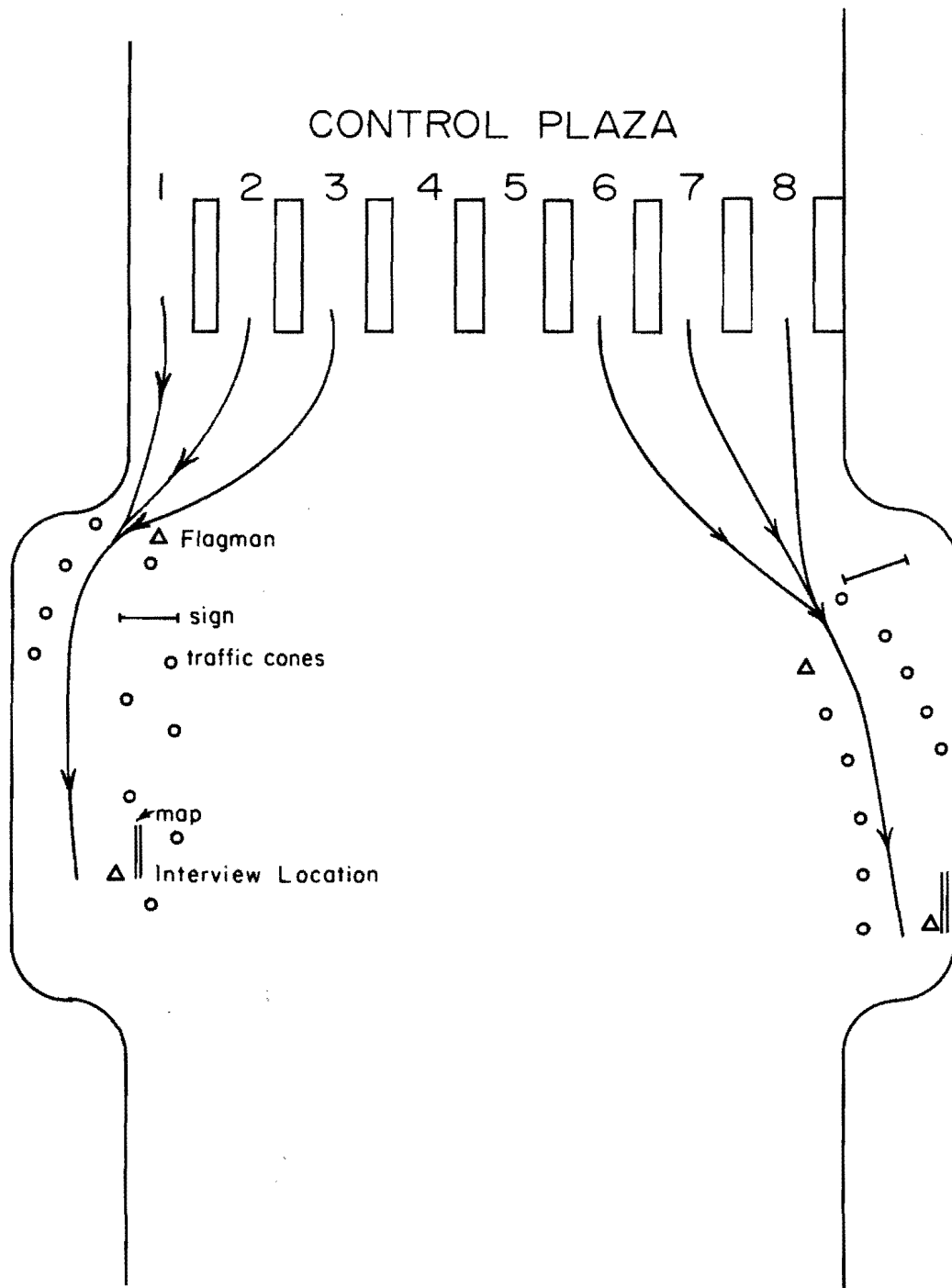


Figure 17. Plan of Interview Station Locations.

### The Roadside Interview Form

The design of the interview form was coordinated, in part, with the one used for an on-board survey at Dallas Love Field in June, 1969 (ref. 39). Figure 18 shows our DFW Interview Form, while the 1969 Love Field Form is shown in Figure 19. The types of questions and categories of answers in these two studies were closely matched so that the results of the two studies could be directly compared, thus facilitating an impact evaluation.

In designing the roadside interview form, we paid careful attention to the phrasing of questions. When asking for destination, for example, we felt that it was important to first ask for the street address or hundred block and then, if that failed, we asked for the nearest street intersection. From a preliminary analysis of responses to this question during an Austin pilot study, we found that drivers would often give a major street intersection that was a considerable distance from their final destination rather than the street intersection closest to where they were going. In requesting the route that drivers would take, it was necessary to be very persistent in asking for the next street along the route because most drivers had a tendency to stop after giving two or three legs of their journey, which often left them at a significant distance away from their final destination.

Similarly, in the questions on perceived time and distance, drivers had to be coaxed to respond correctly. In most cases, distance presented the most difficulty. The purpose of the air trip also required some care since many passengers did not distinguish between some of the given categories, e.g., the convention category as being distinct from the business one.

The procedure for asking the questions on age consisted of the interviewer handing the driver and air-passenger a card containing several ranges of age, each identified by a letter A through F (see Figure 20). The respondents were then asked to indicate which age category they fell into by specifying the corresponding letter. An identical procedure was followed when asking for family income. This method worked very well and made answering these personal questions quite acceptable to the respondents.





5. FREQUENCY OF AIRPORT USE:

1. Times used DFW airport:  month:  year
2. Times used Love Field before DFW opened:  month  
\_\_\_\_\_ times per  year
3. Use Love Field now?  Yes  No  
\_\_\_\_\_ times last  month  Private  
\_\_\_\_\_ year  Comm'l
4. How many miles to Love Field from next stop?  
\_\_\_\_\_ miles
5. How many minutes? \_\_\_\_\_ minutes
6. When Love Field was main airport, type of vehicle used most often?  
 City bus  Drove own vehicle  
 Limousine  Dropped off by someone else  
 Taxi  Rent-a-car  
 Courtesy bus  Other

42	43
44	45
46	47
48	49
50	51
52	53

6. AIRLINE FLIGHT INFORMATION

1. Other airport: \_\_\_\_\_
2. Flight number: \_\_\_\_\_  
 AA  EA  OZ  
 BN  FL  TI  
 CO  METRO  Other  
 DL  MX \_\_\_\_\_
3. Purpose of air trip:  
 Business/Employment  Visiting  
 Vacation  Military  
 Convention  School  
 Personal Affairs  Other
4. When return trip?  fly  drive  other?

54		
55	56	57
58	59	60
61	62	
63		
64	65	66

7. PERSONAL DATA (AP'S AND D'S)

1. Occupation:  
D \_\_\_\_\_  
Position Industry  
AP \_\_\_\_\_
2. Age:  A. Under 21  D. 46-55  
 B. 21-35  E. 56-65  
 C. 36-45  F. Over 65
3. Family Income:  
 A. Under 6.5<sup>k</sup>  D. 20<sup>k</sup> - 26<sup>k</sup>  
 B. 6.5<sup>k</sup> - 13<sup>k</sup>  E. 26<sup>k</sup> - 32<sup>k</sup>  
 C. 13<sup>k</sup> - 20<sup>k</sup>  F. Over 32<sup>k</sup>

67			
68	69	70	71
72	73	74	75
76	77		
78	79		
80	81	82	83
84	85	86	87

Figure 18. (Continued)

## I. ABOUT YOUR AIR TRIP TODAY

### 1. Please check one of the following:

- a. I will be on board this flight when it leaves the Dallas Love Field Airport today
- b. I will be getting off this flight at the Dallas Love Field Airport and transfer to a connecting flight of:
- |  |   |
|--|---|
| 1 <input type="checkbox"/> American    | 5 <input type="checkbox"/> Eastern                        |
| 2 <input type="checkbox"/> Braniff     | 6 <input type="checkbox"/> Frontier                       |
| 3 <input type="checkbox"/> Continental | 7 <input type="checkbox"/> Trans-Texas                    |
| 4 <input type="checkbox"/> Delta       | 8 <input type="checkbox"/> other _____<br>name of airline |

What is the number of the connecting flight? \_\_\_\_\_  
flight number

- c. I will be getting off this flight at the Dallas Love Field Airport and will leave the airport by means of ground transportation (e.g., car, taxi, limo, etc.)

### 2. How many pieces of baggage did you check in for airline handling on your air trip today?

- |                                 |                              |                                      |
|---------------------------------|------------------------------|--------------------------------------|
| 0 <input type="checkbox"/> none | 2 <input type="checkbox"/> 2 | 4 <input type="checkbox"/> 4         |
| 1 <input type="checkbox"/> 1    | 3 <input type="checkbox"/> 3 | 5 <input type="checkbox"/> 5 or more |

### 3. My main purpose in taking this trip is: (check one)

- |   |  |
|---|--|
| 1 <input type="checkbox"/> military leave                 | 5 <input type="checkbox"/> personal or family affairs    |
| 2 <input type="checkbox"/> military duty                  | 6 <input type="checkbox"/> vacation                      |
| 3 <input type="checkbox"/> business                       | 7 <input type="checkbox"/> travel to or from school      |
| 4 <input type="checkbox"/> convention, seminar or lecture | 8 <input type="checkbox"/> other _____<br>please specify |

### 4. Where did you start your air travel today?

\_\_\_\_\_ state  
name of city

### 5. Where will you end your air travel today?

- 1  the Dallas Love Field Airport
- 2  another airport at \_\_\_\_\_ state  
city

## II. ABOUT YOURSELF

### 6. Where is your normal residence located?

\_\_\_\_\_ state  
name of city

### 7. My age bracket is:

- |  |                                     |                                       |
|--|-------------------------------------|---------------------------------------|
| 1 <input type="checkbox"/> 12 or younger | 3 <input type="checkbox"/> 17 to 20 | 5 <input type="checkbox"/> 46 to 64   |
| 2 <input type="checkbox"/> 13 to 16      | 4 <input type="checkbox"/> 21 to 45 | 6 <input type="checkbox"/> 65 or over |

### 8. Counting this flight, how many flights have you been on in the past 12 months which landed at the Dallas Airport?

- |                                   |                                    |                                       |
|-----------------------------------|------------------------------------|---------------------------------------|
| 1 <input type="checkbox"/> 1      | 3 <input type="checkbox"/> 4 to 7  | 5 <input type="checkbox"/> 13 to 20   |
| 2 <input type="checkbox"/> 2 to 3 | 4 <input type="checkbox"/> 8 to 12 | 6 <input type="checkbox"/> 21 or more |

### 9. What is the approximate annual income bracket of your immediate family?

- |  |  |
|--|--|
| 1 <input type="checkbox"/> less than \$5,000 | 4 <input type="checkbox"/> \$15,000-\$19,999 |
| 2 <input type="checkbox"/> \$5,000-\$9,999   | 5 <input type="checkbox"/> \$20,000 or more  |
| 3 <input type="checkbox"/> \$10,000-\$14,999 |  |

#### NOTE:

PART III SHOULD BE COMPLETED BY PASSENGERS WHO WILL BE LEAVING THE DALLAS LOVE FIELD AIRPORT BY MEANS OF GROUND TRANSPORTATION.

Figure 19. Love Field On-Board Survey Form (1969).

### III. ABOUT YOUR GROUND TRIP FROM THE DALLAS LOVE FIELD AIRPORT

10. What address will you be going to directly from the Dallas Airport?

Street # & name if known or the name of building, firm, hotel/motel or nearest street intersection \_\_\_\_\_ city or town \_\_\_\_\_

11. The above address is:

- 1 my residence
- 2 another residence
- 3 a hotel or motel
- 4 a school
- 5 my regular place of employment
- 6 another place of business
- 7 other

12. In what type of vehicle do you plan to travel away from the Dallas Airport?

- 1 rented car
- 2 private car
- 3 taxi
- 4 airport limousine/bus
- 5 hotel/motel courtesy vehicle
- 6 public city bus
- 7 other \_\_\_\_\_ type of vehicle

13. If you plan to leave the Dallas Airport in a private car, please check one of the following:

- 1 car will be driven to airport and parked by another person
- 2 car will be driven to airport to pick me up at terminal curb
- 3 car is parked in airport public parking lot
- 4 car is parked in valet parking lot on airport grounds
- 5 car is parked in valet parking lot on Mockingbird Lane
- 6 other \_\_\_\_\_ please specify

14. If you left a car parked at the Dallas Airport for your use in leaving the airport, about how long will it have been parked upon your arrival there today?

- 1 less than 1 hour
- 2 1 to 3 hours
- 3 4 to 9 hours
- 4 10 to 24 hours
- 5 2 to 3 days
- 6 4 to 7 days
- 7 more than 7 days \_\_\_\_\_ number of days

15. How many family members, relatives, friends or associates will accompany you in the vehicle in which you leave the Dallas Airport today?

- 0 none
- 1 1
- 2 2
- 3 3
- 4 4
- 5 5 or more

16. How many of these persons are also arriving on this same flight?

- 0 none
- 1 1
- 2 2
- 3 3
- 4 4
- 5 5 or more

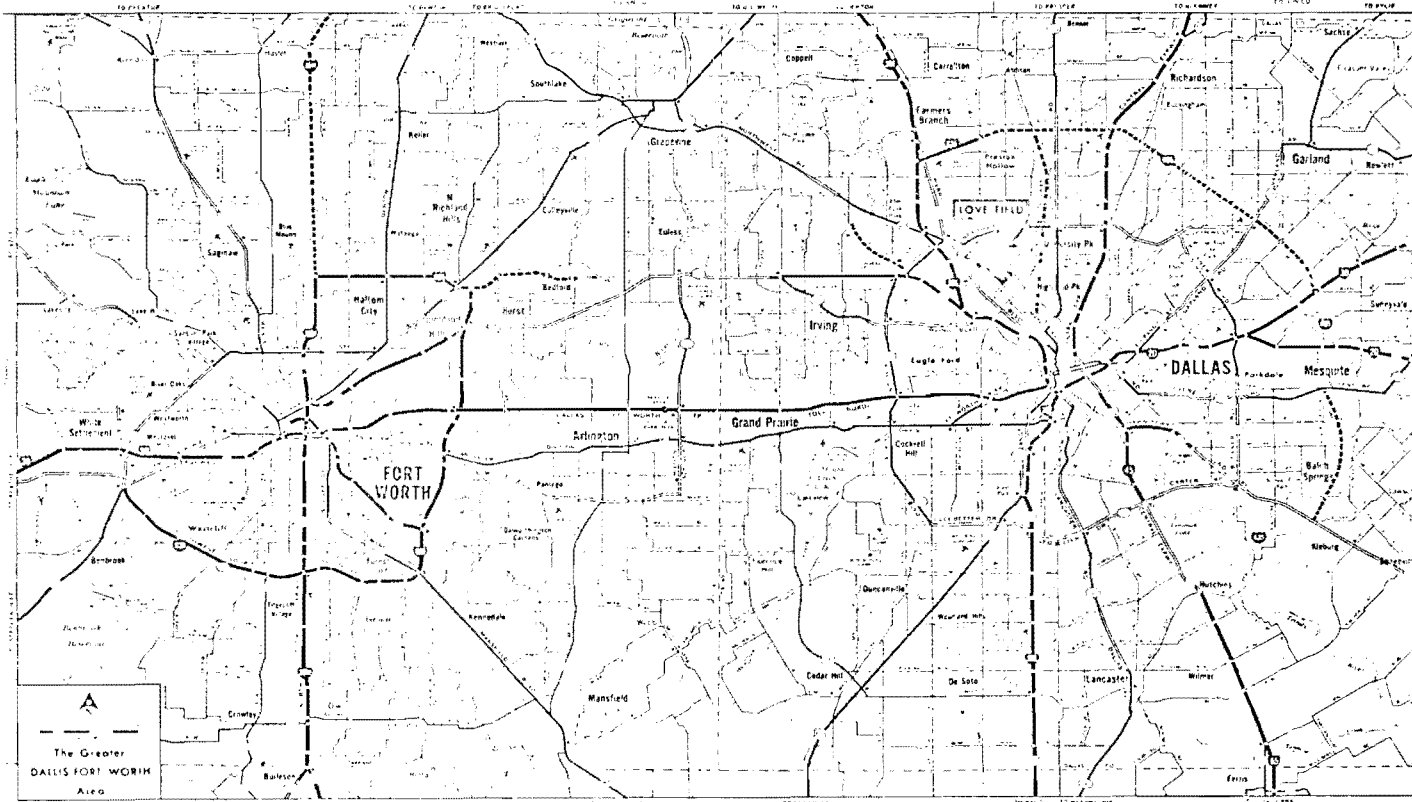
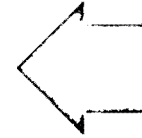
17. Please check one of the following:

- a. I am a resident of the Greater Dallas-Fort Worth area and I am returning to the Dallas Airport on:
  - 1 the same airline I left Dallas on
  - 2 a different airline than I left Dallas on \_\_\_\_\_ airlines name
- b. I am not a resident of the Greater Dallas-Fort Worth area  3

Figure 19. (Continued).

**IMPORTANT**

Please make an "X" at the approximate location of the place you will be traveling to when you leave the Dallas Airport today. If the location is not shown on the map, place an "X" on the map border to indicate the direction in which you will be leaving when you leave the mapped area.



**DALLAS-FORT WORTH AREA**

Figure 19. (Continued).

AGE

- |             |            |
|-------------|------------|
| A. Under 21 | D. 46 - 55 |
| B. 21 - 35  | E. 56 - 65 |
| C. 36 - 45  | F. Over 65 |

INCOME

- |                        |
|------------------------|
| A. Under \$6,500       |
| B. \$6,500 - \$13,000  |
| C. \$13,000 - \$20,000 |
| D. \$20,000 - \$26,000 |
| E. \$26,000 - \$32,000 |
| F. Over \$32,000       |

Figure 20. Age/Income Category Cards.



Figure 21. Typical Auto Survey Station (Right Lanes).

### Physical Setup

In the roadside survey, vehicles were interviewed at both ends of the airport from 6:00 a.m. to 10:00 p.m. as they exited the control booths. Interviews at the north exit had to be stopped at 8:30 p.m. on both days because of insufficient light due to the fact that many of the street lights at the interview site were burned out.

Three interviewers, two flagmen, and two traffic counters were stationed at each end of the airport. Figure 17 shows the physical setup of the interview lanes. As can be seen in the figure, interviews were conducted in turnouts which were located about 100 feet beyond the control booths. A sign identifying the survey (Figure 21) was placed at the entrance to each interview lane, and traffic cones were used to channelize vehicles to the interview point.

The specific traffic lanes open at the control plaza varied throughout the day. Booth 1 was always open due to its use by Surtran buses and other larger vehicles. The other booths were opened as demand warranted, starting with booth 2. During low volume periods booths 1 - 4 were usually open, which required us to set up the left interview lane closer to these open lanes so that vehicles could be directed to the interview point without having to cross too many lanes (See Figure 22).

### Interview Procedure

As a vehicle left a control booth, the flagmen would direct the driver to enter the interview lane. This job may seem easy, but it was often very difficult. Drivers were often confused and hesitant about entering the coned-off lanes. The flagman needed to make his directions precise and unambiguous by correctly displaying the proper directions to the drivers. In short, proper directions by the flagman made drivers less aggravated and more amenable to be interviewed (See Figure 23).

As the driver entered the interview lanes, the interviewer would help direct him to the interview spot by clearly indicating the stopping point with a hand signal. This was important because many drivers tended to proceed right through the interview lane without stopping if there was no clear stopping point. Once stopped, the interviewer would greet the driver by saying something on the order of:



Figure 22. Typical Auto Survey Station (Left Lanes)



Figure 23. Flagman and Interviewer.

"Good morning, sir; we're conducting an airport travel survey to gather information on airport travel patterns and would like to ask you a few questions about your trip to the airport today..."

At this point the drivers would usually answer either affirmatively and ask how much time it would take or, alternatively, would say that they were in a hurry and did not have the time. If drivers objected to being interviewed, they were allowed to proceed and another vehicle was flagged into the lane. If the driver had no objection, the interviewer would proceed by asking the purpose of his or her trip to the airport and continue through the rest of the questions on the interview form. Although interviewers were encouraged to follow this general type of introduction, they were allowed to develop their own precise wording or style.

#### Problems Encountered

During the survey no real problems were encountered with the roadside interviews. Drivers were generally cooperative once they consented to enter the interview lane. Only a few drivers pulled out before the interview was completed.

Interviews proceeded smoothly all day Friday, but on Tuesday rainy weather in the morning and early afternoon caused frequent interruptions. At 3:00 p.m. on Tuesday the weather cleared, and interviewing continued, but this time with three to four interview stations operating simultaneously at each end of the airport to make up for interviews lost during the rainy morning.

#### Interview Rate and Sample Size

An average interview took approximately three or four minutes depending on the purpose of the trip to the airport and the response pace of the driver. The average interviewing rate was 8.4 interviews per hour per interviewer. In addition to the actual interview time of three to four minutes, time was needed between interviews to record the time of day and vehicle occupancy figures, as well as for rechecking the form to see that all questions were completed and legible. Another element of the time interval between interviews was the time required to flag another vehicle into the interview lane, which was a function of delays at the control booths, slack periods in traffic flow, and the



occasional refusal of drivers to be interviewed. On Friday there were 278 interviews at the North end and 219 at the South end, for a total of 497 interviews. Tuesday interview totals were 180 North and 209 South, for a total of 389 interviews. Combining the two days, a total of 886 interviews were conducted which corresponded approximately to a 5 percent sample size based on traffic counts made during the same time periods.

## TRAFFIC COUNTING

### Description

Traffic counts were conducted to determine traffic volumes by direction and vehicle type on the various access roads to the airport. These counts can be used for comparison with traffic volumes at Dallas' Love Field to determine the impact that the new airport is having on volumes of vehicles crossing the airport boundary. These data can also be used to develop models for predicting future traffic volumes and can provide the basis for expanding the roadside interview sample to represent the entire population of vehicles entering and leaving the airport.

In the conduct of these traffic counts, both machine and manual methods were employed. Manual counts were necessary for determining the classification of vehicles and converting axle counts to vehicle counts, because only passenger cars and private pickup trucks were being interviewed. Machine counts were used to obtain 24-hour volumes, as well as traffic volumes during the interview periods (6:00 a.m. to 10:00 p.m.).

### Manual Counts

Manual traffic counts were taken of both inbound and outbound traffic on the main spine road (International Parkway), and on the main service roadways at both ends of the airport. A total of four persons per shift were needed to perform these counts, each person counting one direction on the main spine road and the same direction on the service road.

Classification of vehicles on the two roadways is indicated in Table 2.

TABLE 2. VEHICLE CLASSIFICATION USED IN MANUAL COUNTS

---

---

Main Roadway

Cars and Trucks

Buses and Shuttles

Taxis

Service Road

Cars and Pick-ups

Large Trucks

---

For the main roadway, the category "cars and trucks" included privately owned autos and all types of trucks, from pick-ups to large 5-axle vehicles. The large trucks were included because their frequency is very low (only about 10 per day). Buses and shuttles included hotel and rent-a-car shuttle buses, in addition to Surtran buses.

For the service roads, the category "cars and pick-ups" included employee pick-ups and vans, while large trucks included all other commercial or service vehicles from pick-ups to large 5-axle trucks. This classification scheme allowed for the best separation of employee vehicles from service vehicles.

### Procedures

Cumulative tabulations at each station were made at 15-minute intervals, starting at 6:00 a.m. and continuing to 10:00 p.m. on each survey day. Cumulative counts were made to avoid resetting the counters back to zero. Figure 24 shows a sample counting form. From these 15-minute intervals, various time blocks can be analyzed in determining peak flows of traffic.

### Problems Encountered

In reviewing the counts, two major problems were discovered. First, many of the persons operating the counters would reset, or try to reset, the counters back to zero after each 15-minute interval, or would accidentally turn the knob which reset the counter. Second, many persons were confused with the time blocks used in recording the readings on the dials. In our procedure we used the 15-minute time interval starting with time "X", i.e., at 6:15 a.m. the reading would be placed in the 6:00 a.m. box. Several persons performing the counting did not fully understand this, and instead used the 15-minute ending interval, i.e., they would place the 6:15 a.m. reading in the 6:15 a.m. box. This mistake occurred several times in the recording of readings, and in some cases it was difficult to determine which procedure was used. However, this problem was not considered serious.

### Machine Counts

Machine counts of vehicles were made using portable 24-hour non-recoding automatic traffic counters borrowed from the Texas Highway Department's Main Office and the Fort Worth District Office.



Fifteen traffic counters were placed at 14 locations which comprised the majority of airport access routes. Figure 25 shows the locations of counting stations. We were not able to count every access route because of limitations on the number of available traffic counters. However, uncounted routes were known to be very low volume service roads which mainly serve the air cargo facilities.

Counting stations one through four were placed so that the 24-hour total of vehicles using the main access road (International Parkway) could be determined. Stations five through eight provided counts of vehicles passing through the control plaza, while stations nine through twelve counted vehicles using the main service road. Stations thirteen and fourteen provided counts of most vehicles using the bank, medical clinic, airport maintenance and supply center, and the Airport Board administrative offices.

From the locations of the machine count stations, it is possible to estimate the total volume of traffic using the airport, as well as the traffic volume on particular roads on the airport grounds.

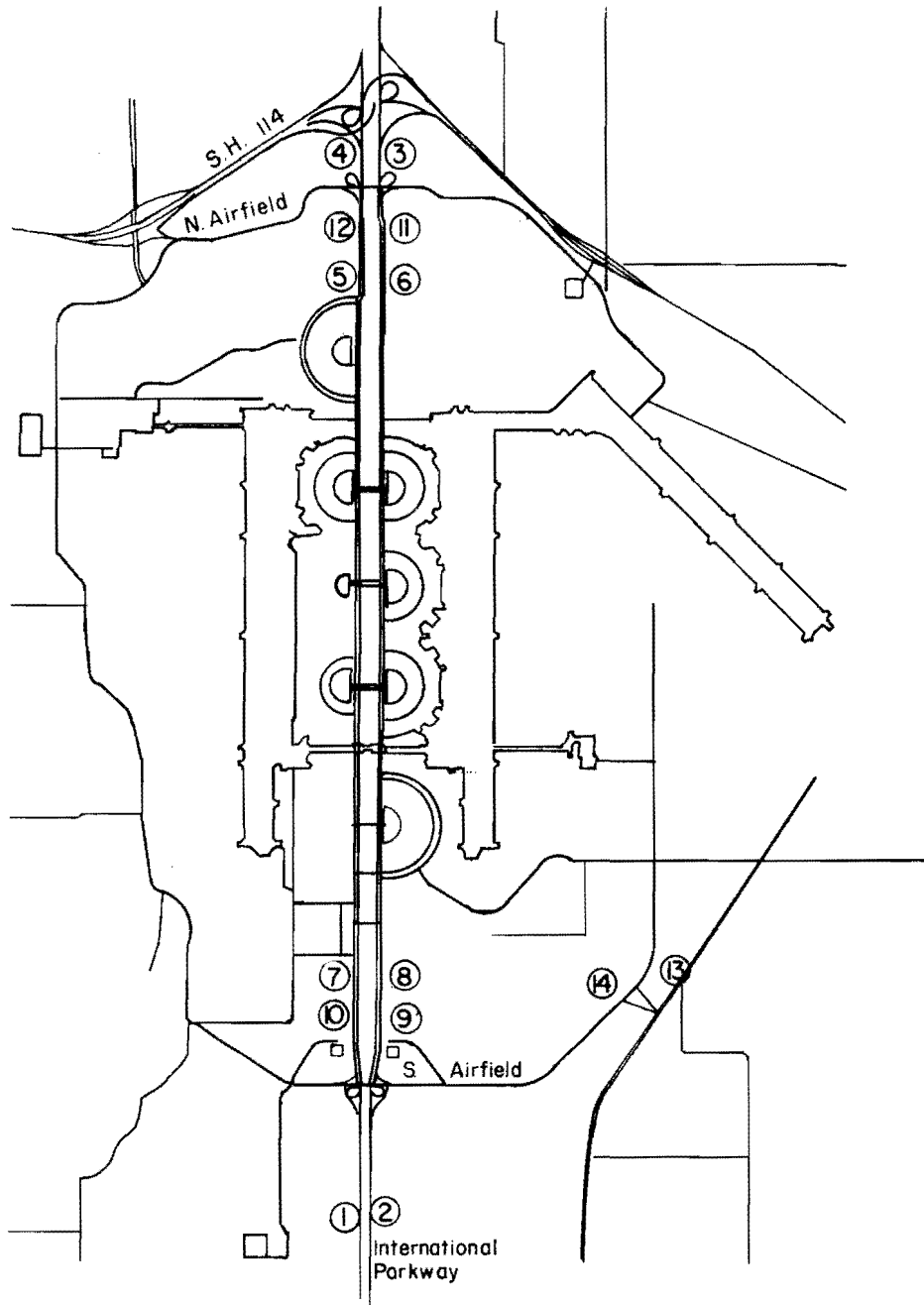


Figure 25. Automatic Traffic Counter Location Plan.

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## DATA REDUCTION AND STORAGE

Results from the various survey forms, traffic counts, and passenger counts can be coded for computer input and stored on magnetic tape in the System 2000 Data Management Package. Through the use of System 2000, various data files can be created and easily accessed by the project team. This can allow definition of new data files, modification of existing files, and retrieval and updating of the data in these files. The system provides a user-oriented language with which non-programmers can readily express their requests for retrieval and/or updating.

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## AUSTIN AIRPORT TEST SURVEY

Many of the questions and techniques included in our survey had not been reported in previous literature on airport access surveys, e.g., interviewing only people leaving the airport, perceived time and distance questions, questions on the routes taken by auto passengers, etc. Therefore, we decided to perform a preliminary study at Robert Mueller Municipal Airport in Austin, Texas, to test out our survey forms and procedures. This airport was chosen because of its proximity to The University of Texas at Austin campus.

The test survey was conducted solely by permanent project staff, along with a few graduate student volunteers who were interested in gaining experience in travel survey techniques. This enabled the graduate students on the research staff to gain sufficient first-hand experience so that they could later help supervise the conduct of the survey at DFW, which employed temporary student data gatherers. The Director of Aviation of the City of Austin was very cooperative in approving the survey, and also in providing traffic cones for delineating the roadside interview stations.

Robert Mueller Municipal Airport is not served directly by a scheduled bus route, although there is service on an adjacent street that will divert a bus to the airport terminal building on request. Therefore, we could not test out our Surtran survey forms in Austin. However, we were able to try out our roadside interview forms and our employee survey techniques. The lack of a Surtran trial was not considered serious because most of the Surtran questions had very similar counterparts on the roadside interview and employee forms.

The pilot study at Austin Municipal Airport was conducted on April 9, 11 and 14, 1975, in such a way that all hours between 6:30 a.m. and 7:30 p.m. were covered. In this pilot study, we attempted to obtain information that would be useful to the Director of Aviation in return for his cooperation. It turned out that we were able to provide him with:

- (1) counts of vehicles (by type) entering and leaving the airport passenger terminal area,
- (2) origins and destinations of airport users,
- (3) number of people using the curbside versus the number of parkers,

(4) length and purpose of air trips (demographic characteristics of airport users),

(5) duration of passengers' stay at the airport,

and other data on employee travel and parking.

The survey forms used in the Austin pilot study are shown in Figures 26 and 27. Close examination of these forms will reveal significant differences from the ones finally used at the Dallas/Fort Worth Regional Airport. The precise differences will not be discussed here. However, we can state that this pilot study led to major improvements and refinements in our survey instruments and procedures.

SHORT FORM  
AUSTIN ORAL AUTO SURVEY

Time \_\_\_\_\_ am \_\_\_\_\_ pm Number of CP's \_\_\_\_\_ M \_\_\_\_\_ F  
Vehicle Type: \_\_\_\_\_ Private Car \_\_\_\_\_ Rent-a-Car

INTRODUCTION

1. Purpose of trip to airport:  
\_\_\_\_ AP, alone (GT 1)      \_\_\_\_ Pick up ticket (GT 1)  
\_\_\_\_ Drop off AP (GT 2)      \_\_\_\_ Visitor (GT 1)  
\_\_\_\_ Pick up AP (GT 2)      \_\_\_\_ Other (specify)  
\_\_\_\_ Business at airport (GT 1) \_\_\_\_\_

1. RESIDENT OF AUSTIN AREA?      \_\_\_\_ Yes      \_\_\_\_ No

2. 1. Number of AP's?      \_\_\_\_\_ M      \_\_\_\_\_ F  
2. AP's residents of Austin area?      \_\_\_\_ Yes      \_\_\_\_ No  
(GT 3).

3. TRIP FROM AIRPORT

1. Where are you going now? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_ Your home      \_\_\_\_ Hotel  
\_\_\_\_ Someone else's home      \_\_\_\_ Shopping  
\_\_\_\_ Your work place      \_\_\_\_ Other (specify)  
\_\_\_\_ Another place of business      \_\_\_\_\_
3. How many miles? \_\_\_\_\_
4. How many minutes? \_\_\_\_\_
5. Route \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. TRIP TO AIRPORT (RESIDENTS ONLY)

1. Where did trip to airport start? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_ Your home      \_\_\_\_ Hotel  
\_\_\_\_ Someone else's home      \_\_\_\_ Shopping  
\_\_\_\_ Your work place      \_\_\_\_ Other (specify)  
\_\_\_\_ Another place of business      \_\_\_\_\_
3. How many miles? \_\_\_\_\_
4. How many minutes? \_\_\_\_\_

Figure 26. Austin Airport Auto Survey Form.



AUSTIN MUNICIPAL AIRPORT TRAVEL SURVEY  
EMPLOYEES

Dear Employees:

This survey is being conducted for the purpose of increasing our knowledge of airport-related travel.

Information from these questionnaires will be used to prepare plans and programs for the future development of transportation services to the Austin Municipal Airport so we can provide you with the best possible service.

Please take a few minutes to fill out the following questions and give the survey to your supervisor.

1. WHAT IS YOUR PRESENT STREET ADDRESS?

(Street No.) (Street Name) (City or Town) (Zip)  
or  
(Nearest Street Intersection) (City or Town) (Zip)

2. YOUR TRAVEL DISTANCE (PLEASE ESTIMATE)

Approximately how many miles long would you guess your total trip to or from the airport to be? About \_\_\_\_\_ miles.

3. YOUR TRAVEL TIME (PLEASE ESTIMATE)

Approximately how many minutes does your total trip to or from the airport take? About \_\_\_\_\_ minutes.

4. TYPE OF VEHICLE TAKEN TO OR FROM WORK

I get to work most often by: (Please check one)

Driving my own vehicle       Being dropped off by someone else

Riding in a carpool             Taxi

Bus                                     Other (please specify) \_\_\_\_\_

5. TIME THAT YOU ARRIVE AND LEAVE WORK

A. What time did you arrive at the Airport today? \_\_\_\_\_ A.M. P.M.

B. What time did your work shift start today? \_\_\_\_\_ A.M. P.M.

C. What time will you leave the airport today? \_\_\_\_\_ A.M. P.M.

6. FREQUENCY OF YOUR TRAVEL

Please check the days of the week you work at the airport:

Sunday     Tuesday     Thursday     Saturday

Monday     Wednesday     Friday

7. YOU ARE:  Male  Female

8. YOUR AGE: (PLEASE CHECK ONE)

Under 21     35-44     55-65

21-34     45-54     Over 65

9. YOUR FAMILY INCOME IS: (PLEASE CHECK ONE)

Under \$6,500     13,000 - 20,000     26,000 - 32,000

6,500 - 13,000     20,000 - 26,000     Over 32,000

10. YOUR OCCUPATION: (PLEASE CHECK ONE)

Professional     Maintenance

Clerical             Other Labor

Sales                     Service (Please circle one)

Craftsman,             Food     Airline     Custodian

Foreman

Technician/Operator

Please do not mark in this box

1 2

3 4

5 6

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Figure 27. Austin Airport Employee Survey Form.

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## CONCLUSIONS

While the DFW Travel Survey contained some areas of weakness, overall it can be said that it was successful in accomplishing the initially prescribed research objectives. Data generated in the survey will be sufficient to enable us to develop and calibrate models interrelating air traffic, ground transportation patterns, and airport user characteristics. This will facilitate our impact analysis of DFW, particularly vis-a-vis prior phenomena at Love Field, and can lead to the enhancement of predictive processes in airport planning.

Our experience has also led us to several conclusions which may help optimize future travel surveys of this type:

1. All survey forms, after initial preparation should be meticulously screened for possible confusing formulations; review by "third parties" outside the project staff is helpful. A test application of the proposed forms, such as our pilot survey at Austin Municipal Airport, is extremely helpful in checking the adequacy of the form under actual similar conditions, and in pointing out formulation or other problems so they can be rectified before final usage.
2. The content of survey forms should be kept as short as possible within the constraints of procuring the necessary data. Personal interviews tend to produce the most complete and accurate data because they, in effect, help enforce and guide completion of the form. Written questionnaires tend to become tiresome to the interviewee, and thus can lead to a lower response rate for a lengthy form. Personal interviews can thus more successfully help complete longer forms, but of course at considerably greater expense for a usually somewhat smaller sample size.
3. Adequate logistical preparation is essential to a successful survey. Particular areas of attention should include the following:
  - a. Recruitment of survey staff should preferably begin at least one month in advance of the target date. One or more training sessions should be scheduled to acquaint new personnel with survey procedures.

- b. Travel, work shifts, and meal breaks should be thoroughly organized and scheduled beforehand.
- c. Close coordination with appropriate authorities should be continually maintained. Respective roles should be clearly worked out.
- d. A schedule for procuring necessary supplies--signs, printed forms, etc.-- should be worked out well in advance of target date to allow for possible delays.
- e. Staffing should include adequate supervision, both to facilitate the administration of the survey, as well as to continually monitor and possibly improve survey staff performance.
- f. Where feasible, rotation of staff among different functions (counting, interviewing, flagging, etc.) helps alleviate monotony and enhances efficient survey work.
- g. Installation and retrieval of automatic traffic counters can be extremely time-consuming. Such time will vary depending on degree of experience, given conditions, etc., but can be estimated in consultation with experienced persons. A prearranged schedule for reading the counters at appropriate intervals is necessary.
- h. Mailing of forms, if needed, should be scheduled well in advance of target dates with considerable allowance for postal delivery delays. First class postage will probably ensure prompt and most reliable delivery.

The DFW Travel Survey represents a further step in a relatively little explored area of research. We are hopeful that the results of this effort will provide some assistance to the future planning of airport facilities, particularly the air/ground interface, and in assessing their impact.

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APPENDIX

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APPENDIX

DFW SURVEY COST

The following is an approximate itemization of the costs incurred in preparing and conducting the travel survey discussed in this report. Only those costs which could be isolated and directly attributed to the survey are included; thus, the salaries of permanent project staff (three graduate research associates, one faculty member and one secretary) and similar overhead costs, are not isolatable and have been excluded. The cost of postage was also not readily isolatable due to administrative accounting procedures; but in view of the extreme importance of this direct cost, a reasonably accurate estimate has been made (See Table 3).

TABLE 3. OVERALL COST TABULATION

Wages (Extra Personnel)	\$ 1,117.60
Travel and Lodging	2,902.21
Printing	543.36
Postage (Estimated)	200.00
Supplies	<u>129.22</u>
TOTAL COST	<u>\$ 4,892.39</u>
Total persons surveyed/interviewed	4,977
Cost per person surveyed/interviewed	\$0.98

In Table 4 we have also attempted to tabulate the individual costs of each of the three types of survey (auto interviews, employee survey, and Surtran surveys) as far as permitted by bookkeeping records. It should be noted that all travel/lodging expenses have been assigned totally to the auto interview survey. The physical presence of project staff was indispensable for this survey component; however, delivery and collection of the employee and Surtran interview forms was accomplished incidentally. Had the project staff's trip to the area not been required for the interviews, all of the employee and Surtran forms would have had to be shipped to the appropriate offices; or, more likely, at

least one staff person would have been required to personally deliver the forms and monitor their distribution and collection. Thus, while the current tabulation reflects our real costs, the two written surveys exhibit costs which are lower by \$100 - \$200 from what they would cost if not conducted concomitantly with the auto interviews.

Note should also be taken of the large proportion of auto interview survey expense assumed by travel/lodging costs. A locally conducted survey could have been expected to cost almost \$3,000 less, or about \$3.39 less per individual auto interview (see Table 4), and about \$0.58 less per person surveyed overall (Table 3).

The effect of inclement weather in increasing the unit cost of the auto interviews should also be recognized. As discussed in this report, almost a half day was lost on May 20 due to rain; yet there could be no corresponding cutback in expenses (wages, travel/lodging, supplies, forms, etc.) which had already been committed. Thus the individual cost per interview is somewhat higher than would be the case without the weather disruption.

TABLE 4. COST TABULATION OF COMPONENT SURVEYS

<u>ITEM</u>	<u>AUTO INTERVIEWS</u>	<u>EMPLOYEE SURVEY</u>	<u>SURTRAN SURVEY</u>
Wages	\$ 1,117.60	-0-	-0-
Travel/Lodging	2,902.21	-0-	-0-
Printing	21.57	\$ 260.26	\$ 231.33
Postage	-0-	200.00	-0-
Supplies	<u>38.52</u>	<u>33.15</u>	<u>57.55</u>
Total Cost	<u>\$ 4,079.90</u>	<u>\$ 493.41</u>	<u>\$ 288.88</u>
Total Surveyed	886	3,157	934
Cost Per Person Surveyed	\$ 4.60	\$ 0.16	\$ 0.31

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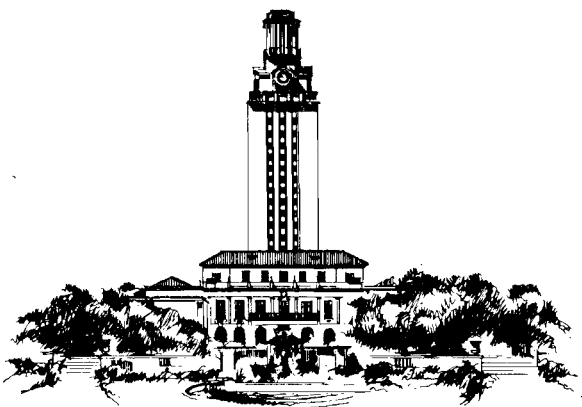
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