Reference Use Only

FAA-80-3

FAA-EM-80-2

COLLECTION OF CALIBRATION AND VALIDATION DATA FOR AN AIRPORT LANDSIDE DYNAMIC SIMULATION MODEL

APRIL 1980

U.S. DEPARTMENT OF TRANSPORTATION

RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION
TRANSPORTATION SYSTEMS CENTER • CAMBRIDGE MA 02142

PREPARED FOR FEDERAL AVIATION ADMINISTRATION
OFFICE OF SYSTEMS ENGINEERING MANAGEMENT • WASHINGTON DC 20591

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FAA-EM-80-2		

4. Title and Subtitle	5. Report Date
COLLECTION OF CALIBRATION AND VALIDATION DATA FOR AN AIRPORT LANDSIDE DYNAMIC SIMULATION MODEL	April 1980
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
P.B. Mandle, F. LaMagna and E.M. Whitlock	DOT-TSC-FAA-80-3
9. Performing Organization Name and Address Wilbur Smith Associates, Inc.* 155 Whitney Avenue New Haven CT 06507	10. Work Unit No. (TRAIS) FA732/R0775
	11. Contract or Grant No. DOT-TSC-1446
	13. Type of Report and Period Covered Final Report Oct. 1977 - June 1979
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration Office of Systems Engineering Management Washington DC 20591	14. Sponsoring Agency Code

15. Supplementary Notes

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

16. Abstract

The report summarizes the airport data collection procedures employed to obtain the necessary calibration and validation information. The preparation for the data collection effort is explained. A description is presented of the initial work tasks, which included a field reconnaissance, preparation of an individual data collection plan for each of the three airports, and pilot studies at each airport, both to test the proposed survey procedures and to determine the necessary sample sizes. The training processes used for the over 400 field staff who were employed is presented. Descriptions are given of the 32 survey forms and of the techniques used to gather information at each of the airport landside sector elements. Terminal area plans illustrate the location of all field observers. A summary of the data reduction procedures, final data presentation formats utilized and the number of samples obtained are included. Selected statistics produced by the surveys are compared including passenger processing times, curbside dwell times, and modal choice patterns. The appendices present each of the data collection forms and the data management process.

17. Key Words	18. Distribution Statement
Data, Airport Landside, Airport, travel survey, traffic surveys, transportation, airport groundside operations	DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	150	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

PREFACE

This report has been prepared as part of the U.S. Department of Transportation/Transportation Systems Center project DOT-TSC-1446, entitled "Collection of Calibration and Validation Data for an Airport Landside Dynamic Simulation Model." The Transportation Systems Center has developed a computer model which simulates the movements of passengers in an airport terminal and vehicles on the adjacent roadways and the processes these vehicles and passengers typically experience. This project was designed to provide the information necessary to refine the simulation model and to compare the model output with observed airport landside activities. To gather the necessary information, surveys were conducted at Miami International Airport on March 17 and 18, 1978, at Denver-Stapleton International Airport on April 13 and 14, 1978, and LaGuardia Airport on May 24 and 25, 1978.

This study would not have been possible without the cooperation and guidance provided by the airport operating agencies and the various airport resident organizations. The authors are greatly indebted to each of them for their invaluable support throughout the conduct of this project. These organizations are delineated as follows:

AIRPORT OPERATING AGENCIES

City and County of Denver

Robert S. Michael - Director of Aviation
Richard F. Veazy - Airport Planner
John B. Renton - Airport Engineer

Metropolitan Dade County - Aviation Department

I.H. Carr - Planning Section Head
Craig F. Timmerman - Chief of Operations
Ronald D. Gunther - Airport Engineer

Port Authority of New York and New Jersey

George W. Blomme - Senior Aviation Planner
Peter G. Ciano - Assistant Airport Manager - LaGuardia
Robert J. Smith - Chief of Operations Supervisor - LGA

Federal Agencies

Department of the Treasuty, Bureau of Customs, Miami International Airport

Justice Department, Immigration and Naturalization Services, Miami International Airport

PARTICIPATING AIR CARRIERS

Aero Condor
Aero Peru
Air Canada
Air Florida
Air France
Air Panama
Lacsa
Lancia
Lloyd Aero Boliviano
Marco Island Airways
Mexicana De Aviacion
National Airlines

PARTICIPATING AIR CARRIERS (Continued)

Allegheny Airlines
ALM - Antillean Airlines
American Airlines
Aviateca
Avianca
Bahamasair
Belize
Braniff International
British Airways
Continental Airlines
Delta Air Lines
Dominicana
Eastern Airlines
Equatoriana
Frontier Airlines
North Central Airlines
Northwest Orient Airlines
Ozark Air Lines
Pan American World Airways
Piedmont Airlines
Southern Airways
TACA
Texas International Airlines
Trans World Airlines
United Airlines
Viasa
Western Airlines

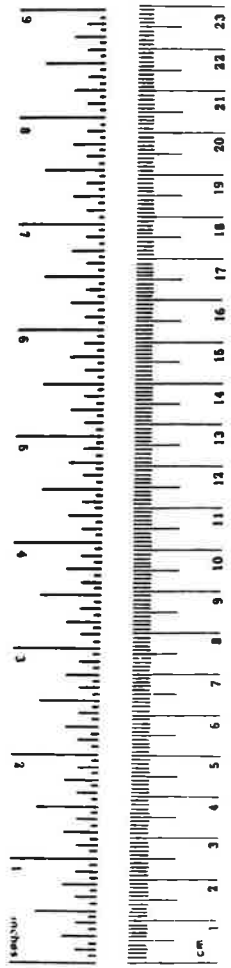
PARTICIPATING CAR RENTAL COMPANIES

Avis Rent-a-Car
Budget Rent-a-Car
Hertz Rent-a-Car
National Car Rental
Thrifty Rent-a-Car

METRIC CONVERSION FACTORS

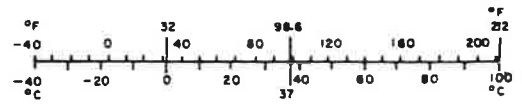
Approximate Conversions to Metric Measures

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



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.036	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



CONTENTS

ILLUSTRATIONS

TABULATIONS

(Continued)

TABULATIONS (Cont'd.)

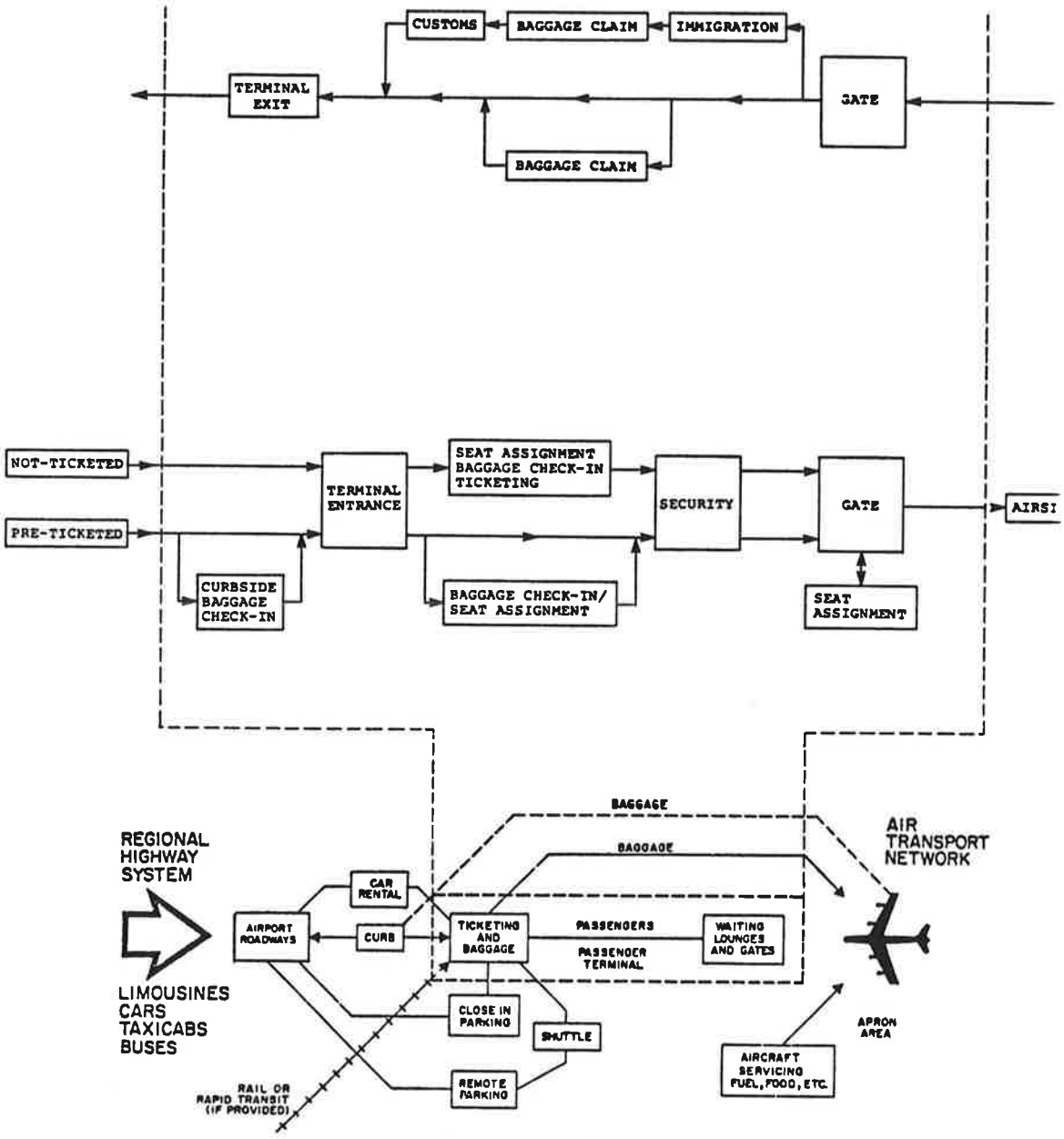
Part 1
INTRODUCTION

Landside transportation and passenger processing at major airports have generally been recognized as the most sensitive and critical links in air travel. There is a growing concern among air transportation planners and administrators that congestion due to landside capacity limitations may be the determining constraint on air passenger traffic growth potential at major airports. Figure 1 portrays the various elements of landside activities at airports.

The magnitude of this congestion at present, and the limit it may impose in the future, have been the subject of numerous studies. These have ranged from assessments of existing conditions to efforts leading to the development of detailed mathematical models simulating the entire landside passenger and vehicular system, beginning when a passenger enters (or leaves) the airport boundary, and ending when the same passenger boards (or exits) the aircraft.

This report has been prepared as part of the United States Department of Transportation/Transportation Systems Center (USDOT/TSC) project DOT-TSC-1446 entitled, "Collection of Calibration and Validation Data for an Airport Landside Dynamic Simulation Model."

The scope of work associated with this project was designed to assist the USDOT/TSC in the collection of data required for calibration and validation of one of the more comprehensive simulation models, The Airport Landside Simulation Model. Preliminary calibration and evaluation of the model was based on data collected expressly for this purpose at Denver-Stapleton International Airport, during the period December 12-15, 1975.



PASSENGER FLOW CHART
AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 1

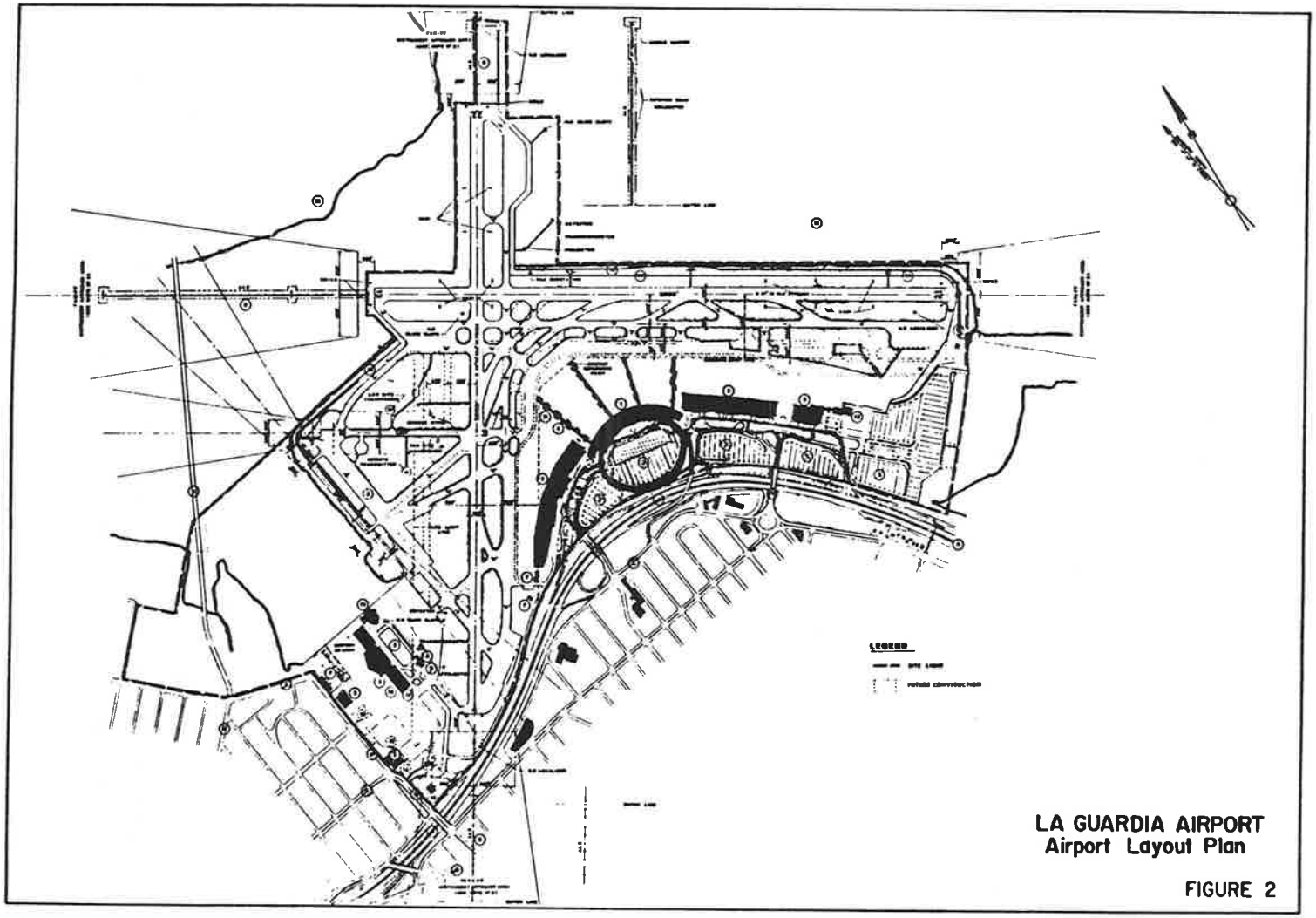
Further refinement and testing of the model (the subject of this study) was to be based upon data to be collected at three airports:

- LaGuardia Airport, New York;
- Stapleton International Airport, Denver; and,
- Miami International Airport.

Each of these airports has individual characteristics and unique activities. The following general descriptions reflect activities and conditions at the time of the surveys.

LaGuardia Airport (LGA), one of three major airports serving the New York Metropolitan Area, ranked as the seventh largest airport in the United States in 1978 with approximately 8.55 million annual enplanements. About 11 percent of the passengers are interline transfers.

Historically, LaGuardia has had a high percentage of commuter and business-oriented passengers. The successful Eastern Airlines shuttle passenger service to Boston and Washington attracts approximately 1.0 million annual enplaned passengers who are served at a separate terminal building. LaGuardia, depicted in Figure 2, had recently undergone an extensive curb frontage revision and parking expansion program at the time the surveys were conducted. A 3,000-space parking garage is situated in the Central Terminal Area with two pedestrian bridges connecting the garage with the Main Terminal. In addition to the garage, a deplaning roadway was constructed for private automobile use only, thereby segregating private vehicles from public transportation vehicles in two discrete curb frontage areas.



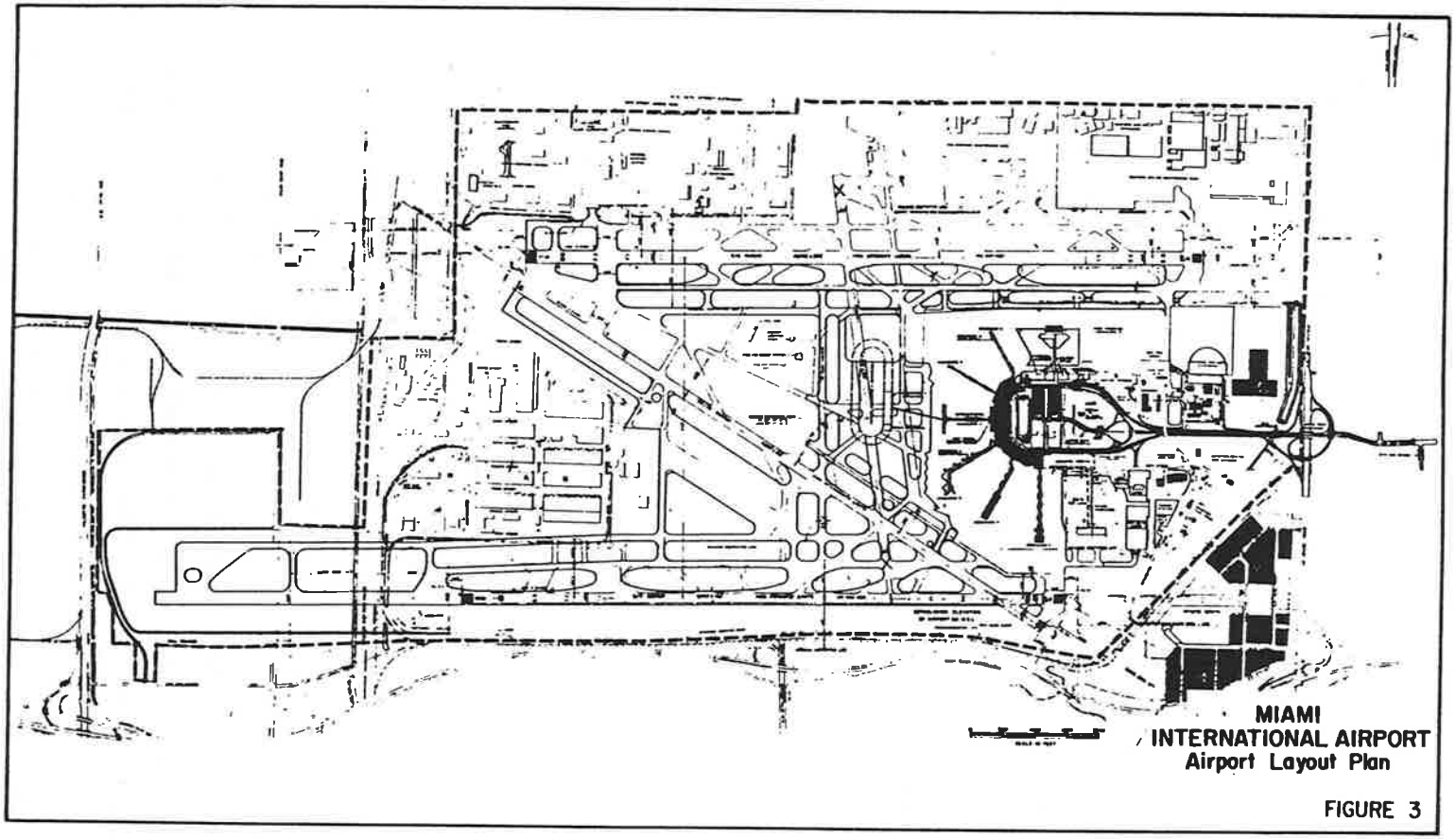
LA GUARDIA AIRPORT
Airport Layout Plan

FIGURE 2

Miami International Airport (MIA), depicted in Figure 3, the eighth largest United States airport, handled about 8.25 million enplanements during 1978. As MIA is an international airport, interline transfers comprise approximately 25 percent of the total passenger activity, with about 35 percent of the passengers oriented toward the Miami central business district. Tourist traffic also impacts MIA as significant peaks are observed during the winter months and around the Easter holidays.

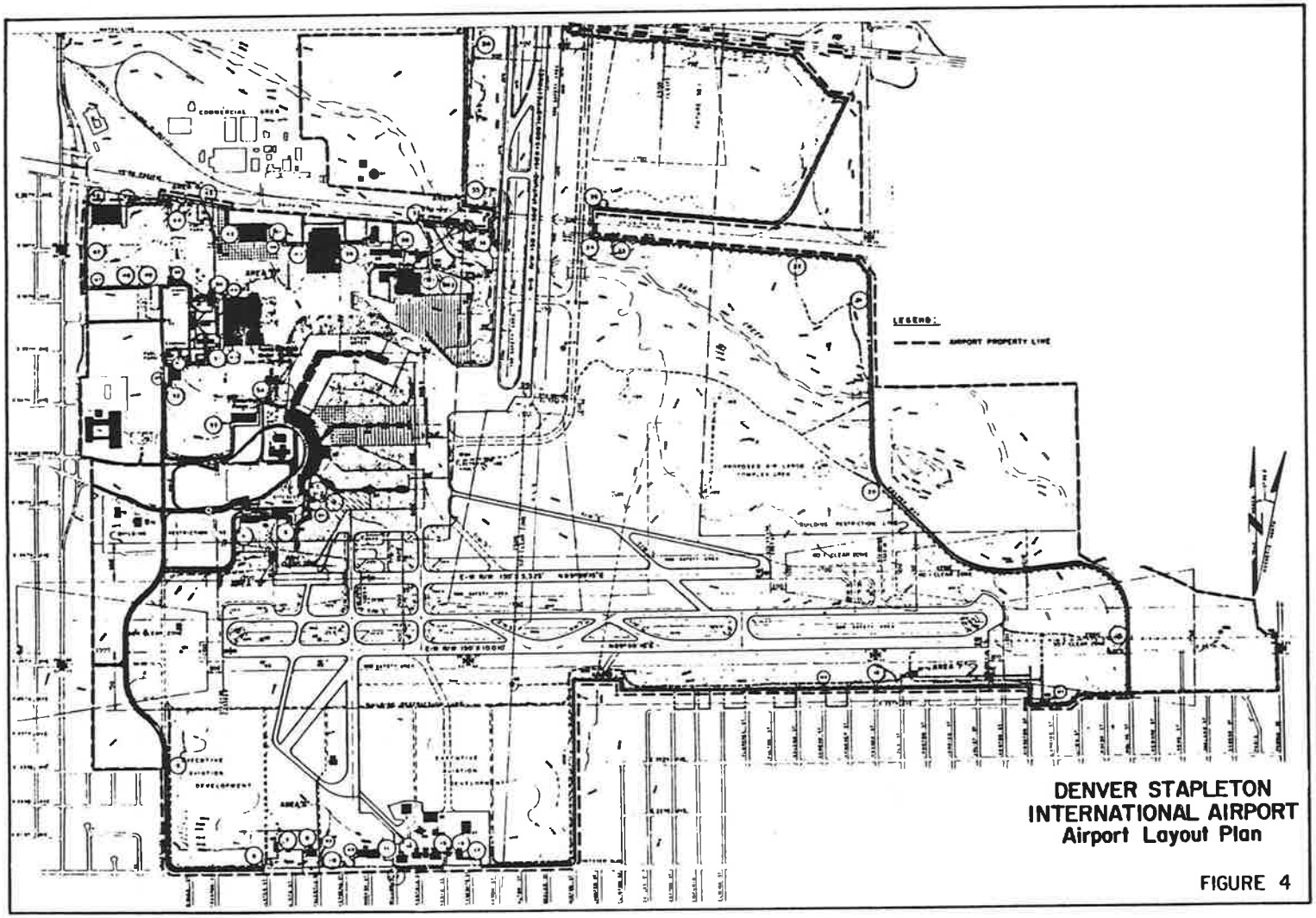
Miami International has more airport-related jobs than any other comparably-sized United States airport with more than 33,000 employees working within its environs. Approximately 71 percent of these persons are airline personnel, with Eastern, Pan American and National Airlines having major maintenance/administrative facilities at MIA. Twenty-eight percent of the employees work at airport or airport-related industries (such as concessions) and 1 percent are Airport Authority or other agency employees.

Denver-Stapleton International Airport (DEN), serves the Denver Metropolitan Area, which includes a major recreational area, light manufacturing and some defense-related industries. Denver is a major hub airport, the ninth largest in the United States. Illustrated in Figure 4, it handled 9.48 million enplanements during 1978. The hub nature of the airport is reflected by the fact that approximately 30 percent of the enplanements are interline transfers and 25 percent are on-line transfers. DEN serves the largest volume of passengers of any airport between Chicago and the Pacific Coast.



MIAMI
INTERNATIONAL AIRPORT
Airport Layout Plan

FIGURE 3



DENVER STAPLETON INTERNATIONAL AIRPORT
Airport Layout Plan

FIGURE 4

The close proximity of DEN to many winter resort areas causes a large seasonal peaking of passengers and aircraft movements. The volume of skiers passing through Denver is sufficiently large to warrant the installation of special check-in counters for passengers with ski equipment. Extra car-ready stalls, an expanded curb frontage area, and additional cargo and baggage handling capabilities had been recently added at the time of the surveys. In addition, pedestrian flow was being improved through the construction of two pedestrian overpasses from the garage to the Terminal Building.

These three airports, although similar in size, are sufficiently unique to allow for diversity in the calibration and validation of the simulation model. It is anticipated the successful calibration of the Landside Model will assist airport planners in assessing the magnitude of congestion and forecasting the point at which existing facilities will reach capacity. Planners will be able to evaluate the benefits and costs of alternative methods of relieving anticipated congestion through analysis of the impact of future congestion associated with demands approaching or surpassing the capacity of landside facilities.

Goals and Objectives of Study

The Transportation Systems Center, through this study, is attempting to develop a planning tool to guide airport planners and designers in determining landside system requirements at airports. It is anticipated the end product of these model development efforts will be a computer simulation tool which accurately depicts the landside activity demands. The model will also determine the landside points of capacity restraint

based on anticipated activity levels at airports.

To develop accurate simulations of the three study airports, the model required detailed information describing demand characteristics, passenger and vehicle processing times, service times, dwell lengths, and information describing the available passenger and vehicle supply facilities, such as the number of ticket counters, security counters, roadway lanes. The data, for model comparison, required simultaneous collection at nearly all survey stations to assure the demand and supply characteristics at all areas were properly correlated by time.

The study also required the data collected to be satisfactory with respect to the random nature of sampling procedures, accuracy, and compatability with existing programs.

Report Presentation

The purpose of this report is to briefly summarize the entire study process from project initiation to the final data processing. The report is presented in six sections which include the following information:

- Introduction;
- Data Collection Procedures;
- Data Collection Survey Forms;
- Unusual Occurrences During Surveys;
- Field Observer Locations;
- Description of Computer Programs;
- Airport Facility Information;

- Data Reduction Procedures; and,
- Comparisons of Selected Data Items.

All information is presented in a format previously approved by the Project Technical Monitor and in accordance with the Contract.

Part 2
DATA COLLECTION PROCEDURES

This section of the report presents the procedures utilized to collect the Calibration and Validation Data for the Airport Landside Simulation Model. Contained in this section is a compilation of all forms utilized in the final data collection effort. In addition, the report summarizes the methods of data collection. The procedures utilized to hire and train the field crews at each airport are highlighted and the procedures used to determine the number of field observers required are briefly described.

Field Reconnaissance - At the onset, a field investigation was undertaken at the three airports under study. During the visit, meetings were held with representatives of the Airport Operating Agency to discuss the purpose and scope of the study. At these meetings any restraints with respect to possible survey locations and security requirements were determined. In addition, meetings were held with the Airport Station Manager's Committee at each airport to brief the airlines on the study and to discuss the data to be requested from the air carriers. Subsequent meetings were also held with individual airline representatives to further review the study and possible data collection procedures. Available data from previous studies were collected and their suitability in connection with this study determined.

Field data were also obtained to enable the Consultant to prepare a data collection plan for each airport. During the field trips the number of observers needed to monitor airport activities was also determined and an inventory of airport facilities prepared.

Data Collection Plan - Upon completion of the airport site reconnaissance a data collection plan was prepared for each airport. As a result of the previously conducted site reconnaissance, a complete inventory of the facilities to be surveyed was available, including the location of all terminal entrance and exit doors, airport parking and roadway entrance and exit points, ticket counters, baggage claim facilities, car rental locations, security screening/checkpoint areas, and level of activities on the enplaning and deplaning roadways. The report presented the collection methodology to be utilized in each area of the airport. Each data collection plan included:

- Description of the quality and availability of existing data;

- Methodology to be followed in collection of all data required by the Contract including:

  - Census surveys; and,
  - Sample surveys.

- Detailed description and copy of all survey forms to be utilized in the final survey; and,

- Location of field personnel assignments and data to be collected by each person.

The report also contained estimates of manpower requirements and a tentative schedule for the pilot studies and final data collection effort.

Pilot Study - The pilot studies were conducted at each airport for two airlines, as specified in the Contract. There were two main purposes of the pilot studies. The first was to review training procedures for the field crews and to refine the survey forms and data collection plans previously prepared. During the pilot studies, the data collection process was carefully monitored with emphasis on:

- Accuracy of data;
- Potential problems with proposed data collection procedures;
- Need to modify or clarify the survey forms;
- Locations of survey stations; and,
- Amount of data each individual could collect.

The second purpose was to develop a direct estimate of the number of entities (passengers and vehicles) and the data variability of each area. This enabled the calculation of the representative sample required for the final study. Upon completion of the pilot study, an evaluation report was presented summarizing the result of the pilot study. The report presented the required modifications to the data collection plan, and the required sample sizes for each data item.

Field Personnel

A combined total of over 400 field personnel was utilized to obtain data for model comparison at the three airports. The majority of the staff was obtained from local sources; i.e., high schools, college and university placement offices, local employment

agencies, State Employment offices, and senior citizen groups. In addition, advertisements were placed in local newspapers to attract field personnel in New York and Denver. Due to the relatively low unemployment situation in Denver at the time of the surveys, an exhaustive attempt to hire the required number of personnel through local agencies was unsuccessful. Thus, it was necessary to utilize the services of a temporary personnel agency to obtain the required manpower. In all cases job applicants were interviewed at the Consultant's local offices to assure those hired had necessary verbal and communication skill levels and had suitable qualifications for contacting the public.

Data Collection Supervision

Supervisory staff was primarily retained from the previously conducted pilot studies. Therefore, the supervisory staff was familiar with the forms to be utilized during the data collection effort. Using potential supervisors in the actual pilot study data collection gave these staff members the benefit of first-hand experience necessary to monitor the final data collection effort. Because of the large areas to be surveyed, and the size of the field crews, each airport was subdivided into several sections. During the data collection period two supervisors were assigned to each section.

At MIA a total of 10 sections were defined. The Terminal Building was divided into five areas, including two areas on the upper level and two areas on the lower level. The fifth area was designated the "International Corridor," which included a portion of the Terminal on both the upper and lower level areas. The curb frontage roadways were also divided into two sections for each level, thus minimizing the walking distance of the supervisory staff and ensuring continued reconnais-

since and surveillance. The final area was designated as the external location. This location was the most remote from the Terminal Building and included the Airport entrance and exit roadways as well as the parking facilities.

LGA was divided into eight sections. These included four inside the Terminal (two upper, two lower), two sectors on the curb frontage roadways (one upper level, one lower level), one sector encompassing required Terminal roadways and parking facilities, and the final sector designated as the Shuttle Terminal area.

DEN was divided similarly to LaGuardia Airport, but as there is no Shuttle Terminal, only seven sectors were used.

Training Procedures

MIA was the first of the three airports surveyed. A substantial amount of knowledge and experience was obtained at MIA while conducting this survey. Field personnel were assembled in an auditorium and were assigned to a specific sub-area and then organized into various groups with their respective supervisors. Each group consisted of two team leaders and relief personnel. Once all personnel were assembled, the group underwent a training period. During this period a review of the data collection procedures and survey forms was accomplished, and basic orientation was given to all field personnel. Included were the following:

- Orientation and purpose of study;
- Need for accuracy and neatness in reporting;

- Need for safety and politeness;
- Presentation and definition of specific tasks;
- Sampling procedures;
- Familiarization with data collection forms;
- Guidelines for data collection;
- Procedures for dealing with air passengers and other members of the public;
- Observation post assignments; and,
- Procedures for handling completed data forms.

Experience at Miami International Airport indicated that due to the large number of field personnel assembled in one area and the number of forms to be explained, significant problems occurred. Since for the most part individual field staff were required to understand only one form, a review of over 25 forms apparently bored the majority of the field crew. As a result of this experience, the Consultant chose to modify these training procedures at both Denver and LaGuardia Airports. At these latter airports the group was similarly assembled in a meeting room which, again, was relatively small in size. However, at these locations each observer was assigned to a sector, and then all persons in one sector moved to another area together. Upon reaching their section an orientation briefing was given to the entire group individually, which included:

- Orientation and purpose of study;
- Need for accuracy and neatness;
- Need for safety;
- Procedures for dealing with air passengers and other members of the public; and,
- Observation post assignments.

Then individual observers were separated from the group and instructed in only the specific data collection procedures they required.

At this point each individual was placed in the assigned location for a one-hour preliminary data collection effort. This enabled the field personnel to become totally familiar with their respective data collection form and location, thereby significantly reducing the amount of confusion realized during the six-hour survey periods. It also allowed supervisors to be assured individual observers properly understood their assignments prior to the actual data collection effort. It should be noted that in all instances prior to the arrival of field personnel the survey forms were precoded and organized by location and section and given to the supervisors. Similarly, at the end of the survey day the section supervisor brought his/her group back to the predetermined meeting room for a debriefing, and returned all survey data collected that day. Field personnel returned data to full-time Consultant staff for review and acceptance of the work. This also enabled the Consultant to monitor payroll and hours of field personnel.

During the data collection, the Consultant provided five full-time professional staff members to act as senior supervisors with the primary responsibility of constant surveillance and immediate response to any problems that occurred during the entire survey period. These staff members also provided coordination with airport operating staff and airline personnel.

Part 3
FIELD DATA COLLECTION SURVEY FORMS

This section presents a description of the various survey forms and data collection techniques employed during the course of the study. Additionally, explanations of data collection procedures used for each survey form are also presented. In view of the large number of forms utilized, these forms are attached as an appendix of this report.

Form A - Enplaning Air Passenger Information - Prior to the actual data collection effort, this self-administered form was distributed to all air carriers serving the designated airport. For the two-day survey period each air carrier was requested to indicate for a seven-hour period (one-half hour before and after the survey period) certain information for each aircraft departure. This information included the designated flight number, the flight type (domestic versus international), the scheduled and actual departure times, the type of equipment (707, 727, et cetera), the departure gate number, and the total number of passengers departing with the aircraft. In addition, if the information was available, the carriers were to indicate the actual number of inter- and intra-line transfer passengers.

Form B - Deplaning Passenger Information - This form was utilized to obtain deplaning passenger information. The form is essentially identical to Form A, the only difference being that instead of the gate number, the baggage claim area identification location for each flight was requested. This form was also submitted to each air carrier serving the airport prior to the survey period.

Form C - Arriving Air Passenger Questionnaire - This form was employed to obtain passenger data. The form was administered by a field interviewer, with a maximum of nine questions to be answered. The following data were obtained through this survey questionnaire:

- Time of passenger departure;
- Mode of ground transportation for passenger;
- Passenger group size;
- The amount of luggage (check-in and carry on);
- Number of greeters for this passenger (s);
- Location where greeters met passenger (s);
- Mode of transportation for greeters; and,
- Time of greeter departure.

This survey was conducted in the baggage claim area while the air passengers waited for their baggage to arrive. A personal interview was chosen in lieu of a fill-in questionnaire to reduce the possibility of improper interpretations of the survey questions, and to assure passengers responded accurately.

Form D - Departing Air Passenger Questionnaire - This form is basically identical to Form C. However, the questions were designed to obtain information from departing air passengers rather than arriving passengers. The surveys were conducted at the gate area prior to flight departure.

Form E - Bus and Limousine Inter-arrival Times - This form was utilized to determine the inter-arrival times of buses and other vehicles on the enplaning and deplaning curbs. Data were

collected by field personnel recording the presence of all buses, limousines, hotel vans, and car rental buses, noting the time the vehicle passed the designated screenline. This form was utilized to obtain information describing the non-scheduled arrivals of these vehicles.

Form F - Car Rental Selection - This form was employed to obtain the number of passengers utilizing the various car rental companies. A person located at the exit end of the deplaning roadway recorded the number of passengers in each passing car or rental bus (excluding driver), time, and company.

Form G - Arrival Distribution for Vehicles Meeting Passengers - The arrival distribution of vehicles prior to scheduled flight arrival time was obtained with this form. The vehicle arrival time was recorded and an occupant of the vehicle was interviewed to determine the airline and the flight number or air trip origin of the air passenger they were meeting. During coding this information was compared to the scheduled arrival times furnished by the airlines and arrival time distribution and then calculated.

Form H - Check-In Counter Survey--Queue Length/Flow Rate, Central Queue - This form was used to obtain both passenger flow rates and a sampling of queue lengths for five-minute intervals. The form was utilized only at central queue ticket counters. Information was recorded in five-minute increments and included the total persons served (walking up to the ticket counter), and the number of persons standing in the queue (at the end of the five-minute interval), as well as the number of ticket counters open (staffed).

Form I - Express/Full Service Check-In Counter Survey-Queue Length/Flow Rate--Individual Queues - This form was employed at all other (non-central queue) ticket counter operations. A total of eight ticket counters could be monitored with this form. (Experience indicated this was the maximum one observer could monitor.) Prior to initiating the survey, the counter identification and the number of people standing in line were noted on top of the survey form. The total number of people served for all counters monitored (either processed by the ticket agent or present at the counter) was recorded by five-minute intervals. At the end of the five-minute period the total number of persons waiting in line at each ticket counter was also noted. When a counter closed, an "X" was placed on the form at the end of each five-minute interval until the counter opened again.

Form J - Express Service Check-In Counter Survey - Process and Queue Time - This form was used to monitor persons as they entered the lines and were serviced at the individual airline ticket counter express check-in positions. The time of arrival, and the number of persons standing were noted. Once this person arrived at the counter the time was noted, as well as the time he/she departed the counter. A total of three to six people at a time could be monitored on about four lines. If a person switched from one line to another line the observer continued to monitor him/her. If the person left the ticket area, the initial time was deleted.

Form K - This form was deleted from the survey.

Form L - Full Service Check-In Counter Survey - Queue Length Flow Rate - This form is identical to Form I, but was utilized only at full-service ticket counters.

Form M - Full Service Check-In Survey - Processing Queue Time - This form is identical to Form J. Form M was used at full service ticket counters, rather than express service check-in counters where Form J was used. Data collection procedures were identical to Form J.

Form N - Curbside Check-In - This form was utilized to determine processing times at the curbside baggage check-in facilities. A sampling technique was employed. Field personnel recorded the location of the curbside check-in (airline) and the time the person arrived at the curbside check-in location or the time the skycap took the baggage. The time of completion, which was also recorded, was defined as the time the passenger received baggage claim tickets for his luggage.

Form O - Immigration Counter Service - Queue Lengths/Flow Rate - This form was utilized in the Immigration Area to obtain flow rate information through the Immigration Counters, as well as a sample of queue lengths. Procedures to obtain this information were identical to that of Form I. The observers also noted whether the counter served U.S. nationals or aliens.

Form P - Immigration Counter Service/Process and Queue Times - This form was employed at the Immigration counters to obtain information regarding processing times, queue times, and overall queue lengths. Procedures utilized to obtain this information were essentially the same as those used in connection with Form J.

Form Q - Gate Counter Survey - Queue Length/Flow Rate - This form was utilized to obtain information at the check-in counters located in the gate areas. Procedures utilized to obtain this information were identical to Form I.

Form R - Gate Counter Survey - Processing Queue Time - This form was utilized to determine activities at the gate counter areas. Procedures utilized to obtain this information were identical to Forms J and M. Observers using Forms Q and R worked together in pairs.

Form S - Parking Lot Exit Survey - Queue Length/Flow Rate - This form was utilized primarily to obtain flow rates at parking lot exits, as well as to obtain a sample of queue lengths by five-minute intervals. Procedures utilized were similar to Form I.

Form T - Parking Lot Exit Survey - Processing Queue Time - This form was employed to determine the amount of time required for vehicle processing at the airport parking facility cashier lanes. Procedures were identical to those used to obtain processing time for passengers at ticket counters; however, in this case the field observer monitored vehicles rather than individual persons.

Form U - Car Rental Counter Survey - Pick-Up - Queue Lengths/Flow Rate - Form U was utilized at car rental companies which had passenger processing facilities located within the airport terminal building. The form was designed to monitor two rental counter locations simultaneously. During each five-minute interval, the total number of persons served for the specific company was recorded. The number of people served was defined as an actual transaction between the car rental company and the individual, whereas persons requesting information or availability of cars were excluded from this count. At the end of the five-minute interval, the number of agents on duty and the total number of persons standing around the car rental counter (queue length) were both recorded.

Form V - Car Rental Counter Survey - Pick-Up Processing Queue Time - This form was utilized to obtain process and queue times, and queue lengths at various car rental counters located in the Terminal. A sampling procedure was utilized; the time the person approached the counter area was noted, as well as the total number of people standing in the vicinity of the counter prior to his/her arrival. It was difficult to monitor individual queue lengths due to the fact that specific queues were not clearly defined at the car rental counters. Once the individual completed the transaction, departure time from the counter was also noted.

Form W - Deplaning Curbside Dwell Time Count - This form was used to determine actual vehicle dwell times at the curb as compared with time required for the loading of passengers. The field personnel recorded the time vehicles stopped at the curb and also noted the vehicle classification. Field staff continued to monitor the vehicle and noted the time at which the loading of passengers/bags started. Finally, the observer indicated the time the vehicle departed the curb. This provided data describing passenger loading time after the vehicle stopped, as well as vehicle dwell times. In some instances the vehicle loading times and dwell times were identical, indicating that upon completion of vehicle loading the vehicle departed the curb immediately.

Form W-1 (Upper Level) Enplaning Curbside Dwell Time Count - This form is identical to that of Form W; however, it is designed for the enplaning curb frontage roadways. As with Form W, the time the vehicle stops at the curb was recorded and the vehicle classification noted. Upon completion of passenger unloading, the time was recorded. Unloading time completion was defined as either the time the driver entered the vehicle, after all passengers

and baggage were unloaded, or the time that the driver left the vehicle unattended and went inside the terminal with the passengers and baggage. The observer would then continue to monitor the vehicle and note the time the vehicle departed the curb.

Form X - Enplaning/Deplaning Curbside Vehicle Queue Time and Size - This form was utilized to obtain queuing information on the enplaning and deplaning curb frontage roadways. Each roadway was divided into three to four sections, as depicted in the individual data collection plans. The surveyor monitored the outer travel lanes of travel, as opposed to the inner parking lane located adjacent to the curb. (At MIA there are dual curbs. Thus, a judgment was necessary by the observer relative to the type of lane.) The field observer noted the time the vehicle arrived in a queue or entered a section. The observer also noted the number of vehicles in front of this vehicle which were not moving in the section. The type of car or color was noted so the field observer would be able to continue to monitor this vehicle as it remained in the section. As the vehicle moved through the designated section, the observer would note either the time the vehicle arrived at the curb, or the time the vehicle left his/her section.

Form Y - This form was deleted from the survey.

Form Z - Security Clearance Survey - Flow Rate/Queue Length - Procedures to obtain data for this form are similar to Form I. It should be noted, however, due to the volume of persons passing through the security facilities, each surveyor could not monitor more than two security locations simultaneously.

Form AA - Security Clearance Survey - Process and Queue Time - This form was utilized to obtain a sample of process times, queue lengths, and queue times at the security clearance counters. Procedures utilized were identical to those employed for Form J.

Form BB - Traffic Flow Rates - This form was utilized to obtain vehicular flow rates by five-minute intervals at various locations throughout the Airport. In some instances, depending on volume, field personnel were supplied manual hand counters to record the number of vehicles passing a given point. This form was utilized on airport roadways, entrances/exits to parking facilities, and others. Observers using hand counters at high volume locations were instructed to use continuous counts, so vehicles would not be missed while setting the counters back to zero.

Form CC - Pedestrian Flow Rate - This form was utilized to obtain total pedestrian movements entering and exiting the terminal building on both the upper and lower levels. As with Form BB, hand counters were utilized to record activity at high volume locations. Data were recorded for five-minute intervals during the survey period. The form was designed to obtain four hours' information on each page.

Form DD - Baggage Area - Flow Rate - This form was utilized to obtain occupancy data and passenger flow information in the baggage claim areas. For each five-minute interval the total number of people entering and exiting the baggage claim facility was noted. In addition, the number of persons standing in the baggage claim area at the beginning of the survey was recorded.

Form EE - Baggage Area - Queue Time - This form was utilized to determine the amount of time passengers spend in baggage claim facility areas. The time the person entered the baggage claim area and a description of the person were recorded. Approximately 8 to 10 people were observed simultaneously. The time spent in this area by one of every 10 to 20 persons was measured. The field personnel observed the selected sample passengers until time of departure, and then selected additional samples.

Form FF - Customs Counter Survey - Flow Rate - This form is similar to Form I but was utilized to monitor Customs Counters. Procedures were identical to Form I.

Form GG - Customs Counter Survey - Process and Queue Time - This form was utilized to obtain a sample of queue lengths, time in queue, and processing time at the Customs Counter. Procedures to obtain this information were previously described under Form J.

Part 4
SUMMARY OF DATA COLLECTION

This section of the report presents facility and observer location information and a summary of unusual events which were observed during the airport surveys. Surveys were conducted on two consecutive days for a predetermined six-hour period as follows:

- Miami International Airport - Friday, March 17, and Saturday, March 18, 1978 - 11:00 A.M. to 5:00 P.M.

- Denver-Stapleton International Airport - Thursday, April 13, and Friday, April 14, 1978 - 2:00 to 8:00 P.M.; and,

- LaGuardia Airport - Wednesday, May 24, and Thursday, May 25, 1978 - 2:00 to 8:00 P.M.

Unusual Events During Surveys

Following is a description of unusual events observed during the conduct of the study.

Miami International Airport - Field surveys were conducted at MIA, on Friday and Saturday, March 17 and 18, 1978. The surveys were conducted for a six-hour period on each day between the hours of 11:00 A.M. to 5:00 P.M. The weather was clear and warm for the two-day survey. The following describes unusual events or problems observed during the study.

Friday, March 17, 1978 - The Consultant noted a relative shortage of survey staff this day due to a larger percentage of worker "no shows" than anticipated. Originally, a 10-15 percent "no show" was estimated and planned; however, 20-25 percent absenteeism was experienced, largely due to the long lead

time required for the hiring process. As a result, the data collection plan was modified in that the activities at the majority of the parking facilities were not manually counted. Parking tickets were audited at a later date to obtain missing information. Additionally, the Consultant was unable to fully staff the Airport entrance-exit roadways; therefore, it was necessary to interpolate actual data obtained at other areas to develop these values. There was some misinterpretation of the curbside queue time and length forms. This confusion resulted in some doubts as to the reliability of these data for the first hour of survey on the first day only.

Saturday, March 18, 1978 - Activity in the Immigration and Customs Area was considerably higher on this day. As a result of the intense volume of passengers, and storage capacity limitations at the Immigration Facility, a staging area was set up by Customs Officers prior to entering Immigration between the hours of 12:00 Noon and 3:00 P.M. As a result, passengers were delayed up to an additional 15-45 minutes prior to arriving in the Immigration Facility. Because this was neither anticipated nor assigned, observers could not monitor the additional queue; therefore, queue lengths and times of passengers recorded reflect only time in the Immigration Facility proper.

As a result of the air passengers associated with cruise ships, buses transporting these passengers from the ships to the Airport utilized the inner recirculation roadway on the lower level and did not traverse the upper level curb frontage roadway. Baggage for these persons was transferred directly to the various air carriers.

Table 1 summarizes the carriers operating at MIA and the required air carriers to be surveyed according to the Contract.

Denver-Stapleton International Airport - Surveys at Denver-Stapleton International Airport (DEN) were conducted on April 13 and 14, 1978, between the hours of 2:00 and 8:00 P.M. The weather conditions during the survey were clear and mild. The following describes unusual events or occurrences noted during the two-day survey period.

The field data collection at DEN was free of major problems with respect to survey data collection procedures. There were,

Table 1

AIR CARRIERS OPERATING AT MIAMI INTERNATIONAL AIRPORT

Aerolineas Argentinas
Aero Mexico
*Aero Condor
*Aero Peru
**Air Canada
*Air Florida
Air France
Air Jamaica
Air Miami
*Air Panama
Air Sunshine
ALM
*Aviateca
*Avianca
*Bahamasair
*Belize
Braniff
British Airways
BWIA
Cayman
**Continental
**Delta
*Dominicana
**Eastern
*Ecuatoriana
Florida Airlines
Iberia
Key West
*Lacsa
Lan Chile
*Lanica
*Lloyd Aero Boliviano
Marco Island
Mexicana
Naples
**National
**Northwest
Ocean Reef
**Pan Am
Pro Air
**Southern
Southeast
*TACA
Tan
**TWA
**United
Varig
*Viasa
Western

**= Indicates airlines to be surveyed according to Contract, and which provided passenger data for study period.
* = Indicates airlines which provided passenger data for study period.

however, some peculiarities at the airport. With respect to air carrier operations, baggage arriving for chartered flights is taken directly to the aircraft from the buses arriving from tourist areas.

April 13 and 14, 1978 - There is no defined pedestrian holding area at the United Airlines Baggage Claim Area; therefore, the Consultant conceived an imaginary barrier (the column line surrounding the area) around the perimeter to monitor flow rates. As a result, movements in and out of this area may be higher than might normally be anticipated due to passengers wandering about waiting for their baggage. Similarly, occupancy values may be somewhat lower than expected.

There also appeared to be a longer queue length at the Security Counter adjacent to Western Airlines. It appears their magnometer was more sensitive than most other security facilities; therefore, the time required for personal scanning was greater.

Car rental activity at the Airport was provided via remote pick-up and drop-off areas. Close-in car rental lots are being phased out at DEN. However, at some times during the survey, the car rental companies utilized their parking lots located opposite the deplaning roads on each end at the terminal. As this activity was minimal, movements were not recorded.

Due to surface repairs, the short-term parking lot at the South Terminal Area was closed and it was not necessary to monitor activity at this location.

It should also be noted that during the time of the survey DEN was undergoing a construction project to provide two overhead pedestrian crossings to the Terminal Building from the garage. This construction did not affect vehicular travel; however, pedestrians oriented to the parking facility were somewhat rerouted from the normal travel path. Volume levels were not affected.

Table 2 summarizes the carriers operating at DEN at the time of the survey.

LaGuardia Airport - The data collection effort at LaGuardia (LGA) was conducted on Wednesday and Thursday, May 24 and 25, 1978. Surveys were conducted between 2:00 and 8:00 P.M., reflecting the peak activity period. The weather on Wednesday was overcast with periodic rain, heavy at times, and on Thursday, partly cloudy.

Table 2

AIR CARRIERS OPERATING AT DENVER-STAPLETON INTERNATIONAL AIRPORT

AIRLINE[1]
Aspen Airways
*Braniff
*Continental
Delta
*Frontier
*Mexicana
*North Central
*Ozark
Rocky Mountains Airways
*Texas International
*TWA
*United
*Western

(1) Excludes commuter airlines operating at South Terminal.
* = Indicates scheduled airlines to be surveyed according to Contract.

Wednesday, May 24, 1978 - Delays exceeding one hour in arriving and departing flights were noted as a result of the rain and low visibility which occurred on Wednesday. In addition, parking lots 1, 2 (garage), 3, and 4 were full during most of the survey period and, therefore, no entering vehicles were allowed. There was a significant amount of traffic entering and exiting the short-term metered parking facility during peak hours (4:30 to 7:30 P.M.). This was largely the result of vehicles constantly recirculating in and out of the metered lot seeking available short-term parking space.

The original data collection plan provided for the monitoring of queuing on three sections of the upper level roadway. Due to the long vehicular queues which formed at the approach to the enplaning curb in the vicinity of Eastern Airlines, an additional field person was utilized to monitor this activity. Field personnel situated on the curb could not physically see the end of the queue. As a result, an additional person was positioned atop the Garage to monitor the queuing activity from the Grand Central Parkway to the Garage entrance on the enplaning roadway (the limits of visibility of the person situated at Eastern Airlines).

Thursday, May 25, 1978 - Weather conditions were much improved on Thursday and aircraft activity was on schedule. The additional person was still positioned atop the Garage to monitor the extensive queues on the entrance to the enplaning roadway.

Parking activity was similar to that which occurred on Wednesday, with the majority of the parking facilities closed at various times of the day.

Table 3 summarizes the carriers operating at LGA at the time the survey was conducted.

Facility Information/Observer Locations

Field observer locations and required facility information are described in the following paragraphs.

Miami International Airport

Data Collection - Table 4 presents the various field observer reference locations and a description of the survey form utilized to collect the data and the type of data obtained. Figures 5, 6,

Table 3

AIR CARRIERS OPERATING AT LAGUARDIA AIRPORT

AIRLINE[1]
*Allegheny
*American
Braniff
*Delta
*Eastern
*National
New York Airways
North Central
Ozark
Piedmont
Southern
*TWA
*United

(1) Excludes commuter airlines operating at shuttle terminal.
* = Indicates airlines to be surveyed according to Contract.

Table 4

OBSERVER LOCATION REFERENCE AND DATA DESCRIPTION

Miami International Airport

OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA (3)
1	Concourses B, C, and D	D	I
2	Concourses E, F, G, and H	D	I
3	Baggage Claim - Sections 1, 2, 3	C	I
4	Baggage Claim - Sections 4, 5, 6	C	I
5	Enplaning Curb - Section 1	E	A
6	Deplaning Curb - Section 1	E/BB	A/F
7	Deplaning Curb - Section 6	F/BB	C/F
8	Deplaning Curb - Section 1,2	G	A
9	Deplaning Curb - Section 3,4	G	A
10	Deplaning Curb - Section 5,6	G	A
11	Ticket Counter - Eastern	J	P
12	Ticket Counter - Eastern	M	P
13	Ticket Counter - Braniff	M	P
14	Ticket Counter - National	M	P
15	Ticket Counter - Northwestern, Air Canada, United Delta	M	P
16	Curbside Check-In - Eastern	N	T
17	Concourse C - Various Gates	R	P
18	Parking Exit	T/S	P/Q
19	Parking Exit	BB/S	F/Q
20	Parking Entrance	BB	F

(Continued)

Table 4 (Cont'd.)
Miami International Airport

OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA
21	Parking Exit/Enplaning Curb Section 3	BB	F
22	Car Rental Counter Sections 1, 2	V	P
23	Car Rental Counter Sections 4, 5	V	P
24	Deplaning Curb - Section 2	W	P
25	Deplaning Curb - Section 3	W	P
26	Deplaning Curb - Section 5	W	P
27	Enplaning Curb - Section 2	W-1	P
28	Airport Entrance/Recirculation Road/Enplaning Curb Section 4	W-1/BB	P/F
		W-1	P
29	Enplaning Curb Section 5	BB	F
30	Enplaning Curb Section 6	BB	F
31	Parking Entrance/Enplaning Curb Section 4	BB	F
33	Enplaning Curb Section 5	BB	F
34	Parking Entrance/Enplaning Curb/Airport Exit Section 6	BB	F
35	Deplaning Curb - Section 2	BB	F
36	Deplaning Curb - Section 3	BB	F
37	Deplaning Curb - Section 4	BB	F
38	Deplaning Curb - Section 5	BB	F
39	Baggage Claim - Eastern	EE	E
40	Ticket Counter - Braniff	I	Q
41	Ticket Counter - Air Canada, Air Jamaica	I	Q
42	Ticket Counter - Continental, Northwest	I	Q

(Continued)

Table 4 (Cont'd.)
Miami International Airport

OBSERVER LOCATION IDENTIFICATION NUMBER(1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA(3)
43	Ticket Counter - Delta	I	Q
44	Ticket Counter - Delta	I	Q
45	Ticket Counter - Eastern	I	Q
46	Ticket Counter - Eastern	I	Q
47	Ticket Counter - Eastern	I	Q
48	Ticket Counter - Eastern	I	Q
49	Ticket Counter - National	H	Q
50	Ticket Counter - National	I	Q
51	Ticket Counter - Pan Am	I	Q
52	Ticket Counter - Southern, TWA	I	Q
53	Ticket Counter - United	I	Q
54	Baggage Claim - Eastern	DD	F
55	Baggage Claim - Eastern	DD	F
56	Baggage Claim - Section 3	DD	F
57	Baggage Claim - Section 4	DD	F
58	Baggage Claim - Section 4	DD	F
59	Baggage Claim - Section 5	DD	F
60	Security - Concourse B	Z	Q
61	Security - Concourse C	Z	Q
62	Security - Concourse D	Z	Q
63	Security - Concourse E	Z	Q
64	Security - Concourse F	Z	Q

(Continued)

Table 4 (Cont'd.)

Miami International Airport

OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA (3)
65	Security - Concourse G	Z	Q
66	Security - Concourse H	Z	Q
67-81	Door - Upper Level	CC	F
82-101	Door - Lower Level	CC	F
102	Customs	FF	Q
103	Immigration	O	Q
104	Enplaning Curb - Section 1	X	L
105	Enplaning Curb - Section 2	X	L
106	Enplaning Curb - Section 3	X	L
107	Enplaning Curb - Section 4	X	L
108	Enplaning Curb - Section 5	X	L
109	Enplaning Curb - Section 6	X	L
110	Deplaning Curb - Section 1	X	L
111	Deplaning Curb - Section 2	X	L
112	Deplaning Curb - Section 3	X	L
113	Deplaning Curb - Section 4	X	L
114	Deplaning Curb - Section 5	X	L
115	Deplaning Curb - Section 6	X	L
116	Security	AA	P
117	Immigration	P	P
118	Immigration	P	P
119	Customs	GG	P

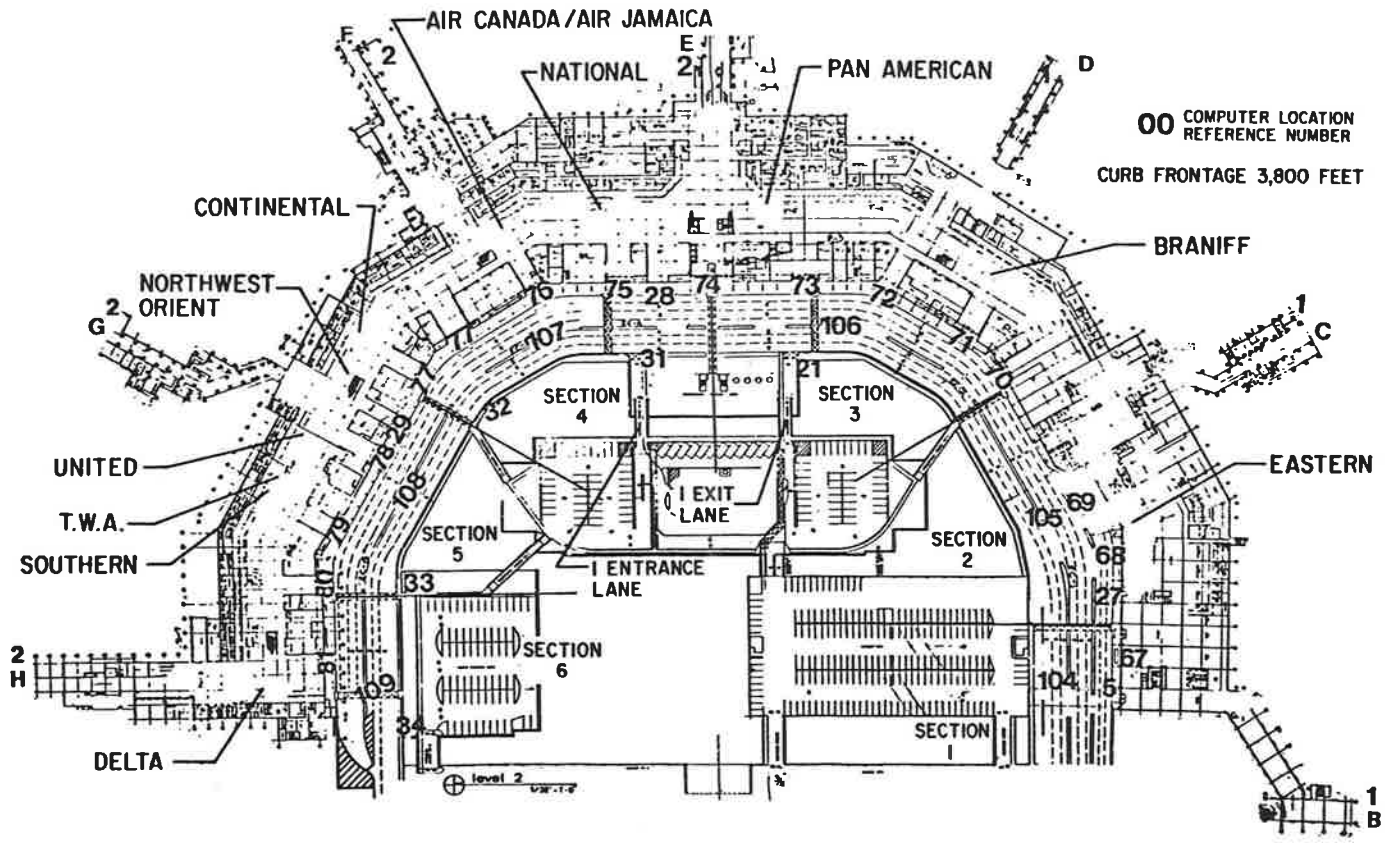
(Continued)

Table 4 (Cont'd.)

Miami International Airport

OBSERVER LOCATION IDENTIFICATION NUMBER(1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA(3
120	Customs	GG	P
121	Baggage Claim - Section 5	EE	E
122	Parking Exit	BB	F
123	Parking Entrance	BB	F
205	Enplaning Curb/Parking Entrance - Section 1	BB	F
218	Parking Exit	S	Q
239	Baggage Claim - Section 2	EE	E
240	Ticket Counter - Air Canada, Air Jamaica	I	Q
253	Door	CC	F
256	Baggage Claim - Section 3	DD	F
257	Baggage Claim - Section 4	DD	F
259	Security	Z	Q
500	Deplaning Curb - Section 1	E	A
502	Parking Entrance/Recirculation to Parking	BB	F
600	Door	CC	F

(1) For facility location see Figures 5, 6, and 7.
(2) See Appendix A for specific survey forms.
(3) A = Arrival distribution/interarrival time.
C = Car rental selection.
E = Queue time only.
F = Flow rate only.
I = Passenger interview.
L = Queue time/queue length.
P = Process time/queue time.
Q = Queue length/flow rate.
T = Process time only.

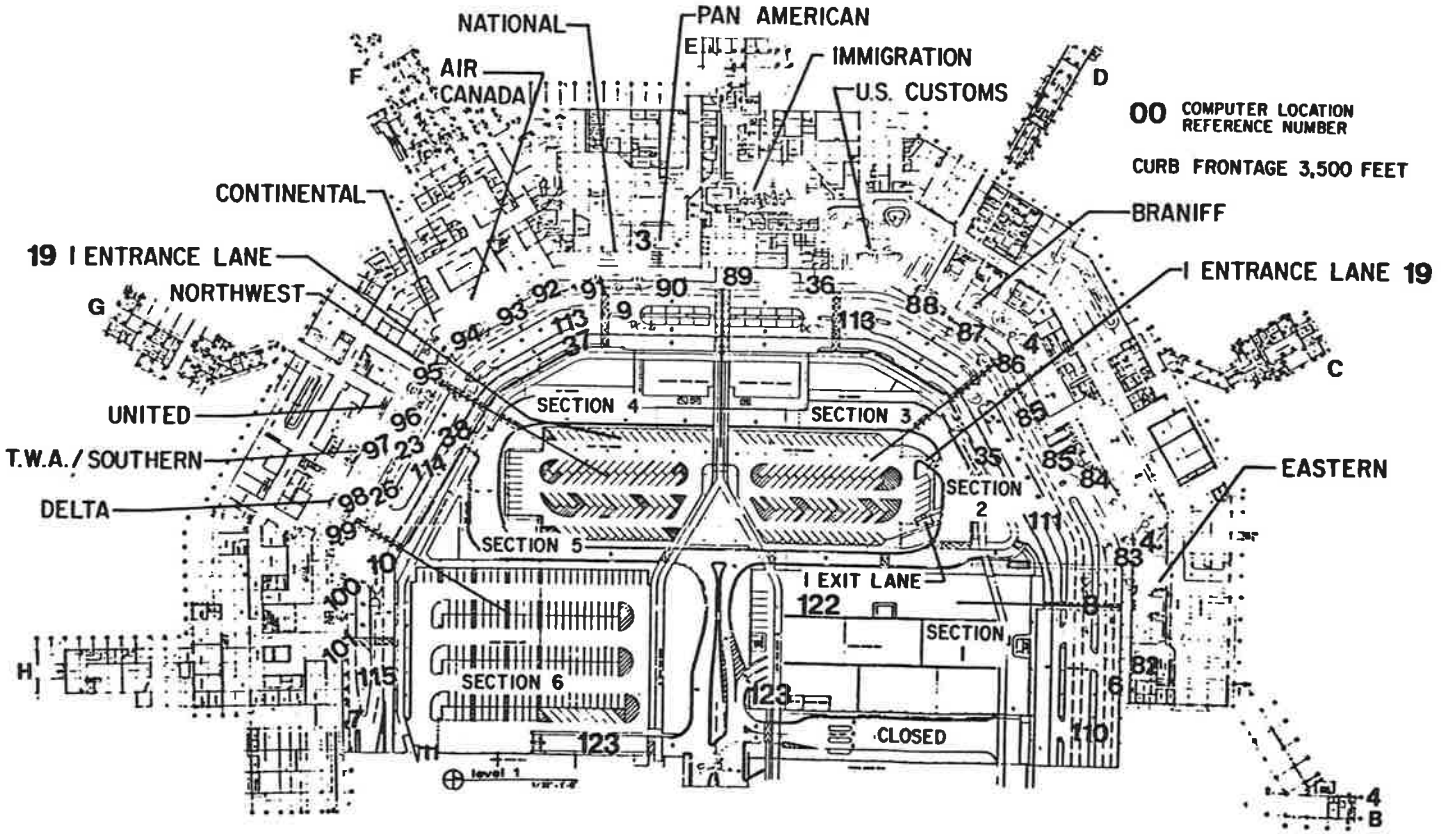


MIAMI INTERNATIONAL AIRPORT

ENPLANING LEVEL

AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 5



MIAMI INTERNATIONAL AIRPORT

DEPLANING LEVEL

AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 6

and 7 depict the existing terminal enplaning level, deplaning level, and airport layout plan, respectively.

Facility Information - Figures 5-7 also depict the following information:

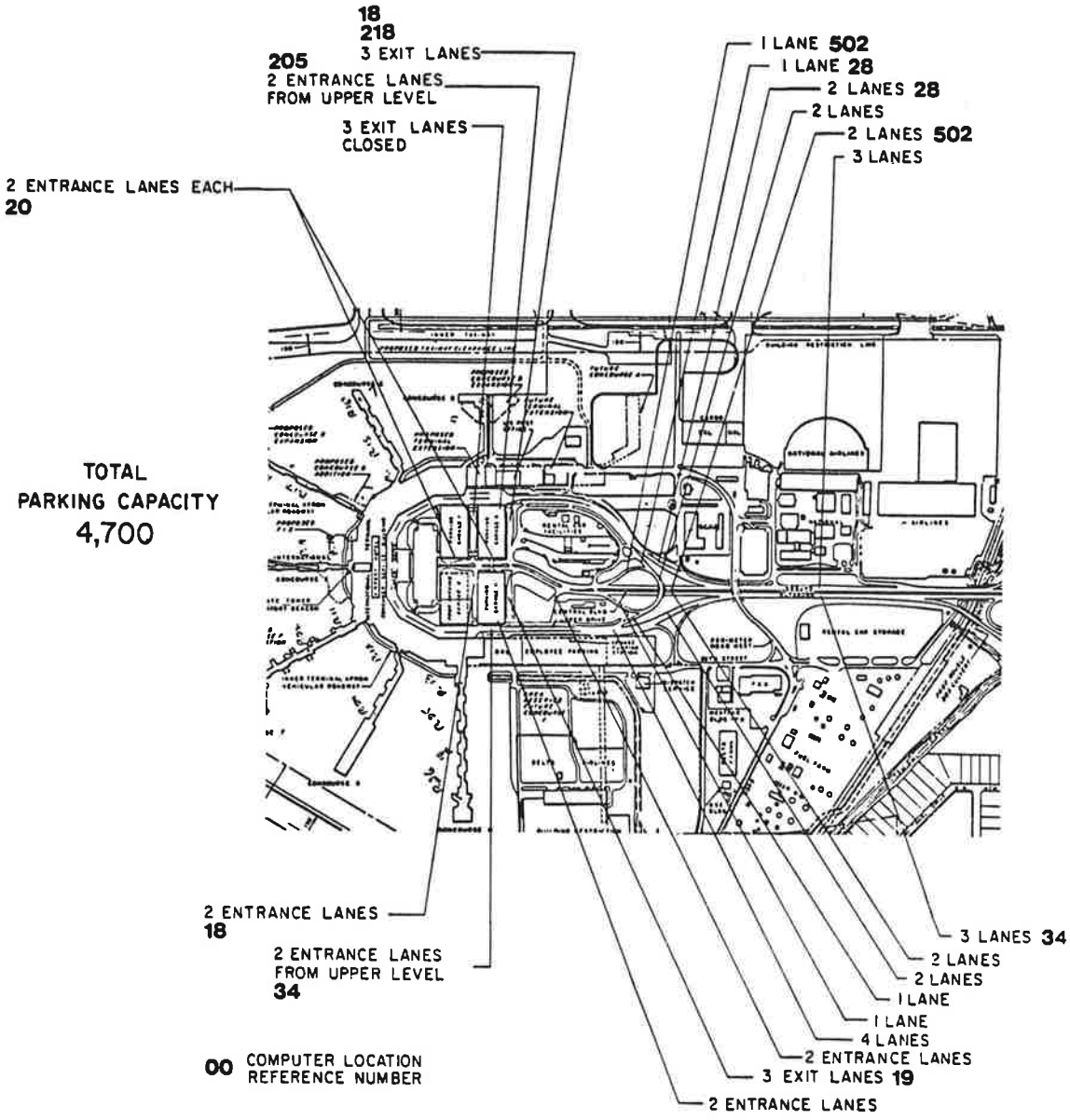
- Number of lanes and direction of travel on various airport roadway sections;
- Number of parking lot entrance and exit lanes by location; and,
- The length of usable curb frontage area on both the enplaning and deplaning levels.

In addition, the parking facility capacity for the public parking areas has also been indicated. Plans identify survey locations,such as door counts,where the description contained in Table 2 may be inadequate to locate the actual field surveyor positions.

Denver-Stapleton International Airport

Table 3 summarizes the air carriers operating at DEN and the airlines to be surveyed according to the Contract. Thirteen carriers, including several commuter carriers, operate at DEN, of which 10 were required to be surveyed during the study.

Data Collection - Field observer reference locations, and a description of the survey form utilized for data collection at each location are presented in Table 4. The type of data collected at each location is also presented. As noted, almost 100 positions were staffed with field personnel to collect the required data for



AIRPORT LAYOUT PLAN
MIAMI INTERNATIONAL AIRPORT
AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 7

Table 5

OBSERVER LOCATION REFERENCE AND DATA DESCRIPTION

Denver-Stapleton International Airport

OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA (3)
1	Concourses C and D - Various Gates	D	I
2	Concourse B - Various Gates	D	I
3	Baggage Claim Facility - United Airlines Area	C	I
4	Baggage Claim Facility - All other Airlines	C	I
5	Enplaning Curb - Entrance (United)	E	A
6	Deplaning Curb - United	E	A
7	Deplaning Curb - Frontier	F	C
8	Deplaning Curb - United	G	A
9	Deplaning Curb - Western	G	A
10	Deplaning Curb - Frontier	G	A
11	Ticket Counter - Braniff	I	Q
12	Ticket Counter - Continental	I	Q
13	Ticket Counter - Frontier	I	Q
14	Ticket Counter - Mexicana/Ozark	I	Q
15	Ticket Counter - North Central/Texas Int'l.	I	Q
16	Ticket Counter - TWA	I	Q
17	Ticket Counter - United	I	Q
18	Ticket Counter - United	I	Q
19	Ticket Counter - Western	I	Q
20	Ticket Counter - United	J	P

(Continued)

Table 5 (Cont'd.)
Denver-Stapleton International Airport

OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA (3)
21	Ticket Counter - United	M	P
22	Ticket Counter - TWA	J	P
23	Ticket Counter - Western	M	P
24	Ticket Counter - Braniff	M	P
25	Curbside Check-In - United	N	T
26	Concourses C and D - Various Gates	R	P
27	Entrance to Parking	T	P
28	Car Rental Counters - Frontier Area	V	P
29	Car Rental Counters - United Area	V	P
30	Deplaning Curb - Frontier	X	L
31	Ticket Counter - United	I	Q
32	Enplaning Curb - TWA	W1	P
33	Enplaning Curb - Continental	W1	P
34	Enplaning Curb - United	W1	P
35	Deplaning Curb - United	W	P
36	Deplaning Curb - Western	W	P
37	Deplaning Curb - Frontier	W	P
39	Airport Entrance Roadway	BB	F
40	Airport Exit Roadway	BB	F
41	Recirculation Roadway	BB	F
42	Long-Term Parking Entrance	BB	F
43	Short-Term Parking Entrance	BB	F

(Continued)

Table 5 (Cont'd.)
Denver-Stapleton International Airport

OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA (3)
44	Parking Exit	S	Q
45	Enplaning Curb - United	BB	F
46	Enplaning Curb - Continental	BB	F
47	Deplaning Curb - Western	BB	F
48	Deplaning Curb - Frontier	BB	F
49	Security Concourse B	Z	Q
50	Security Concourse C	Z	Q
51	Security Concourse D	Z	Q
52	Baggage Claim - Frontier	DD	F
53	Baggage Claim - TWA-Continental	DD	F
54	Baggage Claim - Western-Braniff	DD	F
55	Baggage Claim - United Area	DD	F
56	Baggage Claim - United Area	DD	F
57	Baggage Claim - United Area	DD	F
58	Enplaning Curb - United	X	L
59	Enplaning Curb - Continental	X	L
60	Enplaning Curb - TWA	X	L
61	Deplaning Curb - United	X	L
62	Deplaning Curb - Western	X	L
63 thru 73	Terminal Entrance - Upper Level Doors	CC	F
74 thru 79	Terminal Entrance - Lower Level Doors	CC	F
80	Concourse B - Various Gates	Q	Q

(Continued)

Table 5 (Cont'd.)
Denver-Stapleton International Airport

OBSERVER LOCATION IDENTIFICATION NUMBER(1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA(3)
81	Baggage Claim - Frontier Airlines	EE	E
82	Baggage Claim - TWA Airlines	EE	E
83	Baggage Claim - Braniff Airlines	EE	E
84	Baggage Claim - United Airlines	EE	E
85	Remote Parking Entrance	BB	F
205	Enplaning Curb - Frontier	BB	F
206	Deplaning Curb - United	BB	F
212	Ticket Counter - Continental	I	Q
216	Ticket Counter - TWA	L	Q
221	Ticket Counter - United	M	P
238	Security Counter - United Area	AA	P
257	Baggage Claim - United Area	DD	F
338	Security Concourse C	AA	P
438	Security Concourse D	AA	P

(1) For specific facility location identification see Figures 8, 9, and 10.
(2) See Appendix A for specific survey forms.
(3) A = Arrival distribution/interarrival time.
C = Car rental selection.
E = Queue time only.
F = Flow rate only.
I = Passenger interview.
L = Queue time/queue length.
P = Process time/queue time.
Q = Queue length/flow rate.
T = Process time only.

DEN. Figures 8, 9, and 10 depict the existing terminal enplaning level, deplaning level, and Airport layout plan, respectively. At those locations, such as door areas, where the descriptions are insufficient, the field location reference number is also identified on the respective figure.

Facility Information - The number of lanes on various roadway segments, numbers of parking lot entrance and exit lanes by location, the amount of usable curb frontage area for both enplaning and deplaning levels and parking area capacities are also identified.

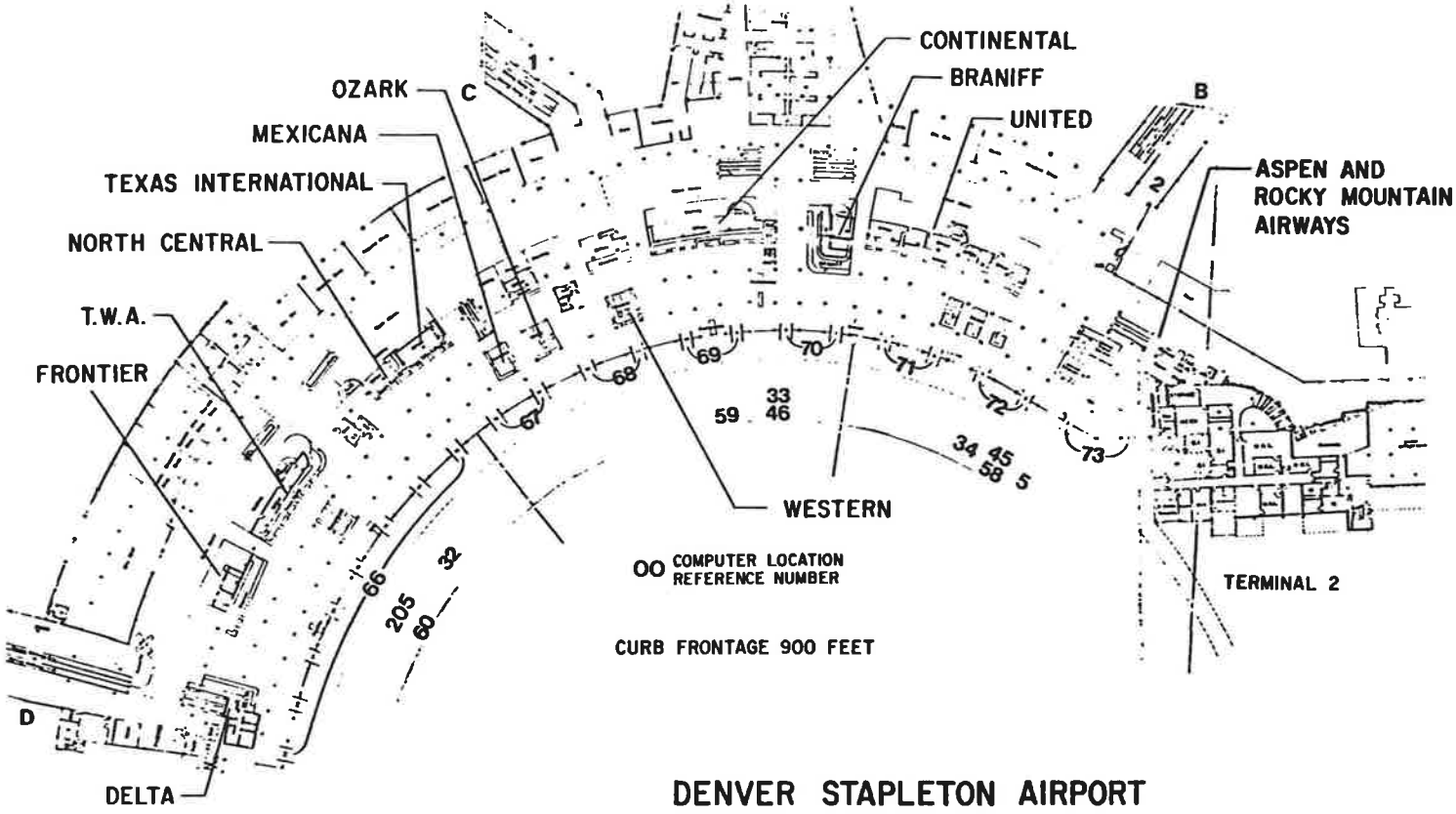
LaGuardia Airport

At the request of Eastern Airlines, no survey questionnaires were utilized in the gate concourses or in the baggage claim area. Table 5 presents a summary of the air-carriers serving LGA and denotes those airlines to be surveyed according to the Contract.

Data Collection - Table 6 presents the various field observer reference locations and a description of the survey form utilized to collect the data and the type of data obtained. Figures 11, 12, and 13 depict the existing terminal enplaning level, deplaning level and airport layout plan, respectively.

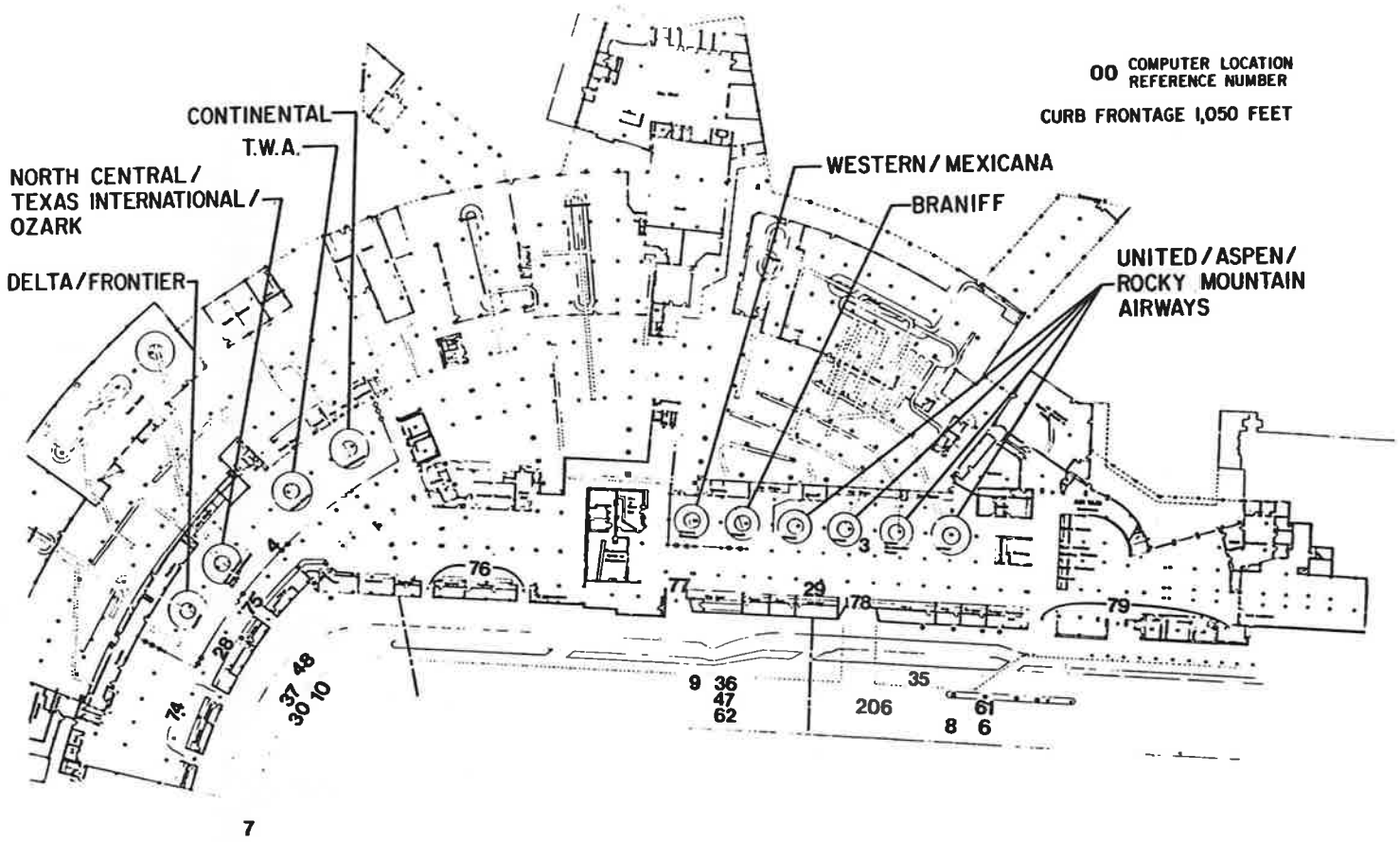
Facility Information - Figures 11-13 also depict the following information:

- Number of lanes and direction of travel on various airport roadway sections;
- Number of parking lot entrance and exit lanes by location; and,



DENVER STAPLETON AIRPORT
ENPLANING LEVEL
AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 8

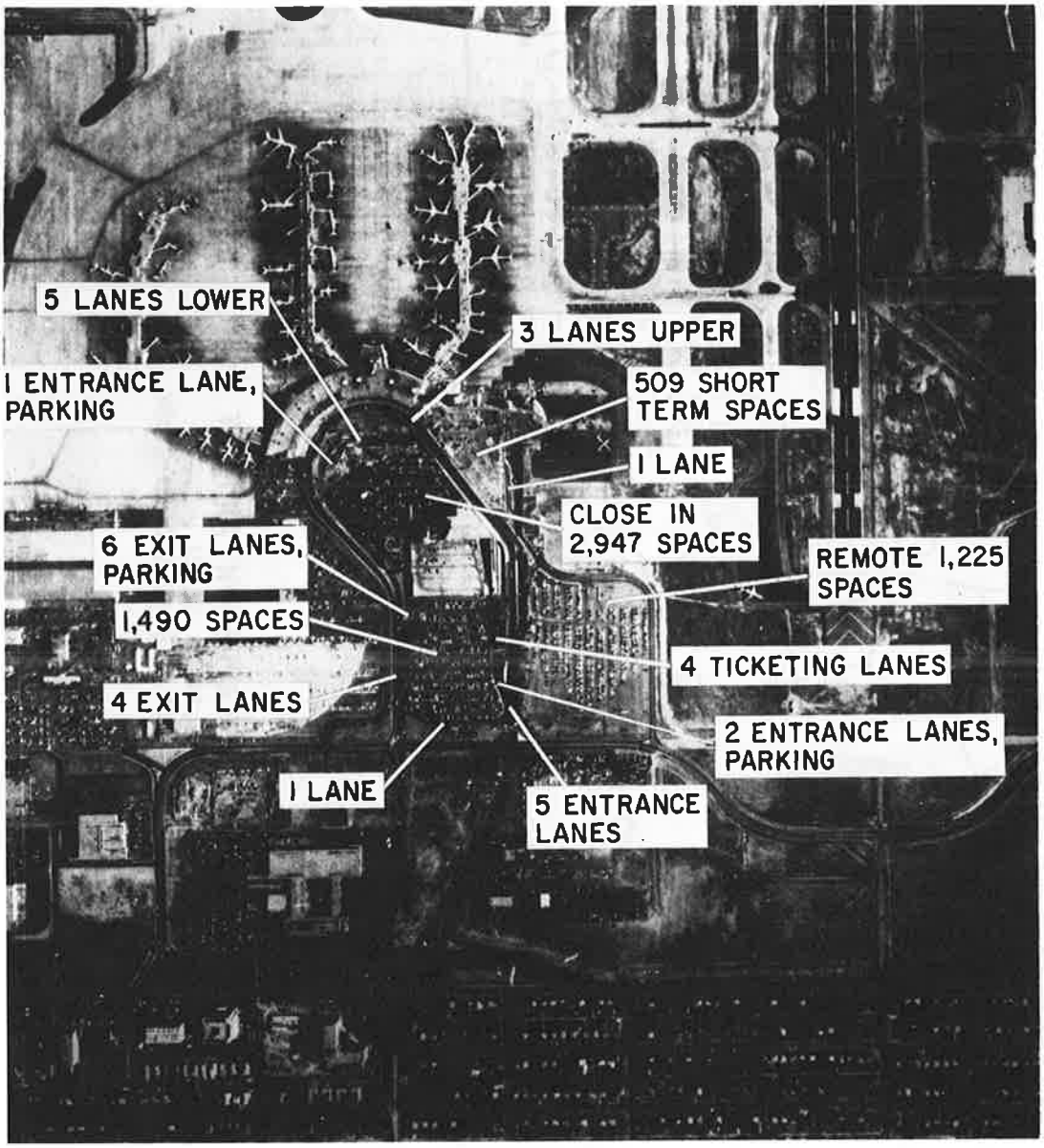


DENVER STAPLETON AIRPORT

DEPLANING LEVEL

AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 9



AIRPORT LAYOUT PLAN
DENVER STAPLETON AIRPORT
AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 10

Table 6

OBSERVER LOCATION REFERENCE AND DATA DESCRIPTION

LaGuardia Airport

OBSERVER LOCATION-IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA (3)
1	Concourse 3	D	I
2	Concourses 1 and 2	D	I
3	Baggage Claim - American, United	C	I
4	Baggage Claim - National, TWA, Delta, United	C	I
5	Deplaning Curb Inner - Eastern	E	A
6	Deplaning Curb Inner - Eastern	E	A
7	Deplaning Curb Inner - American	F	C
8	Deplaning Curb Outer - Eastern	G	A
9	Deplaning Curb Outer - National	G	A
10	Deplaning Curb Outer - American	G	A
11	Ticket Counter - Eastern	H	Q
12	Ticket Counter - Eastern	I	Q
13	Ticket Counter - National	H	Q
14	Ticket Counter - TWA	H	Q
15	Ticket Counter - TWA	I	Q
16	Ticket Counter - Braniff	I	Q
17	Ticket Counter - United	I	Q
18	Ticket Counter - United	-	-
19	Ticket Counter - Delta	I	Q
20	Ticket Counter - North Central and Piedmont	-	-
21	Ticket Counter - American	H	Q

(Continued)

Table 6 (Cont'd.)

LaGuardia Airport

OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA (3)
22	Ticket Counter - American	I	Q
23	Ticket Counter - American	H	Q
24	Ticket Counter - TWA	J	P
25	Ticket Counter - TWA	M	P
26	Ticket Counter - American	J	P
27	Ticket Counter - American	M	P
28	Ticket Counter - United	M	P
29	Security Concourse 1	AA	P
30	Security Concourse 2	AA	P
31	Security Concourse 3	AA	P
32	Security Concourse 4	AA	P
33	Security Concourse 1	Z	Q
34	Security Concourse 2	Z	Q
35	Security Concourse 3	Z	Q
36	Security Concourse 4	Z	Q
37	Airport Entrance, Exit	BB	F
38	Airport Entrance	BB	F
39	Airport Entrance, Exit	BB	F
40	Airport Entrance, Exit	BB	F
41	Airport Exit	BB	F
42	Recirculation Road	BB	F
43	Parking Exit Lot 3	BB	F

(Continued)

Table 6 (Cont'd.)
LaGuardia Airport

OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA (3)
44	Parking Entrance Lot 1	BB	F
45	Garage Entrance, Meter Lot Entrance	BB	F
46	Parking Entrance Lot 3 Exit Lot 4	BB	F
47	Parking Entrance Lot 4	BB	F
48	Parking Entrance Lot 5	BB	F
49	Parking Exit Garage, Meter Lot	BB	F
50	Enplaning Curb Inner - Eastern	BB	F
51	Enplaning Curb Inner - National	BB	F
52	Enplaning Curb Inner - American	BB	F
53	Enplaning Curb Outer - Garage	BB	F
54	Deplaning Curb Inner - American	BB	F
55	Deplaning Curb Inner - American	BB	F
56	Deplaning Curb Outer - American	BB	F
57	Deplaning Curb Outer - National	BB	F
58	Deplaning Curb Outer - Eastern	BB	F
59	Baggage Claim - American	DD	F
60	Baggage Claim - American	DD	F
61	Baggage Claim - American	DD	F
62	Baggage Claim - American	DD	F
63	Baggage Claim - American	DD	F
64	Baggage Claim - United, Braniff, Southern, Ozark	DD	F

(Continued)

Table 6 (Cont'd.)
LaGuardia Airport

OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA (3)
65	Baggage Claim - National	DD	F
66	Baggage Claim - National	DD	F
67	Baggage Claim - TWA	DD	F
68	Baggage Claim - TWA	DD	F
69	Baggage Claim - Delta/Allegheny	DD	F
70	Baggage Claim - Eastern	DD	F
71	Baggage Claim - Eastern	DD	F
72	Baggage Claim - Eastern	DD	F
73-82	Terminal Entrance - Upper Level Doors	CC	F
83-93	Terminal Entrance - Lower Level Doors	CC	F
94	Terminal Entrance - Upper Level Doors	CC	F
95	Parking Exit - Garage	X	L
96	Enplaning Curb Inner - American	X	L
97	Enplaning Curb Inner - National	X	L
98	Enplaning Curb Inner - Eastern	X	L
99	Airport Entrance - Grand Central Parkway Ramp	X	L
100	Shuttle Curb	X	L
101	Deplaning Curb Inner - American	X	L
102	Deplaning Curb Inner - Eastern	X	L
103	Deplaning Curb Outer - American	X	L
104	Deplaning Curb Outer - National	X	L
105	Deplaning Curb Outer - Eastern	X	L

(Continued)

Table 6 (Cont'd.)
LaGuardia Airport

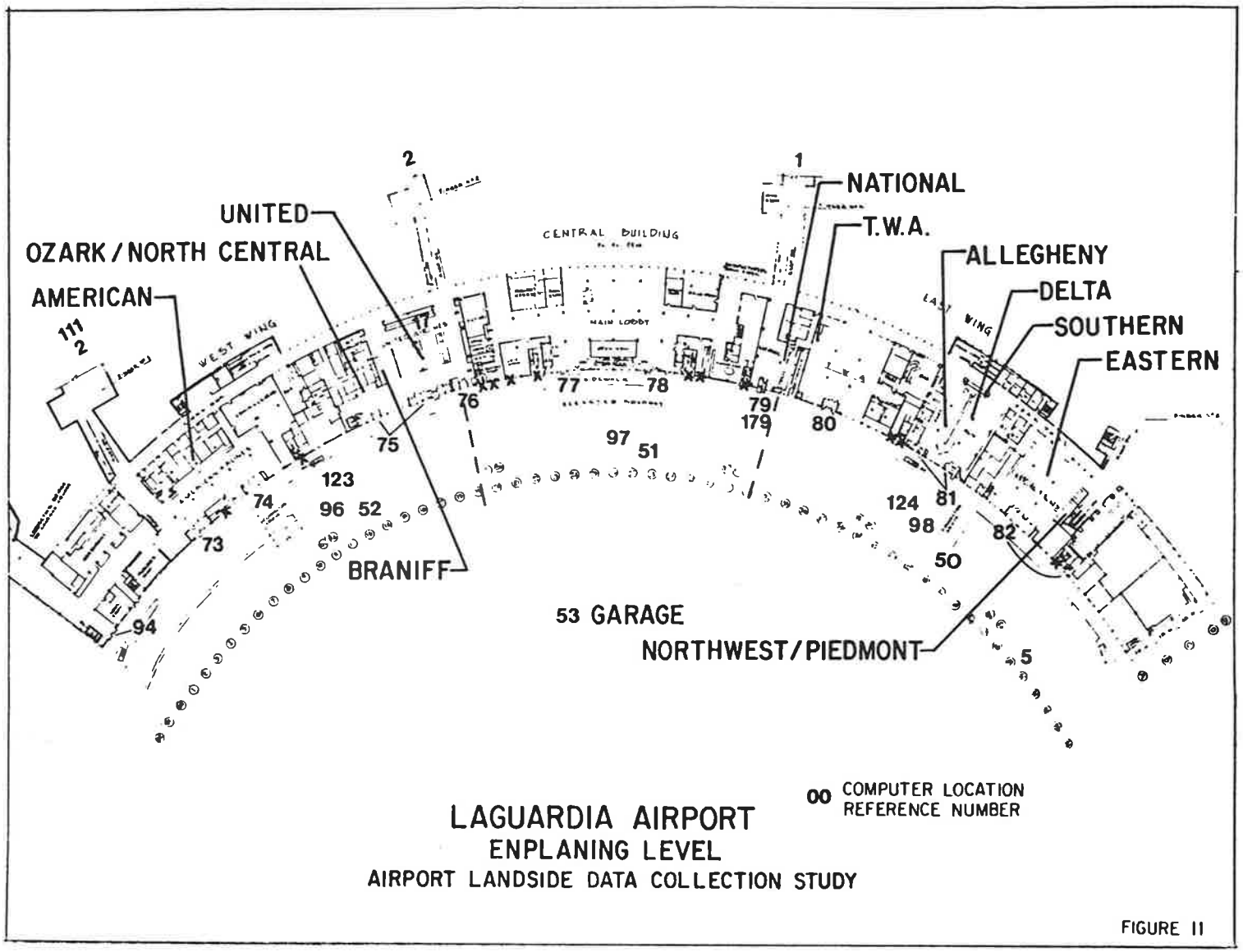
OBSERVER LOCATION IDENTIFICATION NUMBER (1)	DESCRIPTION	DATA COLLECTION FORM (2)	TYPE OF DATA
107	Car Rental Counter - American Area	V	P
108	Car Rental Counter - Eastern Area	V	P
109	Car Rental Counter - Eastern Area	V	P
110	Gate Counters various - Concourses 1, 2, 3	R	P
112	Parking Lot Exit - Lot 5	T	P
113	Baggage Claim - Eastern Area	EE	E
114	Baggage Claim - Eastern Area	EE	E
115	Baggage Claim - American Area	EE	E
118	Parking Exit - Lot 1	BB	F
119	Deplaning Curb Outer - American	BB	F
120	Shuttle Curb	BB	F
121	Deplaning Curb Inner - American	W	P
122	Deplaning Curb Outer - National	W	P
123	Enplaning Curb Inner - American	W-1	P
124	Enplaning Curb Inner - Eastern	W-1	P
125	Deplaning Curb Outer - Eastern	W	P
179	Terminal Entrance - Upper Level Door	CC	F
200	Airport Entrance - Grand Central Parkway Ramp	BB	F
371	Airport Entrance/Exit	BB	F

(Continued)

Table 6 (Cont'd.)
LaGuardia Airport

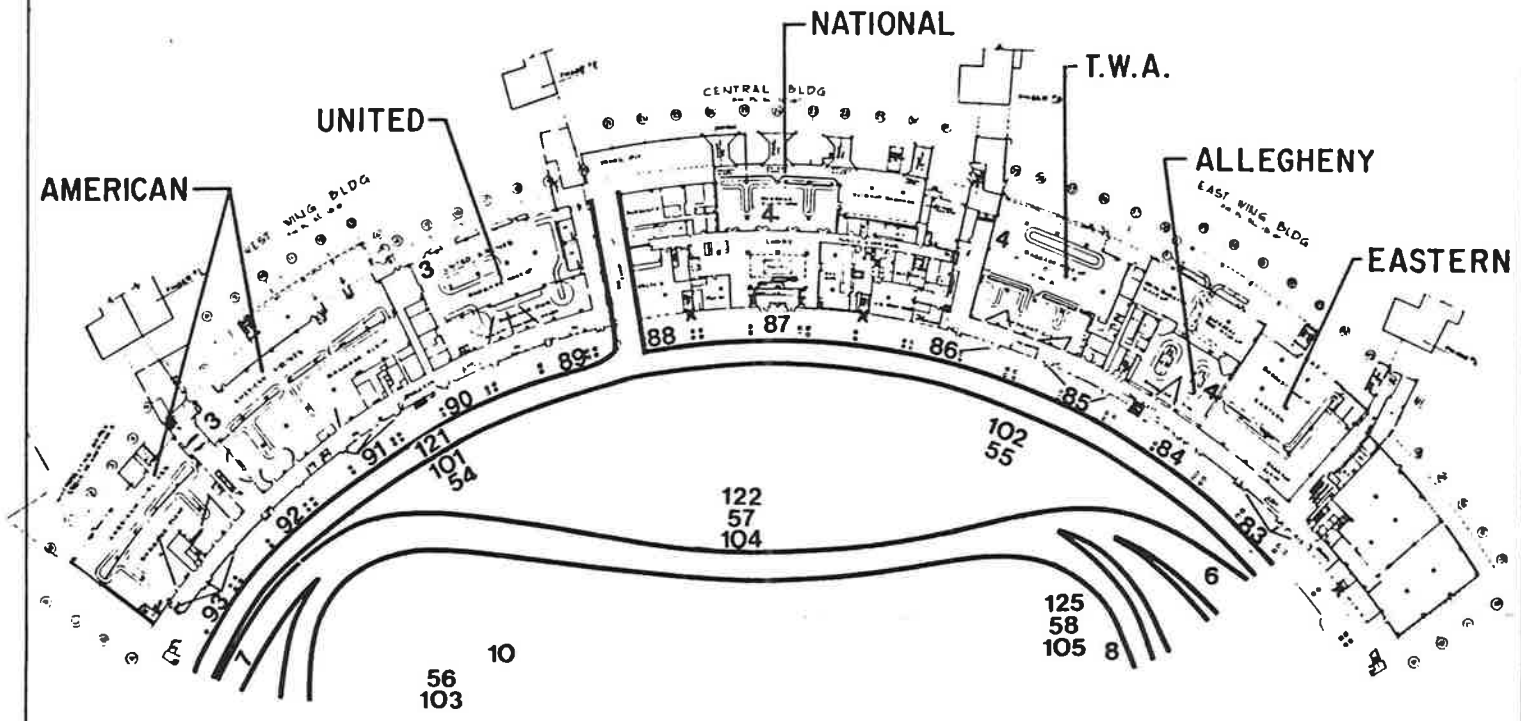
OBSERVER LOCATION IDENTIFICATION NUMBER	DESCRIPTION	DATA COLLECTION FORM	TYPE OF DATA(1)
451	Parking Entrance	BB	F
481	Parking Entrance and Exit	BB	F
491	Parking Exit	BB	F

(1) For facility location see Figures 11, 12, and 13.
(2) See Appendix A for specific survey forms.
(3) A = Arrival distribution/interarrival time.
C = Car rental selection.
E = Queue time only.
F = Flow rate only.
I = Passenger interview.
L = Queue time/queue length.
P = Process time/queue time.
Q = Queue length/flow rate.
T = Process time only.



LAGUARDIA AIRPORT
ENPLANING LEVEL
AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 11



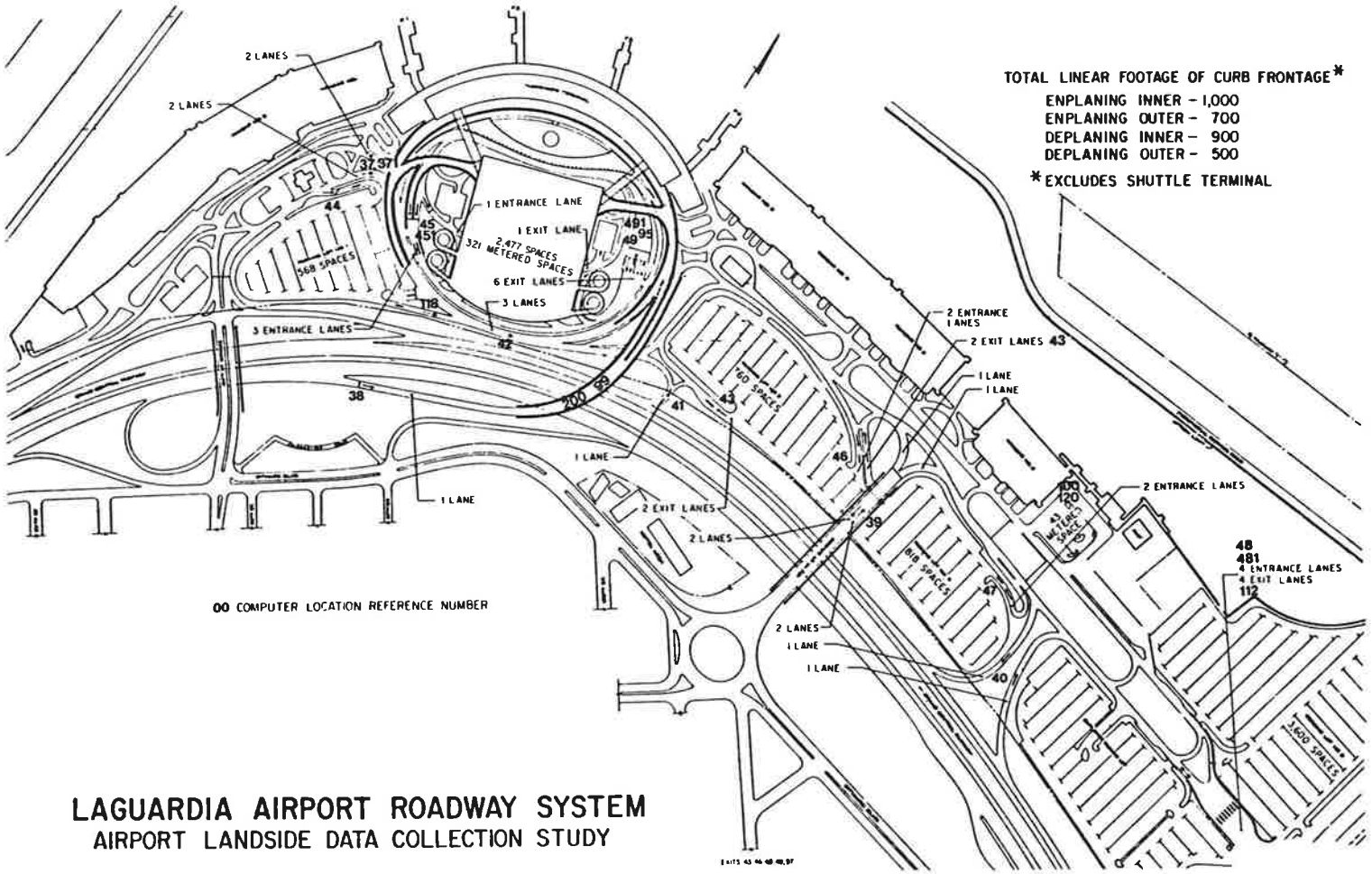
00 COMPUTER LOCATION REFERENCE NUMBER

LAGUARDIA AIRPORT

DEPLANING LEVEL

AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 12



LAGUARDIA AIRPORT ROADWAY SYSTEM
AIRPORT LANDSIDE DATA COLLECTION STUDY

FIGURE 13

- The length of usable curb frontage area on both the enplaning and deplaning levels.

In addition, the parking facility capacity for each public parking area is indicated at LGA. The plans identify those survey locations, such as door counts, where the description contained in Table 6 may be inadequate to locate the actual surveyor positions.

Part 5
DATA REDUCTION PROCEDURES

The data obtained at each airport were reduced in a four-step process. First, the data collection forms were reviewed to detect obvious errors. They were then organized into groups with similar characteristics. Secondly, the data collection forms were coded and simultaneously checked again. Next, the raw data contained on the coded forms were transferred to key punch cards, and then from cards to magnetic tapes. Finally, the required calibration and validation information was obtained from the raw data tape and transformed into hard copy versions. This process is explained in greater detail in Appendix B.

The initial reviews of data were conducted at the three airport sites, while the data were being collected. Consultant supervisors and project principal investigators looked over the shoulder of field personnel, to review the data collection procedures and forms as they were completed. In this manner, observers were discouraged from completing forms inaccurately or falsifying information. Upon completion of the surveys this process was completed and the obvious errors deleted or, where possible, corrected. The forms were organized into groups having similar formats and the coding task was initiated.

Computer cards were prepared directly from the coded forms. A separate card was key-punched for each line item. Each punch card received a code for the airport, survey day, form number, location number, and page number indicator to permit sorting of data in alternative formats. Approximately 75,000 cards were prepared. All data cards were transferred to magnetic tape for data processing.

The data processing task utilized a series of programs which sorted the information by form type and performed necessary data manipulation. For example, since Forms J, M, P, R, T, V, AA, and GG utilized an identical format, process and queue time data were determined by the same program. A detailed description of the programs used in this study is included in Appendix B of this report.

The basic formats resulting from the data analysis included:

- Frequency distribution format with zero values included or excluded for process and service times, queue time, and in certain locations, queue length;

- Time series format used to present pedestrian and vehicle flow data and, in certain locations, queue length;

- Statistical Package for the Social Sciences (SPSS) format used to present passenger interview data, including modal choice patterns; and,

- Distribution pattern used to present arrival distribution of vehicles meeting occupants.

Format of Data Presentation

Due to the diversity of the deliverable items associated with this study, there were several formats used to present the data which have been collected.

Tabular material was assembled for basic types of computer-generated printouts. The first type was used normally to summarize data which were requested in a frequency distribution format, which were collected by a sampling rather than census technique. These tables indicate:

- Airport name and date;
- Form name and number;
- Location number, facility number, and location description;
- Time of survey (military time);
- Number of observations (n);
- Mean value of the observations (MEAN);
- Standard deviation of the observations (STD DEV);
- Minimum (MIN) and Maximum (MAX) observed values. (Note the value indicated is the number of 15-second time intervals. That is, a "MAX" of 49 indicates the maximum value occurred in the range 49 x 15 seconds, or 721 to 735 seconds.)
- Frequency distribution of observed values indicating number of observed values occurring in specified ranges;
- Number of zero observations; and,

- Vehicle mode, with the following coding utilized:

  1 = bus;
  2 = limousine;
  3 = car rental bus;
  4 = hotel van;
  5 = private auto; and,
  6 = truck;

except at LaGuardia where:

  3 = private auto; and,
  5 = other.

A typical computer printout with this type of information is shown in Figure 14.

Standard statistical formulas were used to compute the mean and standard deviation of data. The formulas used were:

$$\text{MEAN} = \bar{X} = \left(\frac{\sum_{i=1}^{N} X_i}{N} \right)$$

Where $i > 1$

X is the sum of the individual observer samples, and

N is the number of observer samples

STD DEV - the sample standard deviation is computed as:

$$\text{STD DEV} = \left(\frac{\sum_{i=1}^{N} (X_i - \bar{x})^2}{N-1} \right)^{1/2}$$

AIRPORT: 2 - DENVER
DATA FORM: 20 - H1 ENPLANING/DEPLANING CURBSIDE DWELL TIMES(UPPER LEVEL)
LOCATION: 32 - ENPCURB S-6
DAY: 1 - TIME: 123800 TO 295543
MEASUREMENT: - PROCESS TIME

FREQUENCY DISTRIBUTION (15 SEC INTERVALS)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1- 300	4	22	30	24	9	7	1	1	1	1	1	0	2	0	1	0	0	0	0	0
301- 600	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

N: 105 MEAN: 11.48 STD DEV: 44.40 MIN: 1 MAX: 22

NUMBER OF ZERO OBSERVATIONS: 0
(NOTE: ZERO OBSERVATIONS ARE EXCLUDED FROM DISTRIBUTIONS AND STATISTICS)

-67-

AIRPORT: 2 - DENVER
DATA FORM: 20 - H1 ENPLANING/DEPLANING CURBSIDE DWELL TIMES(UPPER LEVEL)
LOCATION: 32 - ENPCURB S-6
DAY: 1 - TIME: 123820 TO 195650
MEASUREMENT: - QUEUE TIME

FREQUENCY DISTRIBUTION (15 SEC INTERVALS)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1- 300	3	10	13	15	19	17	9	1	3	2	3	0	1	1	0	0	2	0	0	0
301- 600	0	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
601- 900	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
901- 1200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1201- 1500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1501- 1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1801- 2100	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

N: 105 MEAN: 100.77 STD DEV: 195.07 MIN: 1 MAX: 123

NUMBER OF ZERO OBSERVATIONS: 0
(NOTE: ZERO OBSERVATIONS ARE EXCLUDED FROM DISTRIBUTIONS AND STATISTICS)

TYPICAL COMPUTER PRINTOUT

FIGURE

The second type of computer table is used where data were collected and presented in a time series arrangement, such as vehicle and pedestrian flow rates and queue lengths. To facilitate the production of these data in a machine readable format, written headings and titles have been omitted from these tables. Figure 15 is an example of Form BB (24) which was used to record vehicle flow rates at various locations. This table identifies the following information by column:

Column 1 - Airport name.
- 1 = Miami
- 2 = Denver
- 3 = LaGuardia

Column 2 - Day of survey.
- 1 - Day one
- 2 = Day two

Columns 3 and 4 - Form number.

1 = A	11 = M	21 = X
2 = B	12 = N	22 = Z
3 = C	13 = O	23 = AA
4 = D	14 = P	24 = BB
5 = E	15 = R	25 = CC
6 = F	16 = S	26 = DD
7 = G	17 = T	27 = EE
8 = H	18 = V	28 = FF
9 = I	19 = W	29 = GG
10 = J	20 = W-1	30 = Q
		31 = L

112400600C1	1100	3 056
112400600C1	1105	3 043
112400600C1	1110	3 085
112400600C1	1115	3 038
112400600C1	1120	3 069
112400600C1	1125	3 048
112400600C1	1130	3 093
112400600C1	1135	3 080
112400600C1	1140	3 067
112400600C1	1145	3 067
112400600C1	1150	3 100
112400600C1	1155	3 103
112400600C2	1200	3 097
112400600C2	1205	3 107
112400600C2	1210	3 082
112400600C2	1215	3 033
112400600C2	1220	3 100
112400600C2	1225	3 146
112400600C2	1230	3 104
112400600C2	1235	3 056
112400600C2	1240	3 057
112400600C2	1245	3 116
112400600C2	1250	3 051
112400600C2	1255	3 062
112400600C3	1300	3 082
112400600C3	1305	3 139
112400600C3	1310	3 069
112400600C3	1315	3 111
112400600C3	1320	3 075
112400600C3	1325	3 052
112400600C3	1330	3 129
112400600C3	1335	3 070
112400600C3	1340	3 077
112400600C3	1345	3 075
112400600C3	1350	3 064
112400600C3	1355	3 107
112400600C4	1400	3 091
112400600C4	1405	3 030
112400600C4	1410	3 079
112400600C4	1415	3 061
112400600C4	1420	3 096
112400600C4	1425	3 074
112400600C4	1430	3 052
112400600C4	1435	3 061
112400600C4	1440	3 095
112400600C4	1445	3 073
112400600C4	1450	3 037
112400600C4	1455	3 051
112400600C5	1500	3 075
112400600C5	1505	3 076
112400600C5	1510	3 068
112400600C5	1515	3 055
112400600C5	1520	3 085
112400600C5	1525	3 049
112400600C5	1530	3 101
112400600C5	1535	3 091
112400600C5	1540	3 035
112400600C5	1545	3 063

EXAMPLE OF FORM BB (24)

FIGURE 15

Columns 5-7 - Survey location number (predetermined).

A description of survey locations is found in Part III.

Columns 8-10 - Page number.

Indicating page number of the collection form for the specific observer for the specific day on which the data entry was recorded. This is designed to allow future users of this data set to easily refer to the original data collection entry.

Column 20-23 - Starting time of five-minute intervals (military time).

Indicated in military time, i.e., 1405 is the five-minute interval commencing at 2:05 P.M.

Column 25 - Location code.

1 = parking exit	5 = airport exit
2 = upper curb	6 = parking entrance
3 = lower curb	7 = recirculation road
4 = airport entrance	8 = recirculation road to parking

Columns 27-29 - Flow rate.

Indicates the number of vehicles passing a specific point during the specified five-minute interval.

The above sequence of entries, Columns 1-10, is used in all tables arranged in a time-series format. In fact, all data collected in this study have been entered in the raw data file using this sequence.

Figures 16 and 17 present an example of a second variety of the time series which is used for Forms CC (25) and DD (26). The first 10 columns of each of these forms are arranged in an identical manner with Form BB (24), described earlier in this section. The other information presented is:

1125067001	1100	005	006
1125067001	1105	012	002
1125067001	1110	005	006
1125067001	1115	005	005
1125067001	1120	004	002
1125067001	1125	012	003
1125067001	1130	017	004
1125067001	1135	021	004
1125067001	1140	028	007
1125067001	1145	039	005
1125067001	1150	020	010
1125067001	1155	024	003
1125067001	1200	037	016
1125067001	1205	031	005
1125067001	1210	026	006
1125067001	1215	018	014
1125067001	1220	049	014
1125067001	1225	031	010
1125067001	1230	016	012
1125067001	1235	023	004
1125067001	1240	032	003
1125067001	1245	019	002
1125067001	1250	022	009
1125067001	1255	015	007
1125067001	1300	020	006
1125067001	1305	017	009
1125067001	1310	010	013
1125067001	1315	020	006
1125067001	1320	018	011
1125067001	1325	009	005
1125067001	1330	006	002
1125067001	1335	017	008
1125067001	1340	008	000
1125067001	1345	006	006
1125067001	1350	005	002
1125067001	1355	003	002
1125067001	1415	005	010
1125067001	1420	016	004
1125067001	1425	011	006
1125067001	1430	006	005
1125067001	1435	014	006
1125067001	1440	013	003
1125067001	1445	017	002
1125067001	1450	011	003
1125067001	1455	025	011
1125067002	1500	026	007
1125067002	1505	024	013
1125067002	1510	027	006
1125067002	1515	040	005
1125067002	1520	039	017
1125067002	1525	024	005
1125067002	1530	051	005
1125067002	1535	041	006
1125067002	1540	033	008
1125067002	1545	018	002
1125067002	1550	028	004
1125067002	1555	026	002
1125067002	1600	023	006
1125067002	1605	021	001

EXAMPLE OF FORM CC (25)

FIGURE 16

1126560006	1650 001 001
1126560006	1655 000 000
1126570001	1100 000 000
1126570001	1105 000 000
1126570001	1110 000 000
1126570001	1115 000 000
1126570001	1120 000 000
1126570001	1125 031 024
1126570001	1130 001 020
1126570001	1135 006 021
1126570001	1140 012 003
1126570001	1145 044 018
1126570001	1150 011 012
1126570001	1155 002 033
1126570002	1200 004 005
1126570002	1205 000 006
1126570002	1210 001 002
1126570002	1215 002 004
1126570002	1220 003 000
1126570002	1225 041 000
1126570002	1230 076 033
1126570002	1235 006 067
1126570002	1240 001 002
1126570002	1245 010 000
1126570002	1250 060 001
1126570002	1255 052 000
1126570003	1300 000 015
1126570003	1305 002 005
1126570003	1310 000 000
1126570003	1315 000 000
1126570003	1320 001 001
1126570003	1325 002 001
1126570003	1330 034 000
1126570003	1335 015 000
1126570003	1340 105 007
1126570003	1345 012 016
1126570003	1350 033 030
1126570003	1355 030 020
1126570004	1400 006 015
1126570004	1405 000 072
1126570004	1410 002 051
1126570004	1415 000 002
1126570004	1420 001 001
1126570004	1425 002 003
1126570004	1430 000 000
1126570004	1435 000 000
1126570004	1440 000 000
1126570004	1445 000 000
1126570004	1450 004 004
1126570004	1455 000 000
1126570005	1500 002 000
1126570005	1505 000 002
1126570005	1510 003 000
1126570005	1515 001 000
1126570005	1520 000 000
1126570005	1525 031 000
1126570005	1530 124 002
1126570005	1535 003 025
1126570005	1540 004 041

EXAMPLE OF FORM DD (26)

FIGURE 17

Columns 20-23 - Starting time of five-minute intervals.

Columns 25-27 - Number of persons entering.
Terminal in Form CC or baggage claim area in Form DD during five-minute interval.

Columns 28-31 - Number of persons exiting.
Terminal or baggage claim area, as above, during the same five-minute intervals.

Blanks indicate a zero volume was observed during a given time period.

A third variation of the time series format is shown in Figure 18. This format indicates queue length and flow rate data in a time series mode. This example depicts Form I (09) which was used at airline ticket counters. The first ten columns are arranged as Form BB (24), described earlier in this section. The other information presented is:

Columns 20-23 - Starting time of five-minute intervals,(military time).

Columns 25-26 - Number of persons served during the five-minute interval.

Columns 28-29 - Counter position number (predetermined).

Columns 31-32 - Number of persons waiting in queue.
Number of persons in line at the end of the five-minute interval at counter positions indicated in Columns 28-29.

Columns 34-35 - Counter position number (predetermined).

```
2109011001  1400 03 01 01 02 01 03 01
2109011001  1405 00 01 00 02 00 03 00
2109011001  1410 10 01 01 02 03 03 05
2109011001  1415 10 01 05 02 03 03 02
2109011001  1420 08 01 02 02 02 03 04
2109011001  1425 06 01 03 02 02 03 01
2109011001  1430 08 01 01 02 03 03 04
2109011001  1435 07 01 01 02 01 03 05
2109011001  1440 02 01 01 02 01
2109011001  1445 01 02 01
2109011001  1450 05 01 02 02 04
2109011001  1455    01 01 02 03
2109011002  1500 04 02 02 03 02
2109011002  1505 08 02 02 03 06
2109011002  1510 03 02 01 03 02
2109011002  1515 07 02 04 03 03
2109011002  1520 04 02 02 03 02
2109011002  1525 08 02 03 03 05
2109011002  1530 11 02 02 03 09
2109011002  1535 02 02 01 03 01
2109011002  1540 14 01 05 02 05 03 04
2109011002  1545 08 01 04 02 02 03 02
2109011002  1550 09 01 03 02 03 03 03
2109011003  1600 04 02 01 03 03
2109011003  1605 03 03 03
2109011003  1610 22 01 08 02 08 03 06
2109011003  1615 10 01 04 02 04 03 02
2109011003  1620 09 01 03 02 03 03 03
2109011003  1625 11 01 03 02 04 03 04
2109011003  1630 12 01 02 02 02 03 03 04 02 05 03
2109011003  1635 12 01 01 02 01 03 03 04 04 05 03
2109011003  1640 03 02 02 03 01
2109011003  1645 12 01 02 02 04 03 06
2109011003  1655 05 01 00 02 02 03 01 04 02 05 00
2109011004  1700 04 02 00 03 04 04 00 05 00
2109011004  1705 06 02 01 03 02 04 03
2109011004  1715 05 02 01 04 02 05 02
2109011004  1720 07 01 03 02 01 03 03
2109011004  1725 05 02 01 03 02 04 02
2109011004  1730 06 02 01 03 01 04 02 05 02
2109011004  1735 03 01 01 02 02 04 01
2109011004  1740 03 02 01 03 01 04 01
2109011004  1745 06 02 02 04 01 05 03
2109011004  1750 09 02 01 03 02 04 02 05 04
2109011005  1800 05 03 04 04 01
2109011005  1805 08 02 03 03 02 04 02 05 01
2109011005  1810 08 01 02 02 04 03 01 04 01
2109011005  1815 05 01 01 03 02 04 01 05 01
2109011005  1825 06 03 02 04 04
2109011005  1830 01 04 01
2109011005  1840 01 04 01
2109011005  1845 01 04 01
2109011005  1850 03 03 01 04 01 05 01
2109011005  1855 03 03 01 04 01 05 01
2109011006  1900 01 05 01
2109011006  1905 01 04 01
2109011006  1910 02 02 01 05 01
2109011006  1915 02 03 01 04 01
2109011006  1920 04 03 02 04 02
```

EXAMPLE OF FORM I (09)

FIGURE 18

Columns 37-38 - Number of persons waiting in queue.

Number of persons in line at the end of the five-minute interval at counter positions indicated in Columns 34-35.

The remaining columns repeat the basic pattern (counter number and queue length) for the remaining positions. This table indicates not only flow rate and queue length, but also the number of service positions available during any five-minute period at each designated location. These three examples typify the formats used to present pedestrian and vehicular flow and queue length data.

A third format is used to summarize results of the passenger interviews conducted in the gate and baggage areas. This format, shown in Figure 19, is a basic Statistical Program for the Social Sciences (SPSS) format. The question number (i.e., Q2 in Figure 18) refers to the questions on Form C (departing passengers) or Form D (arriving passengers). The category labels refer to the possible answers shown on the data collection form. In Figure 18, these labels indicate:

0 = no answer
1 = private auto (driver)
2 = private auto (passenger)
3 = car rental bus
4 = taxi
5 = airport limousine
6 = bus
7 = other airline
8 = other

Data Collection Sample Sizes

To assure statistical accuracy of data obtained through sampling methods (as opposed to census techniques) representative samples were chosen which enable estimation of model parameters within a 95 percent confidence interval. Mean values and standard

ANALYSIS OF FORM C - ARRIVING AIR PASSENGER DATA - MIAMI
FILE NCNAME (CREATION DATE = 07/14/78)

Q2

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	0.	25	5.3	5.3	5.3
	1.	204	42.9	42.9	48.2
	2.	2	0.4	0.4	48.6
	3.	89	18.7	18.7	67.4
	4.	77	16.2	16.2	83.6
	5.	42	8.8	8.8	92.4
	6.	23	4.8	4.8	97.3
	7.	13	2.7	2.7	100.0
	TOTAL	475	100.0	100.0	

VALID CASES 475 MISSING CASES 0

BASIC STATISTICAL PROGRAM

FOR THE SOCIAL SCIENCES

FIGURE 19

deviations were observed for items requiring sample surveys during the pilot study to calculate required numbers of observations.

Table 7 summarizes the number of usable samples obtained for various types of data collected by sampling methods during the final data collection effort. A total of 950 passenger interviews were obtained at MIA, 1,620 at DEN, and 1,560 at LGA, from both enplaning and deplaning passengers. At the ticket counters, queue and processing times were obtained for 970 samples at MIA, 830 at DEN, and 770 at LGA. Other sample sizes obtained for processing times at security areas, immigration and customs areas, as well as at parking lot exits,are also noted. The largest number of samples was obtained for vehicle queue times at the various curb frontage sections. A total of 5,100 samples was collected at MIA, 3,415 at DEN, and 5,500 at LGA. These values compare favorably with the required sample sizes derived from analysis of the pilot studies.

Table 7

NUMBER OF SAMPLES COLLECTED FOR VARIOUS DATA ITEMS

MIA - DEN - LGA

TYPE OF DATA	AIRPORT LOCATION AND NUMBER OF SAMPLES[1]		
	MIA	DEN	LGA
Passenger Interviews	950	1,620	1,560
Processing Times:			
Ticket Counters[2]	970	830	770
Security Areas	680	1,530	1,460
Immigration	240	N.A.	N.A.
Customs	355	N.A.	N.A.
Parking Lot Exits	665	860	310
Vehicle Dwell Times[3]	1,725	1,225	2,220
Vehicle Queue Times[3]	5,100	3,415	5,500

(1) Total for two-day survey period.
(2) Total for 12 airlines at MIA, 10 airlines at DEN, and 10 airlines at LGA.
(3) Total for all modes including automobile, taxi, bus, limousine, and rental car buses.

Part 6
COMPARISON OF SELECTED DATA ITEMS

This section of the report presents a summary of selected processed data from the resulting landside data collection surveys. Summary statistics describing observed modal choice patterns, passenger processing times, and curbside vehicle dwell times are presented for review.

Modal Choice of Air Passengers and Visitors

Modal choice information was obtained through personal interviews of enplaning and deplaning passengers. Table 8 presents a summary of the groundside access and egress travel modes of arrival and departure for air passengers at MIA, DEN, and LGA, excluding transfer passengers. The primary mode of arrival and departure during the survey period at MIA and DEN was the automobile (combined auto driver and auto passenger) with between 40 and 70 percent of all passengers using this means of transportation. At LGA, passengers utilizing taxis as their mode of arrival and departure accounted for 45.8 and 35.1 percent, respectively, of all passengers, which is typical for this business-oriented Airport.

Modes of arrival for air passenger well-wishers (enplanements) and greeters (deplanements) were also obtained through the use of personal interviews. Table 9 presents a summary of the modal choice of these persons. Again, the automobile is the primary travel mode accounting for from 80 to 99 percent of all well-wishers/greeters. Use of other modes, such as car rental, bus, taxi, airport limousine, bus and "other" modes was observed to be minimal.

Table 8

MODE OF ARRIVAL AND DEPARTURE OF AIR PASSENGERS

MIA-DEN-LGA

ENPLANING PASSENGERS (1)	PERCENT MODE OF ARRIVAL		
	MIA	DEN	LGA
Private Auto	41.7	55.8	25.0
Car Rental Bus	10.7	13.6	9.3
Taxi	21.6	13.5	45.8
Airport Limousine	10.1	4.9	12.5
Bus	15.4	3.3	5.2
Other	0.5	8.9	2.2
TOTAL	100.0	100.0	100.0

DEPLANING PASSENGERS (1)	PERCENT MODE OF DEPARTURE		
	MIA	DEN	LGA
Private Auto	47.1	69.6	30.7
Car Rental Bus	20.4	7.9	4.2
Taxi	17.6	9.7	35.1
Airport Limousine	9.6	4.8	20.1
Bus	5.3	4.7	5.3
Other	-	3.3	4.6
TOTAL	100.0	100.0	100.0

(1) Excludes transfer passengers.

Table 9

MODE OF ARRIVAL AND DEPARTURE OF AIR PASSENGER

WELL-WISHERS/GREETERS

MIA-LGA-DEN

WELL-WISHERS (ENPLANING PASSENGERS)	PERCENT MODE OF ARRIVAL		
	MIA	DEN	LGA
Private Auto	99.1	80.0	81.8
Car Rental Bus	0.9	-	-
Taxi	-	6.7	9.1
Airport Limousine	-	-	9.0
Bus	-	6.7	-
Other	-	6.6	-
TOTAL	100.0	100.0	100.0

GREETERS (DEPLANING PASSENGERS)	PERCENT MODE OF DEPARTURE		
	MIA	DEN	LGA
Private Auto	84.4	96.9	90.1
Car Rental Bus	6.0	1.5	0.7
Taxi	5.0	0.7	4.9
Airport Limousine	2.8	0.3	0.7
Bus	1.8	0.6	0.8
Other	-	-	2.8
TOTAL	100.0	100.0	100.0

Distribution of Air Passenger and Well-Wisher/Greeter Group Size

Table 10 presents the distribution of enplaning air passengers' group size for each of the three airports. Approximately 70 percent of all air passengers are in groups consisting of between one and two passengers, and group sizes greater than six passengers account for only 3.7, 0.5, and 1.4 percent of all passengers at MIA, DEN, and LGA, respectively.

Characteristics of well-wisher and greeter group size per passenger group are found in Table 11. The group size for well-wishers per passenger group is much smaller than that of greeters, with 73-90 percent of all enplaning passenger groups having no well-wishers contrasted with 47-75 percent of all deplaning passengers.

Distribution of Baggage per Passenger Group

The number of check-in and carry-on bags per enplaning passenger is depicted in Table 12. MIA and DEN have substantially more check-in baggage per passenger group than LGA. At LGA, 36.6 percent of the enplaning passenger groups have no check-in baggage compared to 8 to 19 percent at MIA and DEN. This reflects the business orientation of LGA.

Characteristics of Well-Wishers /Greeters

The passenger interview also identified the point where enplaning passengers departed from well-wishers and deplaning passengers met greeters. At MIA, the largest proportion of well-wishers (30.4 percent) was reported to have left their air passenger at the ticket counter. At DEN, on the other hand,

Table 10

DISTRIBUTION OF AIR PASSENGER GROUP SIZE

Enplaning Passengers

MIA-DEN-LGA

NUMBER OF PASSENGERS PER GROUP	DISTRIBUTION OF AIR PASSENGERS BY AIRPORT					
	MIA		DEN		LGA	
	Percent	Cumulative Percent	Percent	Cumulative Percent	Percent	Cumulative Percent
1	38.9	38.9	23.7	23.7	32.3	32.3
2	34.4	73.3	49.4	73.1	38.4	70.7
3	11.5	84.8	18.7	91.8	20.0	90.7
4	8.1	92.9	5.5	97.3	6.1	96.8
5	3.4	96.3	2.2	99.5	1.8	98.6
6-10	3.7	100.0	0.5		0.8	99.4
Over 10	-		-		0.6	100.0
TOTAL	100.0		100.0		100.0	

An air passenger group represents several air passengers traveling together in one party. (See contract)

Table 11

DISTRIBUTION OF AIR PASSENGER WELL-WISHERS/GREETERS

BY AIR PASSENGER GROUP

MIA-DEN-LGA

NUMBER OF WELL-WISHERS PER PASSENGER GROUP (ENPLANEMENTS)	PERCENT DISTRIBUTION OF AIR PASSENGERS BY AIRPORT					
	MIA		DEN		LGA	
	Percent	Cumulative Percent	Percent	Cumulative Percent	Percent	Cumulative Percent
0	74.1	74.1	73.8	73.8	90.3	90.3
1	15.7	89.8	14.6	88.4	5.6	95.9
2	7.0	96.8	7.6	96.0	3.1	99.0
3	1.7	98.5	2.6	98.6	0.6	99.6
4	1.1	99.6	1.0	99.6	0.3	99.9
5	0.4	100.0	0.2	99.8	0.1	100.0
6-10	-		0.1	99.9	-	
Over 10	-		0.1	100.0		
TOTAL	100.0		100.0		100.0	

NUMBER OF GREETERS PER PASSENGER GROUP (DEPLANEMENTS)	PERCENT DISTRIBUTION OF AIR PASSENGERS BY AIRPORT					
	MIA		DEN		LGA	
	Percent	Cumulative Percent	Percent	Cumulative Percent	Percent	Cumulative Percent
0	57.3	57.3	46.8	46.8	75.2	75.2
1	20.0	77.3	36.6	83.4	17.0	92.2
2	15.6	92.9	10.4	93.8	5.8	98.0
3	3.6	96.5	3.9	97.7	0.9	98.9
4	2.1	98.6	1.7	99.4	0.6	99.5
5	0.8	99.4	0.3	99.7	0.4	99.9
6-10	0.4	99.8	0.3	100.0	0.1	100.0
Over 10	0.2	100.0	-		-	
TOTAL	100.0		100.0		100.0	

Table 12

DISTRIBUTION OF BAGGAGE PER AIR PASSENGER GROUP

Enplaning Passengers

MIA-DEN-LGA

NUMBER OF BAGS PER GROUP	PERCENT DISTRIBUTION OF AIR PASSENGERS BY AIRPORT					
	MIA		DEN		LGA	
	Check-in	Carry On	Check-in	Carry On	Check-in	Carry On
0	8.3	18.9	19.6	27.2	36.6	26.8
1	11.8	43.3	31.6	48.2	26.0	47.0
2	30.1	26.1	27.2	19.2	20.3	17.9
3	21.2	6.2	13.0	3.8	8.6	4.6
4	12.5	8.2	4.4	1.4	4.4	2.4
5	5.3	1.5	1.7	0.2	1.4	0.4
6-10	9.2	0.8	2.4	-	1.9	0.3
Over 10	1.6	-	0.1	-	0.8	0.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

52.3 percent of the well-wishers said farewell to passengers at the gate, while at LGA, 41.5 percent of the well-wishers departed from the passenger at the curb.

Observed air passenger greeter patterns vary from those of well-wishers. At MIA 51.9 percent of the greeters meet passengers at the baggage claim areas. The largest percentage of greeters at DEN and LGA, 60.9 and 46.5, respectively, meet passengers at the gate area. Other values are noted in Table 13.

Process Times

Observed mean process times are presented in Table 14 for ticket counters, security check points, car rental counters, and parking lot exit cashier lanes. Mean process times at full service ticket counters vary from a low of 1.8 minutes to a high of over 5 minutes. The distribution of express ticket counter process times is narrower with an observed range of mean values from 1.5 minutes to 3.1 minutes.

Security area mean process times, as shown in Table 14, vary from about 0.15 minutes to as high as 0.81 minutes. Most of the mean values appear to be in the 0.3 to 0.6 minute-range or about 18 to 35 seconds. These values are somewhat higher than indicated in other studies but reflect the complete security clearance time; that is, from the time the passenger gives the attendant his/her baggage to be checked or passes through the magnetometer, to the time the person leaves (or is free to leave) the security area.

Flow Data and Queue Length Data

These data items were collected by five-minute intervals at each observer location. Queue lengths should be related to activity

Table 13

CHARACTERISTICS OF AIR PASSENGER WELL-WISHERS/GREETERS

MIA-DEN-LGA

DEPARTURE LOCATION OF WELL-WISHERS AND ENPLANING PASSENGERS	PERCENT OF PERSONS BY AIRPORT		
	MIA	DEN	LGA
Curb	28.5	28.6	41.5
Ticket Counter	30.4	13.2	14.3
Security	22.0	5.9	23.4
Gate	19.1	52.3	20.8
TOTAL	100.0	100.0	100.0

MEETING LOCATION OF GREETERS AND DEPLANING PASSENGERS	PERCENT OF PERSONS BY AIRPORT		
	MIA	DEN	LGA
Curb	36.1	22.9	24.3
Baggage Claim	51.9	13.5	27.8
Security	-	2.7	1.4
Gate	12.0	60.9	46.5
TOTAL	100.0	100.0	100.0

Table 14

SUMMARY OF MEAN PROCESS TIME

MIA - DEN - LGA

FACILITY TYPE	AIRPORT AND SURVEY DAY					
	Miami		Denver		La Guardia	
	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
	(Minutes)					
Full Service Ticket Counter	2.7	1.9	3.1	3.7	5.5	4.4
	3.0	4.1	1.8	2.5	3.7	3.4
	4.0	3.6	3.9	2.6	2.8	3.3
	5.6	-	-	3.5		
Express Ticket Counter	2.3	2.2	1.5	1.7	3.1	2.4
			2.7	2.5	1.2	1.3
Security Area	0.47	0.50	0.31	0.22	0.59	0.32
		0.51	0.38	0.56	0.56	0.52
			0.18	0.19	0.15	0.77
					0.30	0.50
Car Rental Counter	5.2	6.0	4.3	7.7	4.2	5.1
			4.4	5.0	4.5	4.2
					4.0	2.6
Parking Lot Exit	0.58	0.45	0.53	0.48	0.63	1.06
					0.18	0.17

Mean Process Time represents the mean value of the observed transaction times. See page 66 for the standard statistical formulas used to develop these data.

Table 15

SUMMARY OF MEAN DWELL TIMES

MIA - DEN - LGA

CURB USAGE	AIRPORT					
	MIA		DEN		LGA	
	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
	(Minutes					
Enplaning Curb	2.3	2.8	1.8	1.8	1.6	1.0
	1.6	2.3	1.2	1.2	1.6	1.3
	4.5	2.1	2.4	2.8	-	-
Deplaning Curb	4.5	3.2	6.6	6.9	4.3	4.8
	3.5	2.3	5.3	5.1	2.5	2.4
	-	3.0	4.8	-	4.6	2.1

Note: Dwell time is measured as the sum of the time spent loading/unloading vehicle and the time vehicle remained at curb.

levels and type of activity. Consequently, a summary of the queue lengths does not present meaningful information although the data in their entirety are quite useful for model validation purposes.

Vehicle Curbside Dwell Times

An overall summary of curbside vehicle dwell times is shown in Table 15 for various locations on the enplaning and deplaning curbs at the three airports. Mean dwell times on the enplaning curb vary from a low of 1.0 minutes at LGA to a high of 4.5 minutes at MIA. On the deplaning level, mean dwell times range from about 2.1 minutes at LGA to a high of 6.9 minutes at DEN. In general, lower values for dwell times on both the enplaning and deplaning level were observed at LGA due to stricter police enforcement of curb utilization.

AIRLINE Smith Airlines

DATE 4/14/78.

FORM A

OUTBOUND DATA REQUIRED

Landside Data Collection Study

Wilbur Smith and Associates

FLIGHT #	EQUIPMENT TYPE	SCHEDULED DEPARTURE	ACTUAL DEPARTURE	PSGR. LOAD F/C-Y/C	# CONNECTIONS	GATE #
143	727	1235	1305	8 - 105	14	5
161	747	1310	1310	2 - 155	7	11
307	DC10	1415	1425	11 - 88	18	3
811	747	1420	1440	0 - 101	22	7

APPENDIX A
SURVEY FORMS

AIRLINE Smith Airlines

DATE 4/14/78

FORM B

INBOUND DATA REQUIRED

Landside Data Collection Study

Wilbur Smith and Associates

FLIGHT #	EQUIPMENT TYPE	SCHEDULE ARRIVAL	ACTUAL ARRIVAL	PSGR. LOAD F/C-Y/C	# CONNECTIONS		GATE #	BAGGAGE CLAIM FACILITY #
					Inter-line	Intra-line		
142	747	1305	1300	8 - 105	3	7	7	101
806	707	1325	1340	0 - 68	2	9	8	103
1104	DC10	1415	1425	11 - 124	-	21	6	101
321	L1011	1430	1505	3 - 107	1	18	2	102

A-2

FORM C

ARRIVING AIR PASSENGER QUESTIONNAIRE

Landside Data Collection Study

Wilbur Smith and Associates

--AT BAGGAGE CLAIM AREA--
(to be filled out by field surveyor)

Flight # 803 Airline American Time of Interview 4:23 P.M.

1. A. Do you plan to leave the airport as soon as you retrieve your baggage?

___ Yes X No

B. If not, what time do you plan to leave? 5:30 P.M.

2. What means of transportation will you use to leave the airport?

___A. Private auto (driver)
X B. Private Auto (passenger)
___C. Car Rental Bus
___D. Taxi
___E. Airport Limo
___F. Bus
___G. Other Airline
___H. Other_____

3. If you flew with family or friends, how many air passengers are in your group?

1 Number of other passengers

4. How many pieces of luggage does your party have?

1 check-in 2 carry-on

A. Was your luggage checked-in for this flight? Yes X No__

5. How many persons came to greet your arrival in the terminal? 1

IF NONE END INTERVIEW

6. Where did these greeters meet you?

X curb
___Baggage area
___security
___gate

7. Are you leaving in the same vehicle with the greeters?

X Yes ___No

8. What means of transportation did they use?

X A. Private Auto (driver)
___B. Private Auto (passenger)
___C. Car Rental Bus
___D. Taxi
___E. Airport Limo
___F. Bus
___G. Other Airline
___H. Other

9. What time will they depart? 5:30 P.M.

FORM D

DEPARTING AIR PASSENGER QUESTIONNAIRE

Landside Data Collection Study

Wilbur Smith and Associates

--AT GATE--
(to be filled out by field surveyor)

Flight # 103 Gate # C-7 Airline United Time of Interview 2:07 P.M.

1. What time did you arrive at the airport? 1:35 P.M.

2. What means of transportation did you use to get to the airport?

X A. Private Auto(driver)	___E. Airport Limousine
___B. Private Auto(passenger)	___F. Bus
___C. Car Rental Bus	___G. Other Airline
___D. Taxi	___H. Other_____

3. If you are flying with family or friends, how many air passengers are in your group?

2 Number of other passengers

4. How many pieces of luggage did your party have?

5 check-in 2 carry-on

A. Is your luggage checked-in for this flight? Yes ✓ No__

5. How many persons came to see you off? 4

IF NONE, END INTERVIEW

6. Where did these well-wishers say good-bye?

___curb	X security
___check-in	___gate

7. Did these well-wishers arrive at the airport with you?

___Yes X No

IF YES, END INTERVIEW

8. What means of transportation did they use?

X A. Private Auto(driver)	___E. Airport Limousine
X B. Private Auto(passenger)	___F. Bus
___C. Car Rental Bus	___G. Other Airline
___D. Taxi	___H. Other_____

9. What time did they arrive? 1:40 P.M.

FORM E

BUS AND LIMOUSINE INTERARRIVAL TIMES

Landside Data Collection Study

Wilbur Smith and Associates

DATE 4/13/78 LOCATION 6 RECORDER WSA

PUBLIC BUS		FOR CODE USE ONLY	LIMOUSINE, VAN, CAR RENTAL, BUS*		FOR CODE USE ONLY
Identification	Time (nearest minute)		Identification	Time (nearest minute)	
Bus	Hr :Min			Hr :Min	
Bus	2 :01		L	2 :02	
Peter Pan	2 :03		L	2 :04	
Bus	2 :05		H	2 :05	
	:		C	2 :05	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	
	:			:	

(*) Indicate Hotel Van - H, Car Rental Bus - C, and Limousine - L

FORM F

CAR RENTAL SELECTION

Landside Data Collection Study

Wilbur Smith and Associates

DATE 3/17/78 LOCATION 5 RECORDER W.S.A.

TIME (nearest minute) Hr :Min	NUMBER OF PASSENGERS (excluding driver)						
	Hertz	Avis	National	Budget	Thrifty	Dollar	Other (Specify)
2:01	8						
2:01		6					
2:03	4						
2:03		3					
2:03			6				
2:04					2		
2:05	5						
:							
:							
:							
:							
:							
:							
:							
:							
:							
:							
:							
:							

FORM G

ARRIVAL DISTRIBUTION FOR CARS MEETING PASSENGERS

Landside Data Collection Study

Wilbur Smith and Associates

DATE 3/18/78 NAME W.S.A. LOCATION 93

Vehicle Arrival Time	Passenger Flight No. or Air Trip Origin	Airline	Vehicle Arrival Time	Passenger Flight No. or Air Trip Origin	Airline	For Coding Use Only
Hrs:Mins			Hrs:Mins			
1:01	116	EAL	:			
1:09	109	U.A.	:			
1:12	New York	EAL	:			
1:15	Denver	UA	:			
1:28	207	TWA	:			
:			:			
:			:			
:			:			
:			:			
:			:			
:			:			
:			:			
:			:			
:			:			
:			:			
:			:			
:			:			

FORM H

CHECK-IN COUNTER SURVEY - QUEUE LENGTH/FLOW RATE

Central Queue Line

Landside Data Collection Study

Wilbur Smith and Associates

DATE 4:00 P.M. NAME W.S.A. LOCATION 143

TIME PERIOD INDICATE STARTING HOUR 4:00 P.M	NUMBER OF PEOPLE SERVED	NUMBER OF PERSONS STANDING IN LINE*	NUMBER OF POSITIONS OPEN*	NOTES
NUMBER OF PERSONS STANDING IN LINE AT BEGINNING OF SURVEY		7	3	
4:00 - 4:05	8	6	3	
4:05 - 4:10	12	8	3	
4:10 - 4:15	11	4	3	
4:15 - 4:20	11	6	3	
4:20 - 4:25	8	3	3	
:25 - :30				
:30 - :35				
:35 - :40				
:40 - :45				
:45 - :50				
:50 - :55				
:55 - :60				

*At the end of five-minute interval.

FORM I

EXPRESS/FULL SERVICE CHECK-IN COUNTER SURVEY - QUEUE LENGTH/FLOW RATE

Individual Queue Lines

Landside Data Collection Study

Wilbur Smith and Associates

BEGINNING 4:00 P.M. NAME W. S. A. DATE 4/13/78 LOCATION ///

TIME PERIOD INDICATE STARTING HOUR 4:00PM	NUMBER OF PEOPLE SERVED	NO. OF PERSONS STANDING IN LINE* AND COUNTER IDENTIFICATION(1) N	N	N	T	T	T	T		NOTES
NUMBER OF PERSONS STANDING IN LINE AT BEGINNING OF SURVEY		2	1	0	0	1	0	0		
4:00 - 4:05	7	1	2	2	1	1	1	0		
4:05 - 4:10	14	3	4	4	3	2	4	3		
4:10 - 4:15	23	5	5	6	5	7	6	7		
4:15 - 4:20	18	5	5	4	4	3	5	3		
4:20 - 4:25	13	5	6	X	4	5	5	X		
:25 - :30										
:30 - :35										
:35 - :40										
:40 - :45										
:45 - :50										
:50 - :55										
:55 - :00										

*At end of five-minute interval.

(1) Record N - Non-ticket Passenger (Purchase Ticket), T - Ticketed Passenger (Check-in Baggage Only). Put "X" in column if server is closed.

FORM J

EXPRESS SERVICE CHECK-IN COUNTER SURVEY - PROCESS AND QUEUE TIME

Individual Queue Lines

Landside Data Collection Study

Wilbur Smith and Associates

Location 85

Hour Beginning: 2:00 Name: WSA Date: 5/24/78

	Arrive In Queue Time	Notes	No. In Front	Arrive at Counter Time	Depart Counter Time	Coding
	Hrs:Min:Sec			Hrs:Min:Sec	Hrs:Min:Sec	
	2 :07 :13	Tall Blonde	3	2 :09 :35	2 :10 :20	
	2 :09 :45	PLAID SUIT	5	2 :15 :55	2 :17 :05	
	2 :11 :00	YELLOW SKIRT	4	2 :14 :10	2 :14 :50	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	

FORM L

FULL SERVICE CHECK-IN COUNTER SURVEY - QUEUE LENGTH/FLOW RATE

Landside Data Collection Study

Wilbur Smith and Associates

BEGINNING 4:00 P.M. LOCATION 81 DATE 3/18/78 RECORDER W.S.A.

TIME PERIOD INDICATE STARTING HOUR 4:00 P.M	NUMBER OF PEOPLE SERVED	NUMBER OF PERSONS* STANDING IN QUEUE	NUMBER OF* POSITIONS OPEN	NOTES
NUMBER OF PERSONS STANDING IN LINE AT BEGINNING OF SURVEY		11	4	
4:00 - 4:05	4	13	4	
4:05 - 4:10	5	17	4	
4:10 - 4:15	7	14	5	
4:15 - 4:20	6	10	5	
4:20 - 4:25	3	11	5	
:25 - :30				
:30 - :35				
:35 - :40				
:40 - :45				
:45 - :50				
:50 - :55				
:55 - :00				

*At end of five-minute interval.

FORM M

FULL SERVICE CHECK-IN COUNTER SURVEY - PROCESS AND QUEUE TIME

Landside Data Collection Study

Wilbur Smith and Associates

Location 78

Hour Beginning: 3:00 P Name: W.S.A. Date: 3/17/78

	Arrive In Queue Time	Notes	No. In Front	Arrive at Counter Time	Depart Counter Time	Coding
	Hrs:Min:Sec			Hrs:Min:Sec	Hrs:Min:Sec	
	3:05:20	Tall Blonde	4	3:08:35	3:09:20	
	3:07:30	Red Jacket	6	3:12:10	3:14:05	
	3:08:45	White Shoes	5	3:10:15	3:10:50	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	

FORM N

CURBSIDE CHECK-IN

Landside Data Collection Study

Wilbur Smith and Associates

DATE 5/25/78 NAME W.S.A. LOCATION 35

AIRLINE	ARRIVAL TIME OF PERSON AT CURBSIDE CHECK-IN COUNTER	TIME OF COMPLETION*	FOR CODING USE ONLY
	Min:Sec	Min:Sec	
A.A.	22 : 10	22 : 25	
A.A.	23 : 05	23 : 15	
A.A.	24 : 50	25 : 10	
A.A	26 : 05	26 : 20	
EAL	28 : 40	28 : 55	
EAL	29 : 05	29 : 45	
TWA	31 : 10	31 : 20	
TWA	32 : 25	32 : 40	
	:	:	
	:	:	
	:	:	
	:	:	
	:	:	
	:	:	
	:	:	
	:	:	
	:	:	
	:	:	

*Time of completion is when passenger receives baggage claim tickets.

FORM O

IMMIGRATION COUNTER SURVEY - QUEUE LENGTH/FLOW RATE

Landside Data Collection Study

Wilbur Smith and Associates

BEGINNING 3:00 P.M. NAME W.S.A. DATE 3/17/78 LOCATION 36

TIME PERIOD INDICATE STARTING HOUR	NUMBER OF PEOPLE SERVED	NO. OF COUNTERS OPEN* AND COUNTER IDENTIFICATION (1)								NOTES
		U	U	U	U	F	F	F	F	
3 :00 - 3:05	27	X	5	4	6	3	5	4	X	
3 :05 - 3:10	35	X	4	4	5	4	4	6	X	
3 :10 - 3:15	42	X	5	4	4	5	7	6	X	
3 :15 - 3:20	27	X	7	6	6	8	7	7	X	
3 :20 - 3:25	33	X	6	5	5	7	8	7	X	
3 :25 - 3:30	28	X	5	6	6	6	7	5	X	
:30 - :35										
:35 - :40										
:40 - :45										
:45 - :50										
:50 - :55										
:55 - :00										

* At end of five-minute interval.
(1) Identify each counter: U - for U.S. Citizens, F - for Foreign nationals.
Put "X" in column if server is closed.

FORM P

IMMIGRATION COUNTER SURVEY - PROCESS AND QUEUE TIME

Landside Data Collection Study

Wilbur Smith and Associates

Location 36

Hour Beginning: 4:00 Name: WSA Date: 3/17/78

	Arrive In Queue Time	Notes	No. In Front	Arrive at Counter Time	Depart Counter Time	Coding
	Hrs:Min:Sec			Hrs:Min:Sec	Hrs:Min:Sec	
	4 :15 :20	Tall Blonde	9	4 :17 :50	4 :18 :15	
	4 :17 :30	Blue Suit	7	4 :18 :45	4 :18 :55	
	4 :18 :30	Pink Blouse	11	4 :22 :15	4 :22 :35	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	

FORM Q

GATE COUNTER SURVEY - QUEUE LENGTH/FLOW RATE

Landside Data Collection Study

Wilbur Smith and Associates

BEGINNING 5:00 P.M. NAME W.S.A. DATE 5/24/78 LOCATION 26

TIME PERIOD INDICATE STARTING HOUR 5:00P.	NUMBER OF PEOPLE SERVED	NO. OF PERSONS STANDING IN LINE* AND COUNTER IDENTIFICATION(1)								NOTES
NUMBER OF PERSONS STANDING IN LINE AT BEGINNING OF SURVEY		0	X							
5:00 - 5:05	0	0	X							
5:05 - 5:10	3	0	X							
5:10 - 5:15	12	5	X							
5:15 - 5:20	13	11	X							
5:20 - 5:25	18	6	4							
:25 - :30										
:30 - :35										
:35 - :40										
:40 - :45										
:45 - :50										
:50 - :55										
:55 - :00										

*At end of five-minute interval.

(1) Identify each counter and put "X" in column if server is closed.

FORM R

GATE COUNTER SURVEY - PROCESS AND QUEUE TIME

Individual Queue Lines

Landside Data Collection Study

Wilbur Smith and Associates

LOCATION: 2

DATE: 4/17/78 NAME: W.S.A. FLIGHT: AA 1412

Person Arrives in Queue Hr:Min:Sec	Number of People in Front	Notes	Person Arrives at Server Hr:Min:Sec	Person Departs Server Hr:Min:Sec	Coding
3:11:10	1	Tall Blonde	3:11:30	3:11:55	
3:12:15	4	Shorts	3:13:50	3:13:55	
3:14:10	6	Red Shirt	3:16:00	3:16:25	
3:17:05	8	Blue Suit	3:20:30	3:21:20	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	

FORM S

PARKING LOT EXIT SURVEY - QUEUE LENGTH/FLOW RATE

Landside Data Collection Study

Wilbur Smith and Associates

BEGINNING 2:00 P.M NAME W.S.A. DATE 5/24/78 LOCATION 39

TIME PERIOD INDICATE STARTING HOUR	NUMBER OF PEOPLE SERVED	NO. OF VEHICLES STANDING IN LINE* AND TOLL LANE IDENTIFICATION(1)									NOTES
NUMBER OF VEHICLES STANDING IN LINE AT BEGINNING OF SURVEY		3	2	1	X	X					
2:00 - 2:05	11	2	3	3	X	X					
2:05 - 2:10	13	4	3	5	X	X					
2:10 - 2:15	12	5	4	4	X	X					
2:15 - 2:20	10	7	7	5	X	X					
2:20 - 2:25	17	4	3	4	4	2					
2:25 - 2:30	18	3	4	4	3	3					
:30 - :35											
:35 - :40											
:40 - :45											
:45 - :50											
:50 - :55											
:55 - :60											

*At end of five-minute interval.

(1) Identify each lane and put "X" in column if lane is closed.

FORM T

PARKING LOT EXIT SURVEY - PROCESS AND QUEUE TIME

Landside Data Collection Study

Wilbur Smith and Associates

DATE: 3/18/78 NAME: W.S.A LOCATION: 61

Arrive in Queue (Time) Hr:Min:Sec	No. of Veh. in Front	Arrive at Toll Booth Hr:Min:Sec	Depart From Toll Booth Hr:Min:Sec	No. of Toll Lanes Open	Coding
2:05:20	3	2:06:30	2:06:50	3	
2:07:10	8	2:09:40	2:10:25	3	
2:08:35	5	2:09:55	2:10:20	3	
2:10:10	4	2:11:40	2:12:05	3	
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		
: :		: :	: :		

(Note: No change in timing procedure if vehicle changes lanes.)

FORM U

CAR RENTAL COUNTER SURVEY/PICKUP - QUEUE LENGTH/FLOW RATE

Landside Data Collection Study

Wilbur Smith and Associates

DATE 3/18/78 NAME W.S.A. LOCATION 107

TIME PERIOD INDICATE STARTING HOUR 4:00	NUMBER OF PEOPLE SERVED		NUMBER OF PERSONS STANDING IN LINE*		NUMBER OF OPEN SERVERS*		NOTES
	Agency HERTZ	Agency AVIS	Agency HERTZ	Agency AVIS	Agency HERTZ	Agency AVIS	
NUMBER OF PERSONS STANDING IN LINE AT BEGINNING OF SURVEY			4	2	3	2	
4:00 - 4:05	5	3	6	2	3	2	
4:05 - 4:10	6	2	3	3	3	2	
4:10 - 4:15	3	5	2	4	3	2	
4:15 - 4:20	4	3	2	1	3	3	
4:20 - 4:25	2	3	1	2			
:25 - :30							
:30 - :35							
:35 - :40							
:40 - :45							
:45 - :50							
:50 - :55							
:55 - :00							

*At end of five-minute interval.

FORM V

CAR RENTAL COUNTER SURVEY/PICK-UP - PROCESS AND QUEUE TIME

Landside Data Collection Study

Wilbur Smith and Associates

Location 112

Hour Beginning: 2:00 P.M. Name: W.S.A. Date: 4/14/78

Arrive at Counter Area Hrs:Min:Sec	NOTES:	No. In Front	Time Served Hrs:Min:Sec	Depart Counter Time Hrs:Min:Sec	Coding
2:04:20	Tall Blonde	4	2:05:10	2:06:15	
2:06:10	Cowboy Hat	3	2:06:45	2:07:50	
2:06:30	Suede Boots	5	2:08:05	2:09:25	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	
: :			: :	: :	

FORM W (LOWER LEVEL)

DEPLANING CURBSIDE DWELL TIME COUNT

Landside Data Collection Study

Wilbur Smith and Associates

DATE: 5/25/78 NAME: W.S.A. LOCATION: 131

CAR	TAXI	BUS/LIMO (1)	OTHER (2)	NOTES	TIME VEHICLE STOPS AT CURB	TIME PASSENGER LOADING IS COMPLETE	TIME VEHICLE DEPARTS CURB	FOR CODING ONLY
					Hr:Min:Sec	Hr:Min:Sec	Hr:Min:Sec	
		L			3:07:10	3:09:15	3:10:55	
✓					3:08:15	3:12:05	3:12:15	
	✓				3:09:10	3:09:30	3:09:30	
			C		3:10:15	3:10:50	3:10:60	
					: :	: :	: :	
					: :	: :	: :	
					: :	: :	: :	
					: :	: :	: :	
					: :	: :	: :	
					: :	: :	: :	
					: :	: :	: :	

(1) Indicate B for Bus, L for Limousine.
(2) Indicate C for car rental, bus; H if for hotel van; and O for Other Type Vehicle.

FORM W-1 (UPPER LEVEL)

ENPLANING CURBSIDE DWELL TIME COUNT

Landside Data Collection Study

Wilbur Smith and Associates

DATE: 5/24/78 NAME: W.S.A. LOCATION: 123

CAR	TAXI	BUS/LIMO (1)	OTHER (2)	NOTES	TIME VEHICLE STOPS AT CURB	TIME PASSENGER UNLOADING IS COMPLETE	TIME VEHICLE DEPARTS CURB	FOR CODING ONLY
					Hr:Min:Sec	Hr:Min:Sec	Hr:Min:Sec	
✓					1 :56:30	1 :56:45	1 :58:30	
		B			1 :56:45	1 :57:40	1 :57 :50	
	✓				1 :58:20	1 :58:35	1 :58:35	
			H		1 :59:15	1 :59:45	2:00:00	
✓					2 :01 :10	2 :01 :45	2 :01 :45	
					: :	: :	: :	
					: :	: :	: :	
					: :	: :	: :	
					: :	: :	: :	
					: :	: :	: :	
					: :	: :	: :	

(1) Indicate B for Bus, L for Limousine.
(2) Indicate C for car rental, bus; H if for hotel van; and O for Other Type Vehicle.

FORM X

ENPLANING/DEPLANING CURBSIDE VEHICLE

Queue Time and Size

Landside Data Collection Study

Wilbur Smith and Associates

DATE: 3/17/78 NAME: W.S.A. LOCATION: 33

Arrive in Queue Time	No. of Vehicles in Front	NOTES	Time Vehicle Arrives at Curb	or Time Vehicle Passes Section
Hr:Min:Sec			Hr:Min:Sec	Hr:Min:Sec
2:05:15	5	Blue Chevy	2:05:55	: :
2:06:10	3	Bus	2:06:40	: :
2:06:45	7	White Volvo	: :	2:07:50
2:06:50	9	Yellow VW	2:07:55	: :
2:07:10	5	Brown Dodge	: :	2:07:45
2:07:30	8	Limousine	: :	2:08:10
: :			: :	: :
: :			: :	: :
: :			: :	: :
: :			: :	: :
: :			: :	: :
: :			: :	: :
: :			: :	: :
: :			: :	: :
: :			: :	: :
: :			: :	: :
: :			: :	: :

FORM Z

SECURITY CLEARANCE SURVEY - FLOW RATE/QUEUE LENGTH

Landside Data Collection Study

Wilbur Smith and Associates

BEGINNING 2:00 P.M. NAME W.S.A. DATE 4/14/78 LOCATION 88

TIME PERIOD INDICATE STARTING HOUR 2:00 PM	NUMBER OF PEOPLE SERVED	NO. OF PERSONS STANDING IN QUEUE*								NOTES
NUMBER OF PERSONS STANDING IN LINE AT BEGINNING OF SURVEY		5	6							
2:00 - 2:05	27	3	7							
2:05 - 2:10	35	5	6							
2:10 - 2:15	48	11	13							
2:15 - 2:20	53	12	11							
2:20 - 2:25	46	18	16							
2:25 - 2:30	29	14	X							
2:30 - 2:35	20	8	X							
:35 - :40										
:40 - :45										
:45 - :50										
:50 - :55										
:55 - :60										

*At end of five-minute interval.

Put "X" in column if server is closed.

FORM AA

SECURITY CLEARANCE SURVEY - PROCESS AND QUEUE TIME

Landside Data Collection Study

Wilbur Smith and Associates

Location 106

Hour Beginning: 3:00 P.M. Name: W.S.A. Date: 3/17/78

	Arrive In Queue Time	Notes	No. In Front	Arrive at Counter Time	Depart Counter Time	Coding
	Hrs:Min:Sec			Hrs:Min:Sec	Hrs:Min:Sec	
	2 :03:20	Man w/camera	5	2 :04:10	2 :04:15	
	2 :04:10	Pink Hat	6	2 :04:45	2 :04:45	
	2 :05:15	Guitar	9	2 :06:05	2 :06:05	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	
	: :			: :	: :	

FORM BB

TRAFFIC FLOW RATES

Landside Data Collection Study

Wilbur Smith and Associates

Hour: 4:00 P.M. Name: W.S.A. Date: 4/13/78 Locations: 107

TIME PERIOD	___ PARKING EXIT ___ UPPER CURB ___ LOWER CURB	X AIRPORT ENTRANCE ___ AIRPORT EXIT	___ PARKING ENTRANCE X RECIRCULATION ROAD
4 00-05		84	23
4 05-10		63	17
4 10-15		58	19
4 15-20		67	14
4 20-25		63	15
4 25-30		71	18
30-35			
35-40			
40-45			
45-50			
50-55			
55-60			

FORM CC

PEDESTRIAN FLOW RATE

Landside Data Collection Study

Wilbur Smith and Associates

Date 5/24/78 Location 106 Recorder WSA

	HOUR BEGINNING: 3:00			HOUR BEGINNING:	
MINUTE	Total People In	Total People Out	MINUTE	Total People In	Total People Out
3 00-05	14	𝍸 I	00-05		
3 05-10	8	III	05-10		
3 10-15	11	II	10-15		
3 15-20	15	I	15-20		
3 20-25	17	IIII	20-25		
3 25-30	19	𝍸 II	25-30		
3 30-35	21	IIII	30-35		
3 35-40	18	III	35-40		
3 40-45	24	II	40-45		
3 45-50	15	𝍸	45-50		
3 50-55	10	III	50-55		
3 55-60	16	III	55-60		
4 00-05	14	I	00-05		
05-10			05-10		
10-15			10-15		
15-20			15-20		
20-25			20-25		
25-30			25-30		
30-35			30-35		
35-40			35-40		
40-45			40-45		
45-50			45-50		
50-55			50-55		
55-60			55-60		

FORM DD

BAGGAGE AREA - FLOW RATE

Landside Data Collection Study

Wilbur Smith and Associates

Hour Beginning: 1:00 Date: 5/25/78 Name: W.S.A Location: 103

TIME PERIOD	NUMBER OF PEOPLE INTO BAG CLAIM	NUMBER OF PEOPLE OUT OF BAG CLAIM	NOTES
1 00-05	15	3	
1 05-10	20	4	
1 10-15	19	8	
1 15-20	25	11	
1 20-25	18	20	
25-30			
30-35			
35-40			
40-45			
45-50			
50-55			
55-60			

NUMBER OF PERSONS IN BAGGAGE AREA AT BEGINNING OF SURVEY 3

FORM EE

BAGGAGE AREA - QUEUE TIME
Landside Data Collection Study
Wilbur Smith and Associates

Hour: 2:00 P.M. Date: 5/25/78 Name: W.S.A Location: 101

TIME PERSON ENTERS BAGGAGE AREA	NOTES	TIME PERSON EXITS BAGGAGE AREA
Hr:Min:Sec		Hr:Min:Sec
2 :01 : 15	Green Scarf	2 :07: 10
2 :02 : 40	Tall Blonde	2 :06: 30
2 :03: 30	Suede Coat	2 :09: 10
2 :04: 50	Red Hair	2 :07: 30
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :
: :		: :

FORM FF

CUSTOMS COUNTER SURVEY - FLOW RATE

Landside Data Collection Study

Wilbur Smith and Associates

BEGINNING 4:00 P.M. LOCATION 101 DATE 5/25/78 RECORDER WSA

TIME PERIOD INDICATE STARTING HOUR 4:00 P.M.	NUMBER OF PEOPLE SERVED	NO. OF INSPECTION COUNTERS OPEN* 1	2	3	4					NOTES
4:00 - 4:05	7	3	2	1	5					
4:05 - 4:10	9	4	3	4	3					
4:10 - 4:15	11	5	4	3						
4:15 - 4:20	14	4	3	4	X					
4:20 - 4:25	18	2	3	4	X					
4:25 - 4:30	9	3	4	4	X					
:30 - :35										
:35 - :40										
:40 - :45										
:45 - :50										
:50 - :55										
:55 - :00										

*At end of five-minute interval.

Put "X" in column if server is closed.

FORM GG

CUSTOMS COUNTER SURVEY - PROCESS AND QUEUE TIME

Landside Data Collection Study

Wilbur Smith and Associates

Location /02

Hour Beginning: 3:00 P.M. Name: W.S.A. Date: 5/25/78

Mins.	Arrive In Queue Time	Notes	No. In Front	Arrive at Counter Time	Depart Counter Time	Co
	3:10:15	Tall Blonde	4	3:11:35	3:11:55	
	3:11:45	Blue Suit	3	3:14:15	3:15:55	
	3:13:00	Gray Hat	5	3:19:10	3:20:40	
	3:14:10	Red Blouse	6	3:22:25	3:24:35	

Appendix B

DATA MANAGEMENT AND ANALYSES

Data Processing/Analysis

The Data Processing function was generally divided into two phases for each airport. Where possible, the computer programs developed for one airport's data were used to process the data from other airports. All data processing/analyses were performed on an IBM 370/158 running under MVS[1] and major emphasis was placed on the use of standardly available programming languages, software packages and utility programs. Customized program development was kept to a minimum to avoid extensive debugging, and, when necessary, for either specialized calculations or report-formatting, program design was as general as possible.

The two basic phases of the data processing function were 1) the data management phase, and 2) the data analysis/reporting phase.

Data Management

The primary purpose of the data management phase was to create a clean and valid data base for each airport in a standard format. Such a data base would then minimize calculational errors in the analysis and also become the transportable data base. During this phase, ordinary utility programs (card-to-tape, sort-merge, etc.), were used extensively and several custom programs were written using the programming language "PL/1". Since the data bases each contained approximately 25,000 records, the quick record input/output processing of PL/1, as well as its general string-handling capabilities, made it a useful and efficient data management tool. This data management phase, then, produced data bases ready for analysis and transfer.

(1) Multi-task virtual system.

Data Analyses

The purpose of the data analysis phase was to produce hard-copy versions of the various distributions requested such as queue time, process time and queue length. All customized programming in this phase was done in the programming language of Fortran IV. The calculational capabilities of Fortran IV, as well as the existence of many scientific program libraries (SSP, IMSL)[2] available in this language made it the proper choice for these analyses. Fortran's relatively slow record I/O, however, indicated that these programs passed only those subsets of the data base which contained the data of interest. Therefore, a PL/1 program extraction program was written, which would pass the entire master data base for a given airport, extract the data to be analyzed and put it into a format accessible by the Fortran analysis programs. Whenever possible, analysis was completed using a standard program package SPSS (Statistical Program for Social Scientists) to avoid customized programming altogether.

An overview of the data processing function is presented in flow chart format on the following pages.

Record Layout of Forms

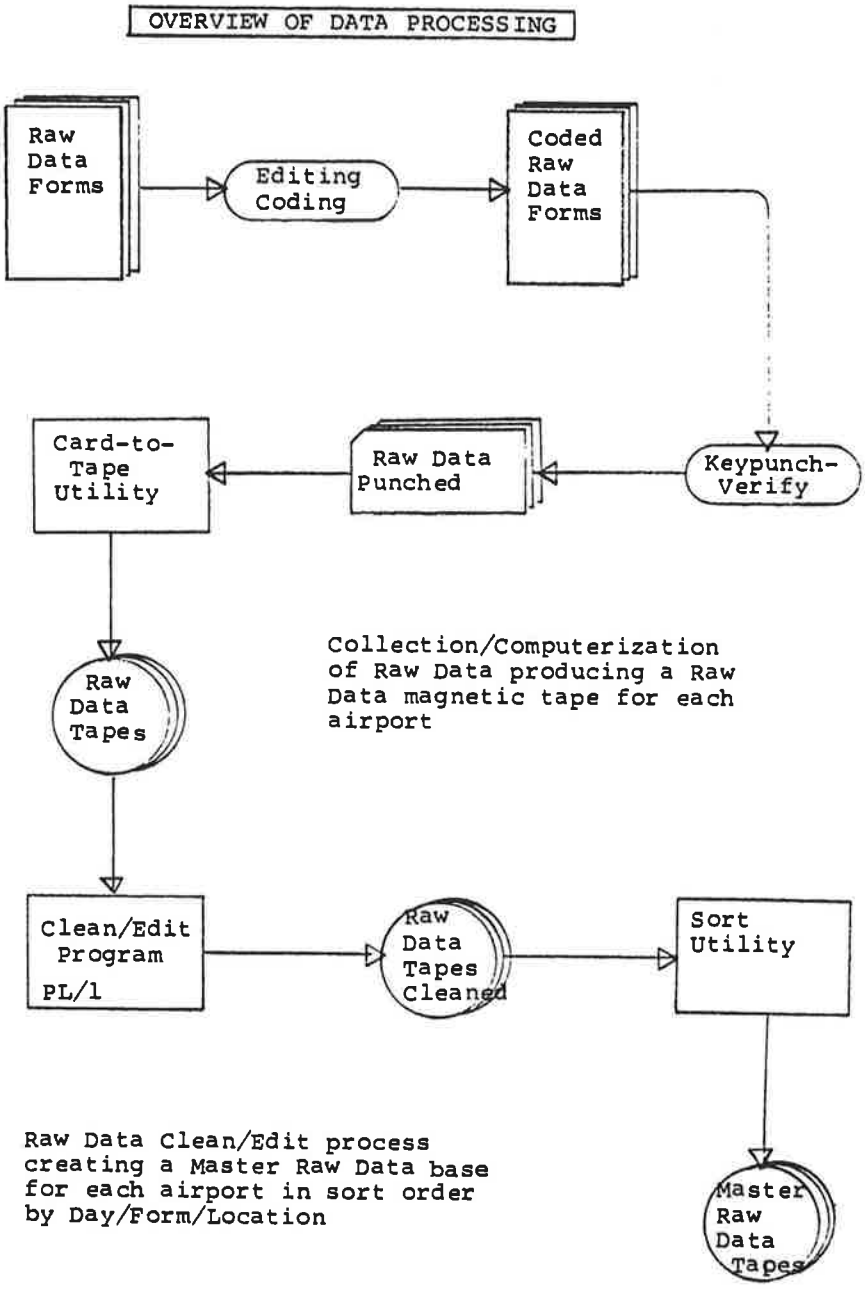
All forms for all airports were keypunched on 80-column cards. The record layout for the cards consists of two parts:

1) That part which is common to all cards: basic identification data in columns 1-10 of each card; and,

2) That part which varies from form to form and is generally placed in columns 20-80 of each card.

(2) SSP - Scientific Sub-routine Park.
IMSL - International Mathematical Scientific Library.

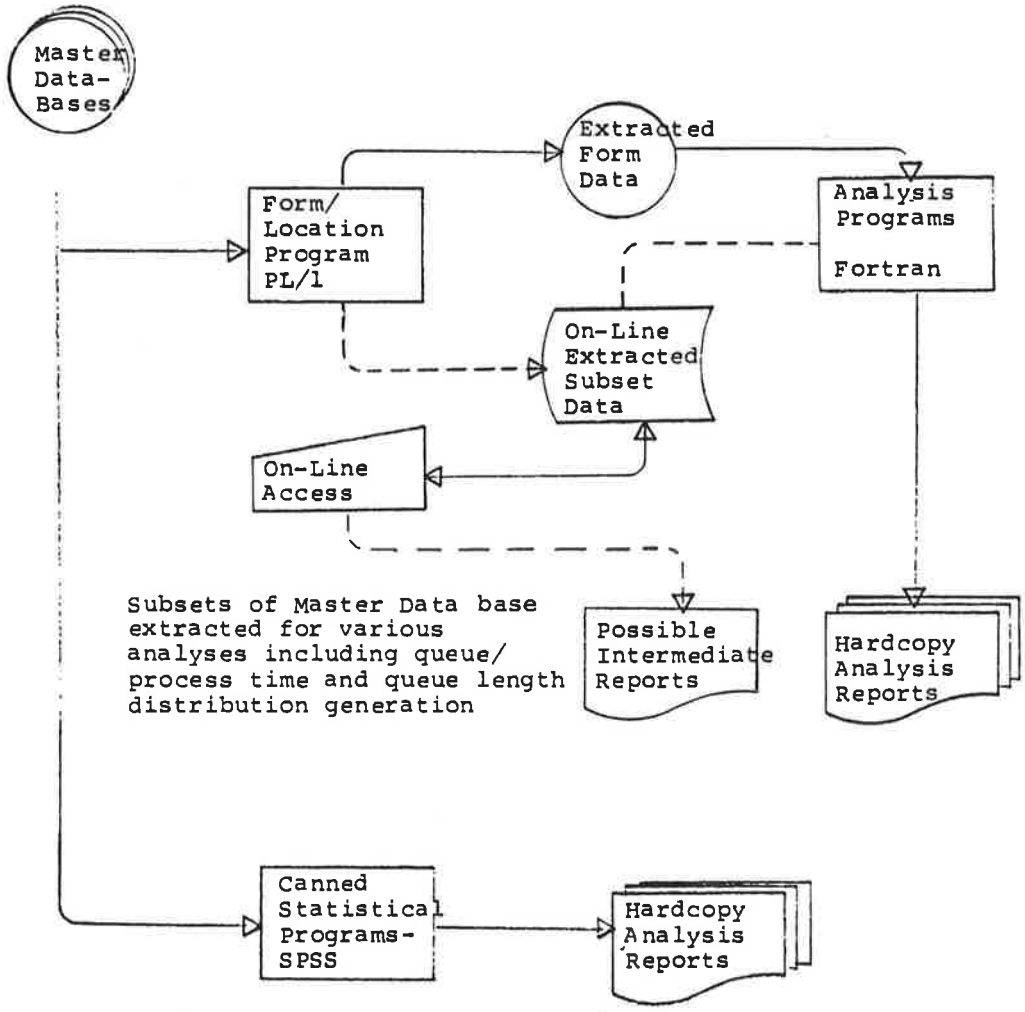
The following tabulations describe the common and individual formats used on each survey form.



Data base Preparation for Subsequent Analysis/Delivery.

Figure 1B

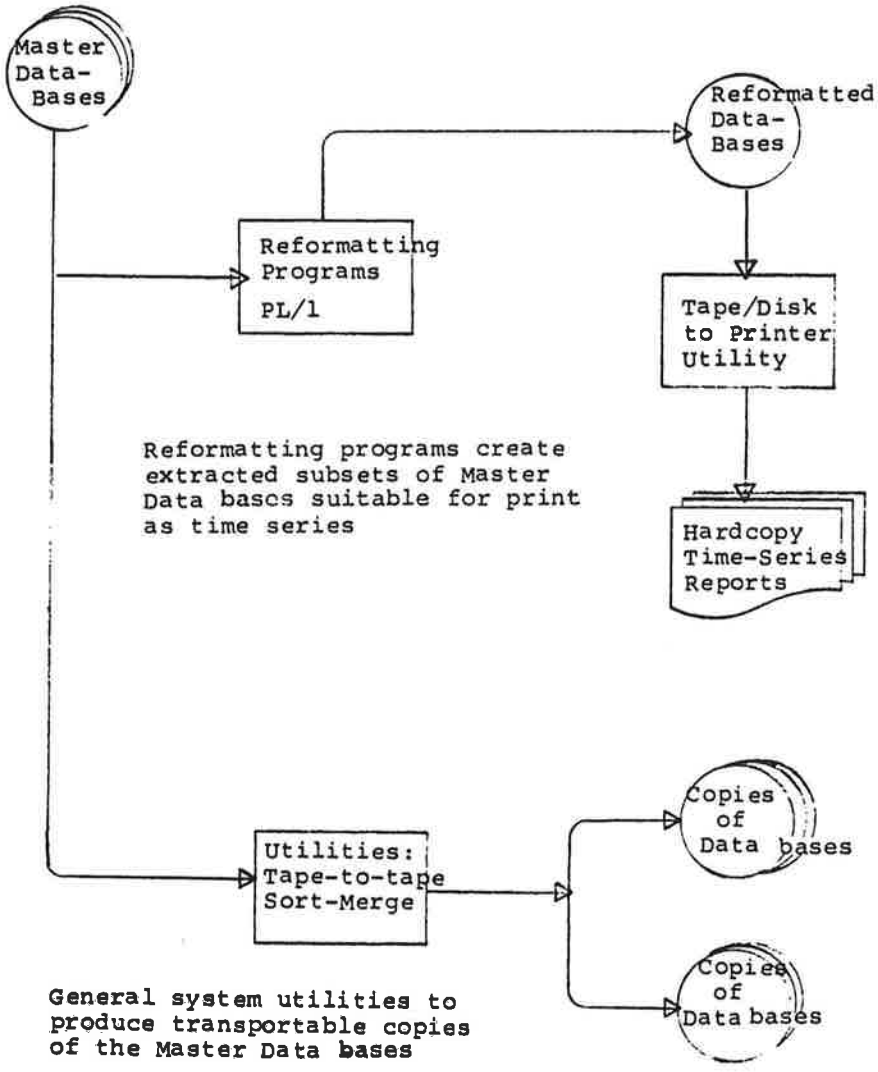
OVERVIEW OF DATA PROCESSING



Production of Analysis Reports from Master Data bases

Figure 2B

OVERVIEW OF DATA PROCESSING



Reformat and Creation of Transportable Copies

Figure 3B

CARD COLUMNS	NUMBER COLUMNS	DATA TYPE	ITEM AND CODE
1-1	1	Numeric	Airport Code 1 = Miami 2 = Denver 3 = New York
2-2	1	Numeric	Day Code 1 = Day one 2 = Day two (Actual dates are provided below.)
3-4	2	Numeric	Form Number (01-31) (See Section V)
5-7	3	Numeric	Location Number (A location list is provided for each airport.) (See Section IV)
8-10	3	Numeric	Page number - A coding page number which facilitated linking punched cards to original form during keypunch/data edit phase.

The variable format - data punched in columns 20-80 of each card varies from form to form. However, some groups of form share a common format.

FORM C - Ø3 - ARRIVING AIR PASSENGER QUESTIONNAIRE (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-23	4	Alphabetic	Flight number
25-26	2	Numeric	Airline number
28-31	4	Numeric	Time of Interview (HR:MN)
33-34	2	Numeric	Q1A 1 = yes 2 = no
36-39	4	Numeric	Q1B (HR:MN)
41-42	2	Numeric	Q2 01 = A, 02 = B, etc.
44-45	2	Numeric	Q3
47-48	2	Numeric	Q4-1
50-51	2	Numeric	Q4-2
53-54	2	Numeric	Q4A
56-57	2	Numeric	Q5
59-59	1	Numeric	Q6 1 = Curb 2 = Check-in 3 = Security 4 = Gate
61-62	2	Numeric	Q7 1 = yes 2 = no
64-65	2	Numeric	Q8 01 = A, 02 = B, etc.
67-70	4	Numeric	Q9 (HR:MN)

FORM D - Ø4 - DEPARTING AIR PASSENGER QUESTIONNAIRE (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-23	4	Alphabetic	Flight number
25-26	2	Alphabetic	Gate number
28-29	2	Numeric	Airline number
31-34	4	Numeric	Time of Interview (HR:MN)
36-39	4	Numeric	Q1 (HR:MN)
41-42	2	Numeric	Q2 01 = A, 02 = B, etc.
44-45	2	Numeric	Q3
47-48	2	Numeric	Q4-1
50-51	2	Numeric	Q4-2
53-54	2	Numeric	Q4A
56-57	2	Numeric	Q5
59-59	1	Numeric	Q6 1 = Curb 2 = Check-in 3 = Security 4 = Gate
61-62	2	Numeric	Q7 1 = yes 2 = no
64-65	2	Numeric	Q8 01 = A, 02 = B, etc.
67-70	4	Numeric	Q9 (HR:MN)

FORM E - Ø5 - BUS AND LIMOUSINE INTERARRIVAL TIMES (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
25-28	4	Numeric	Public Bus/Limo, Van Arrival Time (HR:MN)
30-30	1	Numeric	Vehicle type

FORM F - Ø6 - CAR RENTAL SELECTION (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-23	4	Numeric	Time (HR:MN)
25-25	1	Numeric	Rental Agency 1 = Hertz 2 = Avis 3 = National 4 = Budget 5 = Thrifty 6 = Dollar 7 = Other
27-28	2	Numeric	Number of passengers

FORM G - Ø7 - ARRIVAL DISTRIBUTION FOR CARS MEETING PASSENGERS (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-23	4	Numeric	Vehicle Arrival Time (HR:MN)
25-28	4	Numeric	Airline Arrival Time (HR:MN)

FORM I - Ø9 - EXPRESS/FULL SERVICE CHECK-IN COUNTER SURVEY
(Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-23	4	Numeric	Fix minute interval (HR:MN)
25-26	2	Numeric	Number people served
28-29	2	Numeric	Counter number of people
31-32	2	Numeric	Counter number of people
34-35	2	Numeric	Counter number of people
37-38	2	Numeric	Counter number of people
40-41	2	Numeric	Counter number of people
43-44	2	Numeric	Counter number of people
46-47	2	Numeric	Counter number of people
49-50	2	Numeric	Counter number of people
52-53	2	Numeric	Counter number of people
55-56	2	Numeric	Counter number of people
58-59	2	Numeric	Counter number of people
61-62	2	Numeric	Counter number of people
64-65	2	Numeric	Counter number of people
67-68	2	Numeric	Counter number of people
70-71	2	Numeric	Counter number of people
73-74	2	Numeric	Counter number of people

FORM J - 10 - EXPRESS SERVICE CHECK-IN COUNTER SURVEY (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-25	6	Numeric	Queue Arrival (HR:MN:SS)
27-28	2	Numeric	Number in front
30-35	6	Numeric	Service time (HR:MN:SS)
37-42	6	Numeric	Depart time (HR:MN:SS)

FORM K - Deleted.

FORM L - Deleted.

FORM M - 11 - FULL SERVICE CHECK-IN COUNTER SURVEY (Columns 20-80)

Same as Form J - 10.

FORM N - 12 - CURBSIDE CHECK-IN (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-25	6	Numeric	Check-In Arrival (HR:MN:SS)
27-32	6	Numeric	Completion (HR:MN:SS)

FORM O - 13 - IMMIGRATION COUNTER SURVEY (Columns 20-80)

Same as Form I - Ø9.

FORM P - 14 - IMMIGRATION COUNTER SURVEY (Columns 20-80)

Same as Form J-10.

FORM Q - Deleted.

FORM R - 15 - GATE COUNTER SURVEY (Columns 20-80)

Same as Form J-10

FORM S - 16 - PARKING LOT EXIT SURVEY (Columns 20-80)

Same as Form I - Ø9

FORM T - 17 - PARKING LOT EXIT SURVEY (Columns 20-80)

Same as Form J-10

FORM U - Deleted.

FORM V - 18 - CAR RENTAL COUNTER SURVEY (Columns 20-80)

Same as Form J-10.

FORM W - 19 - (LOWER LEVEL) - DEPLANING CURBSIDE DWELL TIME (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20	1	Numeric	Mode
22-27	6	Numeric	Vehicle Stop Time (HR:MN:SS)
29-34	6	Numeric	Passenger Unloading Time (HR:MN:SS)
36-41	6	Numeric	Vehicle Depart Time (HR:MN:SS)

FORM W1 - 20 - (UPPER LEVEL) - ENPLANING CURBSIDE DWELL TIME (Columns 20-80)

Same as Form W-19.

FORM X - 21 - ENPLANING/DEPLANING CURBSIDE QUEUE (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-25	6	Numeric	Queue Arrival Time (HR:MN:SS)
27-28	2	Numeric	Number of Vehicles on Front
30-35	6	Numeric	Curb Arrival Time
37-42	6	Numeric	Section Pass Time (HR:MN:SS)

FORM Z - 22 - SECURITY CLEARANCE SURVEY (Columns 20-80)

Same as Form I - Ø9.

FORM AA - 23 - SECURITY CLEARANCE SURVEY (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-25	6	Numeric	Queue Arrival Time (HR:MN:SS)
27-28	2	Numeric	Number in Front
30-35	6	Numeric	Counter Arrival Time (HR:MN:SS)
37-42	6	Numeric	Counter Depart Time (HR:MN:SS)

FORM BB - 24 - TRAFFIC FLOW RATES (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-23	4	Numeric	Time (beginning of five minutes - HR:MN)
25	1	Numeric	Location Type 1 = Parking exit 2 = Upper curb 3 = Lower curb 4 = Airport entrance 5 = Airport exit 6 = Parking entrance 7 = Recirculation road
27-29	3	Numeric	Number in five-minute period
31	1	Numeric	Same as Column 25
33-35	3	Numeric	Same as Columns 29-29

FORM 25 - CC - PEDESTRIAN FLOW RATES (Columns 20-80)

CARD COLUMNS	NUMBER COLUMNS	DATA TYPE	ITEM
20-23	4	Numeric	Time (beginning of five minutes (HR:MN)
25-27	3	Numeric	Number of people in
29-31	3	Numeric	Number of people out

FORM 26 - DD - BAGGAGE AREA FLOW RATE (Columns 20-80)

Same as Form 25-CC .

FORM 27 - EE - BAGGAGE AREA QUEUE TIME (Columns 20-80)

CARD COLUMN	NUMBER COLUMNS	DATA TYPE	ITEM
20-25	6	Numeric	Time person enters (HR:MN:SS)
27-32	6	Numeric	Time person exits (HR:MN:SS)

FORM 28 - FF - CUSTOMS COUNTER SURVEY (Columns 20-80)

Same as Form I - Ø9.

FORM - GG - CUSTOMS COUNTER SURVEY (Columns 20-80)

Same as Form AA - 23.

Appendix C
REPORT OF NEW TECHNOLOGY

The data collected as part of this study represents a new advancement in the field of airport landside passenger and vehicle operations. The procedures used to gather this data are not patentable, nor were any other patentable products developed as part of this project.

☆U.S. GOVERNMENT PRINTING OFFICE : 1980—600–908/74