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Abridgment

Survey of Ground Transportation at the Dallas-Fort Worth Regional Airport

William J. Dunlay, Jr., * Peat, Marwick, Mitchell and Company
Lyndon Henry, University of Texas at Austin

This paper describes a survey of ground transportation at the Dallas-Fort Worth Regional Airport (DFW) conducted on May 16 and 20, 1975. For purposes of the survey, trips were classified as follows: (a) trips made by air passengers and visitors in private automobiles, (b) trips made on public transportation, and (c) trips made by employees. Each of the three classes of trips was investigated separately. This paper describes the methodology and physical performance of the travel survey and some of its findings.

OVERVIEW OF DFW GROUND TRANSPORTATION SYSTEM

Highway Access

Automobile access to DFW is provided by several distinct roadway systems, the most important of which is the north-south spine highway, which passes through the center of the airport. The spine highway system is composed of a multilane public roadway flanked on both sides by a physically separated service road system.

Access via the public roadway is controlled by means of control plazas at the north and south entrances to the airport, each consisting of eight control booths. Control booths on inbound parkway lanes issue parking tickets; outbound booths collect parking fees.

The system of service roads is used mainly by employees and commercial, maintenance, and service vehicles. The service roads branch from the spine highway just outside the control plazas at each end of the airport.

Public Transportation Access

Public airport transportation is provided by bus, limousine, and taxi services. A quasi-public corporation created by the cities of Dallas and Fort Worth, Surtran, has an exclusive franchise to provide express airport bus service. In addition, shuttle bus service is provided by various companies using small minibuses or vans.

EMPLOYEE TRAVEL SURVEY

Over 13 000 employees make daily work trips to and from DFW, thereby contributing significantly to the total traffic volume. A general classification of employees by type of industry and the number in each classification is shown below.

Industry	Number of Employees
Airlines	8 364
Air cargo	1 139
General aviation	100
Food service	1 406
Maintenance (excluding airline employees)	379
Security and police	378
Rent-a-car firms	268
Miscellaneous	1 334
Total	13 368

The miscellaneous category includes employees of the U.S. air mail facility, the Federal Aviation Administration, the Dallas-Fort Worth Regional Airport Board (excluding security and maintenance employees), and the Airport Marina Hotel.

The employee survey form requested information on street address, mode of travel, time of arrival and departure, sex, age, occupation, income, and previous airport employment. Survey forms were distributed to employees by their supervisors. Most survey forms were mailed to the employer; some were delivered by hand. The completed questionnaires were collected in

Table 1. DFW ground transportation modal split.

Mode	Vehicle Trips		Person Trips	
	Number	Percent	Number	Percent
Automobile	43 133	93.0	64 992	89.8
Taxi	1 391	3.0	2 221	3.0
Surtran bus	393	0.8	3 035	4.2
Other buses, shuttle vans	813	1.8	1 301	1.8
Heavy trucks, other	650	1.4	845	1.2
Total	46 380	100.0	72 394	100.0

reverse order of the distribution. Of the 13 368 employee forms sent, 3157 were returned, a 23.6 percent rate of return.

PUBLIC TRANSPORTATION (SURTRAN) SURVEY

Surtran buses operate from five outlying passenger terminals—three in Dallas, one in Fort Worth, and one in Arlington. Surtran ticket clerks dispense tickets at Surtran terminals in the outlying stations as well as at kiosks within the DFW airline terminals. Sale of Surtran tickets in subcontracted to hotels served in downtown Dallas and Arlington. Daily over 3000 passengers ride Surtran to and from the airport.

Two separate forms were designed, one for buses bound for the airport and the other for buses leaving the airport. Ticket clerks handed out the forms to passengers and also provided pencils (not providing pencils might bias returns in favor of those who carry pencils). The rider then completed the form while in transit; the survey form was printed on heavy paper to facilitate onboard completion. Surtran drivers collected the forms as passengers left the bus.

ROADSIDE SURVEY OF AUTOMOBILE USERS

Most surveys of automobile travel by air passengers to and from major airports used questionnaires distributed and completed onboard the aircraft. Standard techniques for conducting such surveys are given in the Airport Travel Survey Manual (1), which also describes roadside interview techniques, the method selected for this research. We decided that much of the information sought (e.g., automobile occupancy, perceived time and distance, specific routes taken to and from the airport, and times of entering and leaving) could best be determined from a personal interview on the roadside.

Scope of Roadside Survey

Only drivers of vehicles in the outgoing lanes of the airport spine roads were stopped for interviews because we thought that persons leaving the airport would be less reluctant to stop for an interview than persons on their way to catch a flight. Feedback from the interviewers suggested that this hypothesis was correct.

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. Interviews were conducted in turnouts located about 30 m (100 ft) beyond the control booths. Vehicle drivers were interviewed at both ends of the airport from 6:00 a.m. to 10:00 p.m. as they exited the control booths. Three interviewers, two flaggers, and two traffic counters were stationed at each end. A sign identifying the survey was placed at the entrance to each interview lane, and traffic cones were used to channel vehicles to the interview point.

Interview Rate and Sample Size

An average interview took approximately 3 to 4 min. Time was needed between interviews to record the time of day and vehicle occupancy figures and to recheck the form to see that all questions were completed and legible. Also, time was required between interviews to flag another vehicle into the interview lane. The average interviewer conducted 8.4 interviews/h. A total of 886 interviews were conducted, which corresponded to an approximately 5 percent sample size, based on traffic counts made during the same time periods.

Traffic counts were conducted to determine traffic volumes by direction and vehicle type on the various access roads to the airport. These data provide the basis for expanding the roadside interview sample to represent the entire population of vehicles entering and leaving the airport. Both machine and manual counts were conducted. Manual counts were necessary for determining the classification of vehicles and for converting axle counts (machine counts) to vehicle counts.

SUMMARY OF SURVEY RESULTS

A complete description and the full results of the DFW survey are presented in the project report (2). Some of the more salient findings are summarized below.

Table 1 gives the overall modal split determined from the data in terms of both person trips and vehicle trips. The automobile mode includes both personally owned and rented vehicles. Also included in that designation are pickup trucks, campers, and motorcycles. Other buses and shuttle vans refer to vehicles supplied by hotels and car rental agencies for the convenience of their customers. The other category refers to commercial vehicles.

Table 1 shows that Surtran accounted for 4.2 percent of person trips, but represented only 0.8 percent of the vehicular traffic because of the higher vehicle occupancy rates of Surtran buses compared to automobiles. The combination of Surtran, taxis, and the special-purpose transit services accounted for 9 percent of the total person trips to and from DFW.

The contribution of each of the three surveyed DFW ground transportation components (employees, Surtran riders, and air passenger and visitor automobile users) to the total is given below. Employees represent about one-fourth of the total person trips to and from DFW.

Trip Maker	Person Trips	
	Number	Percent
Employees and service personnel	18 623	25.7
Users of Surtran, taxis, and other buses (excludes employees)	6 107	8.4
Air passengers and visitors using automobiles	47 664	65.9
Total	72 394	100.0

Below is the ground transportation modal split of just air passengers. Clearly, Surtran's share of air passenger trips is significantly higher (10.9 percent) than its share of total person trips (4.2 percent). In fact, all public transportation modes taken together account for 25.7 percent of the air passenger ground travel to or from DFW.

Mode	Passenger Trips	
	Number	Percent
Automobile (includes personal light trucks and motorcycles)	16 626	74.3
Surtran bus	2 447	10.9
Taxi	2 088	9.3
Other buses, shuttles	1 223	5.5
Total	22 384	100.0

The modal split of employee ground travel to and from DFW for the sample date is given below. The automobile is the predominant mode, even though at the time of the survey employees paid a special fare of $1.00 on Surtran compared to $2.50 paid by others.

Mode	Person Trips	
	Number	Percent
Automobile (includes personal light trucks and motorcycles)	17 328	96.3
Taxi	18	0.1
Surtran bus	432	2.4
Other	216	1.2
Total	17 994	100.0

Modes of access to or from the outlying Surtran terminals are tabulated below. The largest proportion of passengers (over 58 percent) use personal vehicles (predominantly automobiles) in a park-and-ride (16.7 percent) or kiss-and-ride (41.9 percent) manner.

Mode	Percent
City bus	9.2
Limousine	3.9
Taxi	16.5
Private vehicle	
Driver	16.7
Passenger	41.9
Other (includes walking, riding bicycle)	11.8
Total	100.0

The third principal component of DFW ground traffic consists of air passengers and visitors driving their own vehicles. The ground trip purposes of interviewed vehicle drivers who used the public roadway is given below.

Purpose	Percent
Airline passenger	26.9
Pick up air passenger	22.9
Drop off air passenger	33.8
Pick up ticket	0.5
Business at airport	6.6
Visitor	1.6
Drive through	4.3
Other	3.4
Total	100.0

CONCLUSIONS

This survey has led to several conclusions that may help future travel surveys of this type.

1. All survey forms should be meticulously screened for possible confusing formulations. Review by outside parties is helpful; a test application of the proposed forms is recommended. Reference should be made to standard guides such as the one by Jacobs (3).
2. Adequate logistical preparation is essential. Special attention should be given to (a) recruiting survey staff at least 1 month in advance and conducting one or more training sessions; (b) planning and scheduling travel, work shifts, and meal breaks; (c) staffing to include adequate supervision, both to facilitate the administration of the survey and to continually monitor and possibly improve survey staff performance; and (d) where feasible, rotating staff among different functions, such as counting, interviewing, and flagging, to help alleviate monotony and enhance efficiency.

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Mr. Dunlay was with the University of Texas when this research was performed.