REPORT NO. DOT-TSC-FAA-72-17

PHASE 1 AGTC SURVEY - DATA COLLECTED

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INTERNAL REPORT

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16. Abstract

As part of a nationwide airport ground traffic control requirements study, a survey of nine airports has been made to gather data. At each airport, pre-planned interviews were conducted with the airport management and with FAA control tower personnel, and a written data request was left. In addition, personnel were stationed in the tower cab for an evening peak period and a morning peak period to make tower observations and to obtain tape recordings of the local and ground controller communication channels. This report briefly describes this survey and serves as the bibliography for the collected data.

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PREFACE

The survey described in this report was conducted by the Transportation Systems Center of the U.S. Department of Transportation in support of the Airport Ground Traffic Control Program. This program is sponsored by the Systems Research Development Service of the Federal Aviation Administration. The authors wish to acknowledge the high level of cooperation provided by the airports surveyed - namely; Boston Logan International, Bradley International, Chicago O'Hare International, Cleveland-Hopkins International, Detroit-Metropolitan Wayne County, Greater Pittsburgh, Los Angeles International, Philadelphia International, and Seattle-Tacoma International.

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INTRODUCTION

The Airport Ground Traffic Control (AGTC) system is defined as that system controlling the vehicles on the surface of the airport. Three broad categories of problems currently face the system. These are caused by increased operations, poor controller visibility, and poor pilot visibility. Concern over the seriousness and extent of these problems today and over the next decade brought about the creation of an AGTC Project Office at the DOT/Transportation Systems Center in 1971. The responsibilities of the Project Office are (1) to determine the present AGTC requirements of the national airport system, (2) to determine how these requirements will evolve over the next decade, and (3) to develop those AGTC equipments for the national airport system for which a need based on cost benefit or safety considerations can be demonstrated.

As a part of the nationwide AGTC requirements study, a survey of nine airports has been made to gather data. The survey consisted of trips of one day duration to each of the nine airports. Generally, the airport management was visited in the morning and the FAA control tower in the afternoon. Both groups were given a briefing on the program; then a preplanned interview was conducted, and a written data request was left. In addition, personnel were stationed in the tower cab for the evening peak period and the following morning peak period. Tower observations were made, informal discussions with controllers were held and tape recordings of the local and ground controller communication channels made. This report briefly describes the survey and is to serve as the bibliography of the collected data.

AIRPORT SELECTION

The criteria used to select the airports to be included in the survey were traffic mix, traffic level, and weather. It was expected that the AGTC problems would be most serious at the large, air carrier airports; consequently, the survey was to be primarily made up of airports with traffic mixes consisting of less than 35% general aviation. To broaden the survey's data base, two of the survey airports were to have traffic mixes made up of more than 50% general aviation. Next, the survey airports were to span a range of traffic levels. Two of the airports were to have traffic levels over 350,000 total annual operations. It was expected that these airports would demonstrate the seriousness of the AGTC problems rooted in handling high traffic levels, such as controller VHF channel utilization, blind spots due to expanding terminal facilities, etc. It was thought that although airports in this category would probably be found most in need of assistance, they would be too preoccupied to serve as test sites for the development of the needed AGTC equipments. For this reason, five of the nine airports were to have traffic levels between 200,000 and 350,000 total annual operations -- big enough to be experiencing problems yet small enough to perhaps permit field tests. To gauge the extent of the AGTC problems at smaller airports, data was to be gathered at two airports with traffic levels between 150,000 and 200,000 total annual operations. Data concerning the effects of weather on AGTC operations and equipment were also to be obtained. Therefore, the survey airports were to have a high incidence of poor weather and to experience snow.

Table 1 shows the nine airports selected. The traffic levels of the selected airports fell into three categories: (1) Chicago O'Hare and Los Angeles International with around 600,000 total annual operations, (2) Boston Logan, Cleveland - Hopkins, Detroit Metropolitan Wayne County, Greater Pittsburgh, and Philadelphia International with 300,000 operations, and (3) Seattle-Tacoma and Bradley International with 150,000 operations. The traffic mix ranged from 6% to 35% general aviation with the exception of Cleveland-Hopkins

TABLE 1. AIRPORTS SELECTED FOR THE SURVEY

AIRPORT	TRAFFIC LEVEL	TRAFFIC MIX	WEATHER	
	TOTAL 1970 OPERATIONS[1]	PERCENTAGE OF GENERAL AVIATION[1]	SNOW	AVERAGE HOURS PER YEAR AIRPORT CEILING <200ft AND VISIBILITY <1/2 mile[2]
Chicago O'Hare International	671,000	6%	yes	76
Los Angeles International	575,000	24%	no	143
Boston Logan International	328,000	35%	yes	97
Cleveland-Hopkins International	322,000	55%	yes	
Detroit Metro. Wayne County	310,000	30%	yes	111
Greater Pittsburgh	294,000	35%	yes	86
Philadelphia International	274,000	30%	yes	94
Seattle-Tacoma International	163,000	33%	yes	230
Bradley International	155,000	62%	yes	135

and Bradley at 55% and 62%, respectively[1]. All the airports except Los Angeles International experience snow. The average number of hours per year these airports experience a ceiling less than 200 ft. and a visibility of less than a half mile varies from Chicago O'Hare with 76 hours to Seattle-Tacoma with 230 hours[2]. Seattle-Tacoma has one of the highest occurences of poor weather in the country.

DATA COLLECTED

The data collected by the airport survey is listed in the bibliography. A summary of the tower observations made at each of the airports is listed in the bibliography as Item G.1. The local and ground controller VHF channel communication tapes taken during these tower observation periods are described in Table 2 and are listed as Item G.2 in the bibliography. To complete the data taken for these observation periods, the logs showing the runway on/off times and gate in/out times were requested for company aircraft from a number of the larger airline companies. The airline companies from which this data was obtained are listed in Table 3. These logs are listed in the bibliography as Item G.3.

The data requests left with the airport management and FAA tower at the time of the visits are shown in Appendix A, and the requested information received from each of the airports is shown in Table 4. This table defines the index system used in the bibliography. The first digit (1 through 9) of the Item Number refers to the airport with which the data is associated, unless the data applies to all of the survey airports in which case the Item Number starts with a G. The second digit (.1 through .12) appears as the Data Item Number in Appendix A and refers to the specific data requested of the airports. Second digits greater than .12 are reserved for documentation supplied by the various airports beyond that which was requested.

Appendix B presents the types of questions asked during the survey interviews with the airport management and with the FAA tower personnel. Informal notes were taken during the interviews. These informal notes were then expanded and organized into a set of working notes. This set of working notes is listed as Item G.4 in the bibliography.

TABLE 2. AIRPORT RECORDINGS OF GROUND AND LOCAL CONTROLLER POSITIONS

AIRPORT	DATE	POSITION	TIME
Boston	1 December 1971	Ground	7:00-8:30 AM
	"	Local	"
	"	Ground	4:00-6:30 PM
	"	Local	"
Bradley	15 December 1971	Ground	4:00-5:02 PM
	"	Local	"
	16 December 1971	Ground	8:15-9:05 AM
	"	Local	8:15-9:05 AM
Chicago	13 January 1972	Ground #1&2	4:58-6:39 PM
	14 January 1972	Ground #1&2 (dead last 1/3 of tape)	8:25-10:17 AM
	13 January 1972	Local #1	5:00-5:42 PM
	"	"	5:42-6:26 PM
	"	"	6:26-6:37 PM
	"	Local #2	5:00-5:43 PM
	"	"	5:43-6:28 PM
	"	"	6:29-6:36 PM
	14 January 1972	Local #1	8:25-9:10 AM
	"	"	9:10-10:08 AM
	"	Local #2	8:37-9:20 AM
	"	"	9:20-10:05 AM
Cleveland	14 December 1971	Ground	4:45-6:15 PM
	"	Local	"
	15 December 1971	Ground	8:35-10:17 AM
	"	Local	8:26-10:17 AM
Detroit	13 December 1971	Ground	4:30-6:00 PM
	"	Local	4:30-6:00 PM
Los Angeles (First Trip)	10 January 1972	Ground (Foggy)	6:30-8:00 PM
	"	Local 1&2	"
	11 January 1972	Ground	11:30-1:00 PM
	"	Local 1&2	"
	"	Ground	6:30-8:00 PM
	"	Local 1&2	"

TABLE 2. AIRPORT RECORDINGS OF GROUND AND LOCAL CONTROLLER POSTIONS (CONTINUED)

AIRPORT	DATE	POSITION	TIME
(Second trip to obtain copy poor visibility; airport closed until 7:45 am 24 February 72)	24 February 1972	Ground (Foggy)	7:00-9:00 AM
	"	Local 1&2	"
	25 February 1972	Ground (Clear)	7:00-9:00
	"	Local 1&2	"
Philadelphia	16 December 1971	Ground	4:30-6:00 PM
	"	Local	"
	17 December 1971	Ground	8:14-9:45 AM
	"	Local	"
Pittsburgh	17 December 1971	Ground	6:30-8:04 PM
	"	Local	7:26-8:04 PM
	"	Ground	4:30-5:45 PM
	"	Local	4:45-6:15 PM
Seattle	12 January 1972	Ground	6:30-8:10 PM
	"	Local	"

TABLE 3. THE AIRLINE COMPANIES THAT PROVIDED GATE/RUNWAY LOGS

American Airlines
Braniff International Airlines
Delta Airlines
Eastern Airlines
National Airlines
Northeast Airlines
Pan American World Airlines
Trans World Airlines
United Airlines
Western Airlines

TABLE 4. DATA RECEIVED FROM THE AIRPORTS IN RESPONSE TO THE DATA REQUESTS

Item No.	AIRPORTS SURVEYED	DATA REQUESTED											
		.1	.2	.3	.4	.5	.6	.7	.8	.9	.10	.11	.12
		Controller Duties	Traffic Routes	Runway Utilization	Blind Spots/FAA Tower	Blind Spots/ASDE Antenna	Ranking of Tasks	Flight Progress Strips	Current Airport Layout	Gate Allocations	Field Obstruction Heights	Expansion Plans	Reduced Minimums Plans
1	Boston Logan International	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓
2	Bradley International	✓	✓	✓		N.A.	✓		✓	✓	✓	✓	
3	Chicago O'Hare International	✓	✓	✓	✓	✓		✓	✓	✓			
4	Cleveland Hopkins		✓		✓	✓			✓	✓		✓	✓
5	Detroit Metropolitan	✓	✓	✓	✓	N.A.	✓		✓	✓		✓	
6	Greater Pittsburgh					N.A.			✓	✓	✓	✓	
7	Los Angeles International	✓	✓	✓	✓	✓	✓	✓	✓			✓	
8	Philadelphia International	✓				N.A.			✓	✓	✓	✓	
9	Seattle Tacoma International	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		

USE OF THE DATA

This survey has collected data at nine airports. The data consists of interviews with airport personnel, data requested of the airports, and the data necessary to reconstruct the traffic of an evening and morning traffic peak at each of the airports. An analysis of this data will be made to establish the AGTC requirements of the nine airports surveyed. The nationwide extent of these requirements will then be determined by using data obtained by a second survey, of less depth, conducted at twenty additional airports. The nationwide AGTC requirements study will be completed by the end of CY 72.

APPENDIX A

DATA REQUESTS SUBMITTED TO THE AIRPORTS

SUBMITTED TO THE FAA TOWER

Data Item No.

.1 The Tower's Standard Operating Procedure manual, or at least those portions of it that describe the duties and responsibilities of the ground controller(s) and the local controller(s).

.2 A set of airport maps showing the standard taxiway routes associated with each runway configuration normally used and if possible, to include:

- the departure and arrival routes differentiated
- the departure and arrival staging areas differentiated
- the sectional responsibility of each controller if more than one controller handles traffic on the taxiway system.

.3 A statement on the frequency of use of each runway configuration

.4 An airport map showing the present visual blind spots to the FAA tower

.5 An airport map showing the present blind spots to the ASDE antenna (if applicable)

.6 Rank the following ground control tasks for a typical peak capacity with respect to: (i) difficulty (i.e. most apt to get out of hand), and (ii) demands on the controller's time.

Ramp Assistance - The ramp is defined as the area between the gates and the inner taxiway. Two basic advisories are pushback clearance for outbound aircraft and staging for inbound and outbound aircraft to permit access to gates.

Intersection Control - An intersection is defined as the crossing of two taxiways or a taxiway and an inactive runway being used as a taxiway. Control of the intersection is when the controller issues entrance priorities up to the pilots on a first come, first served basis.

Inbound Delay Control - If inbound aircraft are delayed due to a lack of gates, this is done chiefly by routing to an inbound staging area or holding the aircraft along his route in the taxiway system. Any advisories issued for this purpose exclusive of the ramp area are defined as inbound delay control.

Outbound Delay Control - If outbound aircraft are delayed due to lack of clearance or ATC system saturation, this is done chiefly by queuing in the runup area, routing to an outbound staging area, or holding the aircraft along his route to the runup area. Any advisories issued for this purpose exclusive of the ramp area are defined as outbound delay control.

Routing - Any directional advisories given aircraft in the taxiway system exclusive of the above control advisories are considered routing.

Gate Information - If inbound aircraft do not know if their company has a gate clear and request such information of the ground controller, that advisory is defined as gate information.

.7 The flight progress strips for the day(s) that tower observations were made (when they are released after the mandatory fifteen day hold period)

SUBMITTED TO THE AIRPORT MANAGEMENT

Data Item No.

.8 A set of airport maps of the current airport configuration indicating:

- taxiways, runways, terminal facilities, etc. shown to scale with their designations
- taxiway and runway lighting (type and location) and markings (lines, signs, etc.)
- FAA tower location
- airline (ramp) tower locations.

.9 An airport map showing gate locations, numbers and allocation by airline

.10 An airport map showing the heights of airport facilities (obstruction chart)

.11 A set of airport maps of proposed airport changes such as:

- a new tower
- taxiway/runway modifications
- new terminal facilities.

.12 Their plans for reducing minimums and anticipated implementation dates

APPENDIX B

AIRPORT INTERVIEW QUESTIONS

AIRPORT MANAGEMENT INTERVIEW

1. Concerning the current airport layout and in particular:

   a. The sign/marking/lighting system:

      . How extensive a sign system is employed? Type (back lit or front lit)? Is it considered adequate by the airlines?

      . How extensive a lighting system is employed? Type (edge or centerline, unidirectional or bidirectional)? Where is each located?

      . What is experience with centerline lighting (snow removal, dirt in lens, water leakage)? How do they feel about taxiway centerline lighting with the half inch slush limit consideration?

      . What type of segmented lighting do they have? Is panel integrated at all? How is it broken up? Does tower use it to avoid power loss or confusion?

      . How extensive a marking system is employed? Is ramp edge marked and enforced? Are the ramp vehicle roadways marked? How often do they repaint? Have they tried reflective paint?

   b. Snow Removal:

      . What is the typical and maximum snow depths experienced by airport alongside the runways and taxiways?

      . What is the effect of these snow depths on the lighting and sign systems?

   c. FAA Tower:

      . Are there plans for a new tower?

      . If so, for what reasons?

d. Gate location, identifiers and allocation by airline

- What is the current number of gates?
- Are gates assigned to or leased to the airlines?
- What is the airport's experience with floating gates?

e. Airline (ramp control) towers

- How many airline towers are there?
- What is their function?
- What is the desirability for supervision of controllable vehicles in the ramp area?
- Would formal ramp supervision be desirable at this airport in the foreseeable future?
- If so, who should be responsible for it?

2. Plans for airport expansion:

- Are they in agreement with the FAA forecast?
- Is the present airport configuration gate limited or runway limited?
- What is the capacity limit of the current airport configuration?
- Briefly, what do the airport expansion plans involve (new terminal facilities, taxiway/runway modifications, a new tower)?
- Motivation for these changes?
- What environmental/political pressures are they experiencing concerning their expansion plans?
- How do they calculate their future gate requirements? Criteria used?
- How many gates will be added? How will they be allocated?
- What is the ultimate upper limit on the airport?

3. Plans for reducing minimums and anticipated implementation dates:
    - What are the current landing and takeoff minimums?
    - When is CAT II planned and where?
    - When is CAT III planned and where?
4. Plans for ATC changes:
    - What is the schedule for TCA?
    - What is the schedule for ARTS?
    - Where is the IFR room located?
    - Where is the ASR radar located?
5. Are there any R&D efforts that we might be interested in?
6. Do they have any suggested areas, either procedural or with equipment, that they would like to see this program address?
7. Organization chart.

FAA TOWER INTERVIEW

1. Does the ground or local controller have any acute problems:

Staging

- Is airport gate limited?
- If it is, how often must an aircraft be held to wait for gate?
- Where does the inbound staging take place (in air, in taxiways, in ramps, in formal staging areas)?
- Is outbound staging a problem?
- Does flow control cause a problem for the ground controller?
- What is length of the typical peak departure queue?
- Where does outbound staging take place (some done at gates)?

Intersection Control

- Does the controller have a problem controlling any particular intersection or taxiway link?
- If so, identify the area?
- Would they be receptive to local autonomous control?

Surveillance

- Where are the blind spots?
- Are there any critical blind spots?
- What is the controller's role in these blind spots?
- Do night operations differ from day operations due to lost surveillance?
- What % increase in controller workload at night?
- What are the take off minimums?

- How does the controller handle ground traffic at reduced visibilities (one aircraft at a time)?

Sign/Marking/Lighting Systems

- How adequate are the sign/marking/lighting systems?
- What is their experience with edge and in pavement lights?
- Would they favor a segmented lighting system?

Ramp Supervision

- What is the desirability for supervision of controllable vehicles in the ramp area?
- Is ramp supervision presently done to some extent? Explain?
- Would more formal ramp supervision be desirable at this airport in the foreseeable future? Explain?
- If so, who should be responsible for it?

2. Manning of the Local and Ground Controller stations

- How many local and ground controller positions do they use?
- If they plan to add a second position, why and when?
- Is there a VHF frequency available?
- If they already have the second position manned,
    - When was it done?
    - Why was it done (VHF channel, surveillance)?
    - How long will this be satisfactory (either a date or a capacity estimate and reason for final breakdown)?
    - What do they envision as the next step after dual manning?

3. Airport Growth

   . Do they agree with the FAA forecast?

   . What is the practical expansion limit of the airport?

   . What will be the final limiting factor (gates, runways)?

4. ASDE Radar

   a. If they have experience with ASDE,

   . How often do they use it?

   . What % of the time is it used and by whom, local or ground controller?

   . Is it used for night operations as well as for bad weather?

   . What is the availability of the ASDE?

   . How much maintenance is required? What sort?

   . Would they use a reliable bright display any differently?

   . Would they use a bright display with ID any differently?

   b. If they do not have experience with ASDE,

   . Why don't they have one; was one ever considered or requested?

   . Would a good, reliable ASDE bright display be of any immediate or near term use?

   . How would they use ASDE with ID?

5. Are there any R&D efforts that we might be interested in?

6. Do they have any suggested areas (procedural, equipments) that they would like to see this program address?

APPENDIX C

BIBLIOGRAPHY

This bibliography lists all the documentation obtained as a result of the Phase I AGTC Survey. The documentation is made up of general documents that pertain to all nine airports and of specific documents that apply only to the individual airports:

GENERAL DOCUMENTATION

Item

G.1 Baran, G., Bales, R.A., Koetsch, J.F.: Phase I AGTC Survey Tower Observations Report, MITRE Corp. working paper WP 8675 done under the sponsorship of DOT/FAA under contract no. DOT-FA70WA-2448, 25 February 1972.

G.2 Phase I AGTC Survey Tower Controller Communication Tapes, DOT/TSC, March 1972.

G.3 Phase I AGTC Survey Airline Runway/Gate Logs, DOT/TSC, March 1972.

G.4 Stevenson, L.E., Rempfer, P.S.: Phase I AGTC Survey Airport Interviews, DOT/TSC, June 1, 1972.

BRADLEY INTERNATIONAL AIRPORT

Items 2.1 through 2.12, defined in Table 4, are the data requested from the airport.

Item	
2.1	The Requested Bradley Airport FAA Tower Data, December 1971
2.2	Ibid
2.3	Ibid
2.6	Ibid
2.8	Airport Layout Plan, December 1968 (3' x 4')
2.9	Ibid
2.10.1	Ibid
2.10.2	The Requested Bradley Airport Management Data, January 1972
2.11	Same as Item 2.8

CHICAGO O'HARE INTERNATIONAL AIRPORT

Items 3.1 through 3.12, defined in Table 4, are the data requested from the airport.

Item	
3.1	Same as Item 3.19
3.2	The Requested Chicago O'Hare Airport FAA Tower Data, April 1972
3.3	Ibid
3.4	Ibid
3.5	Ibid
3.7	Flight Progress Strips for 13 and 14 January 1972
3.8.1	Proposed Construction - 1972, October 1971 (11" x 14")
3.8.2	Terminal Area and Vicinity, 31 March 1971 (3' x 4')
3.9	Area Assignment/Airline Gate Assignments (8" x 11")
3.13	Airport Operations Log by Airline for January 1972
3.14	Terminal Ground Control Team Report, written by a joint committee of the FAA, Department of Aviation, ATA, Bureau of Engineering, and the Airlines, 13 Oct. 1970
3.15	Snow Removal Instructions, O'Hare Management Directive O-1, 1 November 1971
3.16	Emergency Rescue and Fire Fighting Procedures, O'Hare Management Directive 0-5-71, 15 June 1971
3.17	Driving Rules and Regulations, O'Hare Management Directive 0-3, 5 July 1971
3.18	"Suspicious Material" Threat Procedures, O'Hare Management Directive 0-4-71, 15 June 1971
3.19	Chicago O'Hare Airport Air Traffic Control Tower Training Manual

CLEVELAND-HOPKINS INTERNATIONAL AIRPORT

Items 4.1 through 4.12, defined in Table 4, are the data requested from the airport.

Item	
4.2	The Requested Cleveland-Hopkins Airport FAA Tower Data, March 1972
4.4	Ibid
4.5	Ibid
4.8.1	Photo of Airport Layout, 1968 (2' x 2')
4.8.2	Photo of Airport Layout, 15 April 1970 (9" x 9")
4.8.3	Existing Landing Area (18" x 24")
4.8.4	The Requested Cleveland-Hopkins Airport Management Data, April 1972
4.9	Ibid
4.11	Landing Area Layout Configuration - 4B-1 (18" x 24")
4.12	Same as Item 4.8.4

DETROIT METROPOLITAN WAYNE CO. AIRPORT

Items 5.1 through 5.12, defined in Table 4, are the data requested from the airport.

Item	
5.1	The Requested Detroit Metropolitan Airport FAA Tower Data, February 1972
5.2	Ibid
5.3	Ibid
5.4	Ibid
5.6	Ibid
5.8.1	Airport Layout Plan, 8 Feb. 1968 (3' x 4')
5.8.2	Building Layout and Identification, 3 March 1969 (12" x 18")
5.8.3	Airport Taxi Chart, Aug. 1970 (6" x 9")
5.9	The Requested Detroit Metropolitan Airport Management Data, February 1972
5.11.1	Ibid
5.11.2	Same as Item 5.8.1
5.11.3	Same as Item 5.8.2

GREATER PITTSBURGH INTERNATIONAL AIRPORT

Items 6.1 through 6.12, defined in Table 4, are the data requested from the airport.

Item	
6.8.1	Airport Layout (8" x 14")
6.8.2	Master Plan, 2 December 1969 (15" x 22")
6.8.3	Construction Plan (18" x 30")
6.8.4	Airport Obstruction Chart, OC570, U.S. Dept. of Commerce/ National Ocean Survey, May 1970 (2' x 4')
6.8.5	The Requested Greater Pittsburgh Airport Management Data, April 1972
6.9	Ibid
6.10	Same as Item 6.8.4
6.11.1	Same as Item 6.8.2
6.11.2	Greater Pittsburgh Airport Master Development Plan, Richard Gordon and Associates together with Tippetts-Abbett-McCarthy-Stratton, 1 October 1970
6.11.3	Same as Item 6.8.5

LOS ANGELES INTERNATIONAL AIRPORT

Items 7.1 through 7.12, defined in Table 4, are the data requested from the Airport.

Item	
7.1	Same as Item 7.13
7.2	The Requested Los Angeles International Airport FAA Tower Data, February 1972
7.3	Ibid
7.4	Ibid
7.5	ASDE Photographs, 1970
7.6	Same as Item 7.2
7.7	Flight Progress Strips for 10 and 11 January 1972
7.8.1	Master Plan, 1 August 1969 (10" x 15")
7.8.2	Taxiway and Parking Facilities, Jeppesen, 30 April 1971, (8" x 10")
7.8.3	Pictorial Layout of Terminal (8" x 10")
7.11.1	Planning Alternatives for Airport System Expansion 1970 - 1975, Prepared by the Staff of the Dept. of Airports of the City of Los Angeles, December 1969
7.11.2	Same as Item 7.8.1
7.13	Los Angeles Tower - TRACON Facility Management Handbook, DOT/FAA, LAX Tower/TRACON 7210.1, 1 Sept. 1969
7.14	Los Angeles Tower - TRACON Terminal Air Traffic Control Handbook, DOT/FAA, LAX Tower/TRACON 7110.1A, 1 May 1969
7.15	Summary of Air Traffic 1961-1970
7.16	Various Los Angeles Tower/TRACON Notices
7.17	Organization Chart, City of Los Angeles/Dept. of Airports, 1 July 1970

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Items 9.1 through 9.12, defined in Table 4, are the data requested from the airport

Item	
9.1	The Requested Seattle-Tacoma International Airport FAA Tower Data, February 1972
9.2	Ibid
9.3	Ibid
9.4	Ibid
9.5	Ibid
9.6	Ibid
9.7	Flight Progress Strips for 12 and 24 January 1972
9.8	Airport Layout Plan, 19 November 1970 (2' x 3')
9.9	Plane Position Allocations, 16 September 1970 (2' x 3')
9.10	Same as Item 9.8
9.11.1	Breindl, V.A., Holder, D.W.: Practical Annual Aircraft Handling Capacity of the Proposed Runway Configuration at the Seattle-Tacoma International Airport 1970 - 1985, Port of Seattle Planning and Research Dept., March 1969
9.11.2	Same as Item 9.8
9.13	Airport Surface Detection Radar "Surveillance for Control", Texas Instruments
9.14	ASD Radar, Texas Instruments
9.15	Staff Study of the Airport Surface Detection Equipment at the Seattle-Tacoma International Airport, FAA/Airport Traffic Control Tower at the Seattle-Tacoma International Airport, January 1967

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1. Terminal Area Air Traffic Relationships for Fiscal Year 1970, DOT/FAA/Office of Management Systems/Information and Statistics Division, April 1971

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