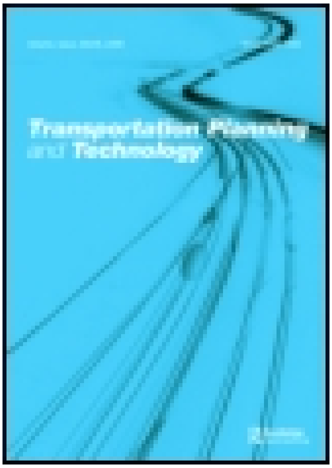

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An operational analysis of regional airport passenger terminals

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AN OPERATIONAL ANALYSIS OF REGIONAL AIRPORT PASSENGER TERMINALS

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Based on a survey of passenger, baggage and vehicle flows at ten regional airports in the southeastern region of Brazil, where regular air transport is provided by aircraft of 15 to 54 seats, the utilization process and interrelation of the operational components of the passenger terminal are characterized.

This characterization is used to model the observed phenomena, identify relevant commonalities in the process and establish design parameters for this kind of terminal. It is concluded that it is possible to derive a general method to estimate operational area requirements with reasonable precision, using relatively simple tools, even considering the differences that exist in the user profiles at this airports.

KEY WORDS: Passenger terminal design, regional airports, small airports.

INTRODUCTION

In a similar way as in other countries, regional air transport has been developed in Brazil utilizing mainly existing airport facilities. Many passenger terminal buildings where built originally for other purposes and their design has therefore little or nothing to do with the effective requirements or need generated by regular air transport.

Little effort has been allocated to the design of new, or the adaption of existing terminals to the new scenario, because in the seventies and early eighties traffic was small, mainly carried by EMB-110 Bandeirantes, and even very modest facilities supplied enough capacity and acceptable service levels.

The regional air traffic growth however, followed by an increase in aircraft size, has generated more and more Fokker F-27s at these airports, and at some, jet aircraft in the range of 100 seats capacity should be expected by 1990.

This change of scene has created operational problems at some airports while at others facilities were able to cope with the new operational conditions with minor adaptions.

Table I presents data of some of these airports to highlight the differences observed in traffic and present installation characteristics.

This paper, based on the research by Silva,[1] proposes a method to evaluate terminal facilities area requirements and provides answers to the question of how these components shall grow to cope with traffic growth.

OPERATIONAL AREAS

The following components are considered relevant operational areas in the analysis:

Table I Traffic and typical dimensions of some Brazlian regional airports

Airport	Passengers 1984	(ENPL+DEPL) 1985	1986	Runway M	Terminal M2	Parking spaces
Araçatuba	34,545	36,945	51,941	2,120 × 35	1,125	30
Bauru	15,658	16,537	21,759	1,500 × 35	267	25
Marília	12,258	12,728	12,483	1,500 × 35	393	20
Maringá	32,459	34,548	45,329	1,500 × 35	960	35
Ourinhos	1,777	1,812	2,102	1,550 × 35	175	25
R. Caldas	998	1,803	2,415	1,500 × 35	255	50
P. Prudente	37,544	39,403	55,742	2,100 × 35	1,120	30
Rib. Preto	65,228	70,554	62,698	1,500 × 35	410	60
S. J. Preto	26,125	24,675	32,294	1,500 × 35	600	60
S. J. Campos	14,444	12,435	13,781	3,000 × 45	800	50

a) Parking areas—spaces, preferably close to the terminal building reserved for parking private vehicles, taxis and buses which stop for long periods at the airport. At regional airports it is normally one single area which serves all the parking needs.

b) Curb—a space along the terminal building landside interface, reserved for short time parking of vehicles that are involved in the process of loading and/or unloading passengers and eventually packages.

c) Main lobby—the focal point of the passenger terminal, where the majority of passengers and well-wishers concentrate during the time they stay in the terminal during the enplaning and deplaning process.

d) Check-in counter—an installation, normally in the main lobby, where passengers and their baggage are processed when enplaning.

e) Baggage make-up—a space, in general behind the check-in counter area along the airside interface of the terminal, where baggage is stored on one or more carts, which when loaded, are pulled manually to the aircraft.

f) Baggage retrieval area—a space within the terminal, which has an interface with the terminal airside, where deplaning passengers retrieve their baggage.

g) Departure lounge(s)—constituted by one or more rooms where passengers are grouped some time before the enplanement, in order to assure a correct and rapid terminal/aircraft connection.

There are however several other relevant areas in a small passenger terminal which are not directly involved in the processing of regular air transport passengers, baggage and vehicles but that have to be considered in the design process. They are in general:

—commercial areas—fast food services, newspaper stall, car rental counters, etc.

—restrooms

—airport administration rooms

—air taxis

—air traffic control rooms

Although they can be in a certain sense related to regular air traffic volumes, they are not considered explicitly in this study, because at this type of airport, the area requirements for these installations are in general easily definable by good engineering judgement.

TRAFFIC SURVEY AND ITS RESULTS

Traffic Survey

The survey was conducted at ten regional airports, on two weekdays that were considered representative of high enplaning and deplaning flows. Monday and Friday were selected and the following airports surveyed:

Airports	Survey dates		
Araçatuba	02/27/84	and	04/13/84
Bauru	01/06/84	and	01/10/84
Franca	12/05/83		
Londrina	01/13/84	and	01/17/84
Maringá	02/17/84	and	02/20/84
Poços de Caldas	12/02/83		
Presidente Prudente	02/24/84	and	04/16/84
Ribeirão Preto	01/20/84	and	01/24/84
São Jose dos Campos	01/27/84	and	03/05/84
São Jose Rio Preto	02/03/84	and	03/07/84

Survey Results

Access and parking system:

—transport mode used for access

There are basically two types of access modes at the surveyed airports, private car and taxis. Table II presents data of the split between these two modes for the surveyed flights and includes the trip purpose divided into business and leisure trips.

One can observe that there is a wide variation in access mode split even for flights with the same number, that is to say, departing at the same time for the same destination.There is also no uniform pattern in terms of trip purpose. In terms of passenger terminal design however, the survey has shown that there is little difference in terms of passenger behavior or car parking times at the curb, and that the data can be aggregated if taxis and private cars share the parking positions.

—vehicle arrival and departure distribution at curb

The following observations were considered valid for these type of airports: the curb has a single level that is used for loading and unloading passengers and to a very small extent to load and unload packages; the vehicles that unload passengers have, as a general rule, a short parking period, leaving the area as soon as they are cleared; the vehicles that load passengers, as a general rule, come from the parking lot, when the drivers have observed that the passengers that they will pick up are already at the curb (parking periods are therefore comparable with the unloading process); a small number of taxis (1 or 2) sometimes remain parked at the curb waiting for passengers; the critical period of curb occupancy associated to a single flight occurs within the 60 min prior to the scheduled time of departure (STD), with a peak ranging from STD-48 to STD-20. Figure 1 shows the car arrival distribution accumulated for all surveyed airports as well as the distributions for Ribeirão Preto (the largest traffic) and Maringá (an average traffic level).

Table II Summary of surveyed operational parameters

Airport	Flight	Access privt	Mode taxi	Trip busin	Purpose leisr	W. wish pax	Bags pax
Araçatuba	459	0.50	0.50	0.90	0.10	0.50	0.70
	459	1.00	0.00	0.50	0.50	n.a.	n.a.
	541	1.00	0.00	0.86	0.14	0.57	0.57
	541	0.67	0.33	0.44	0.56	0.38	0.69
Bauru	541	n.a.	n.a.	0.69	0.31	1.00	0.82
	541	n.a.	n.a.	0.38	0.62	0.31	0.47
	543	n.a.	n.a.	0.67	0.33	0.88	0.78
	543	n.a.	n.a.	0.58	0.42	0.83	0.58
Londrina	520	0.68	0.32	0.27	0.73	0.43	0.70
	520	0.64	0.36	0.76	0.33	1.36	0.88
	520	0.69	0.31	0.35	0.65	0.85	0.79
	681	0.67	0.33	0.60	0.40	0.33	0.27
Maringá	680	0.57	0.43	0.53	0.47	0.33	0.73
	534	0.93	0.07	0.81	0.19	0.75	0.74
	537	0.73	0.27	0.26	0.74	0.95	0.50
	537	0.73	0.27	0.45	0.55	1.18	0.58
Pres. Prudente	535	0.43	0.57	0.59	0.41	1.00	n.a.
	535	0.50	0.50	0.44	0.56	1.11	n.a.
	598	0.50	0.50	1.00	0.00	0.80	0.59
	598	1.00	0.00	0.23	0.77	1.41	0.75
Rib. Preto	411	0.26	0.74	0.58	0.42	0.28	0.34
	411	0.18	0.82	0.58	0.42	0.28	0.46
	413	0.71	0.29	0.75	0.25	0.81	1.00
	419	0.33	0.67	0.67	0.33	0.33	0.27
	415	0.34	0.66	0.92	0.08	0.26	n.a.
	415	0.83	0.17	0.77	0.23	0.53	n.a.
S. J. Campos	745	0.60	0.40	0.50	0.50	n.a.	0.83
	745	0.93	0.07	0.55	0.45	0.05	1.00
	743	0.67	0.33	1.00	0.00	0.33	0.67
	743	1.00	0.00	0.71	0.29	0.14	0.50
S. J. R. Preto	458	0.67	0.33	0.75	0.25	1.17	0.83
	458	0.80	0.20	0.25	0.75	n.a.	0.56
	435	0.67	0.33	0.55	0.45	0.78	0.33
	435	0.88	0.12	0.56	0.44	0.76	0.68

As it is intended to derive car flows from expected enplaning passengers, the relation of cars to enplaned passengers was also investigated. The following linear relation was assumed as acceptable:

$$\text{vehicles} = 4.61 + 0.72^{*} \text{ passengers } R^2 = 0.79$$

The value of the non zero intercept can be interpreted as cars generated within the regular air traffic flow for other reasons that are not associated with the enplaning and deplaning of passengers. Statistical tests have shown that the hypothesis that car arrivals within the traffic peak period follow a Poisson distribution cannot be rejected at the 0.05 confidence level, and that parking times follow an exponential distribution with an average of 2.03 min.

—vehicle arrival and exit distribution at parking lot

The following observations were considered valid for these types of airports: the parking spaces is in general much larger than required for regular air traffic service; as a general rule the areas have shade trees and are paved; they are located right in front of the terminal entrance; their entrances and exits are normally unmarked, and

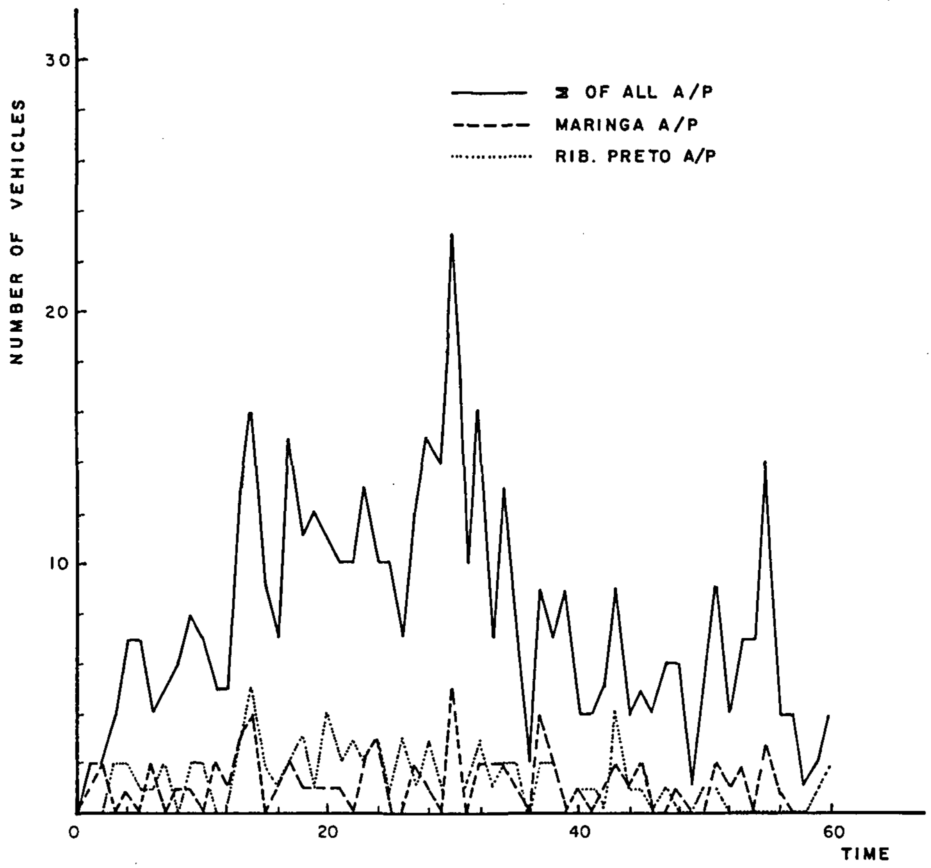

Figure 1 Car arrivals distribution at curb

there are no fees to be paid; as the size is small no traffic control is needed; taxis normally have a reserved area close to the curb access; the occupancy of the parking lot associated to regular air traffic starts approximately 60 min prior to STD for departing flights and 45 min prior to STA (scheduled time of arrival) for arriving flights; as a general rule there is a considerable number of parked cars that are not related to regular air traffic, operators (aeroclubs) and air taxi services. The quantity of these "captive" cars varies significantly from airport to airport depending on its size and on the size of the complementary operations. Figure 2 presents a curve of accumulated cars at the parking lot that is representative of the phenomenon. For the reasons previously presented however, each case has to be analysed separately.

Passenger and baggage processing:

—enplaning

The normal route followed by enplaning passengers is to go from the curb or the parking lot, directly to the check-in counter, carrying their own baggage. After being processed at the check-in, passengers use other terminal areas, concentrating in general in the main lobby. As terminal size is normally small and passengers can overview the process from the main lobby, departure lounges, when available, are underused, serving mainly as a corridor. When departure lounges are integrated to the main lobby and there are windows to the apron, passengers choose places where

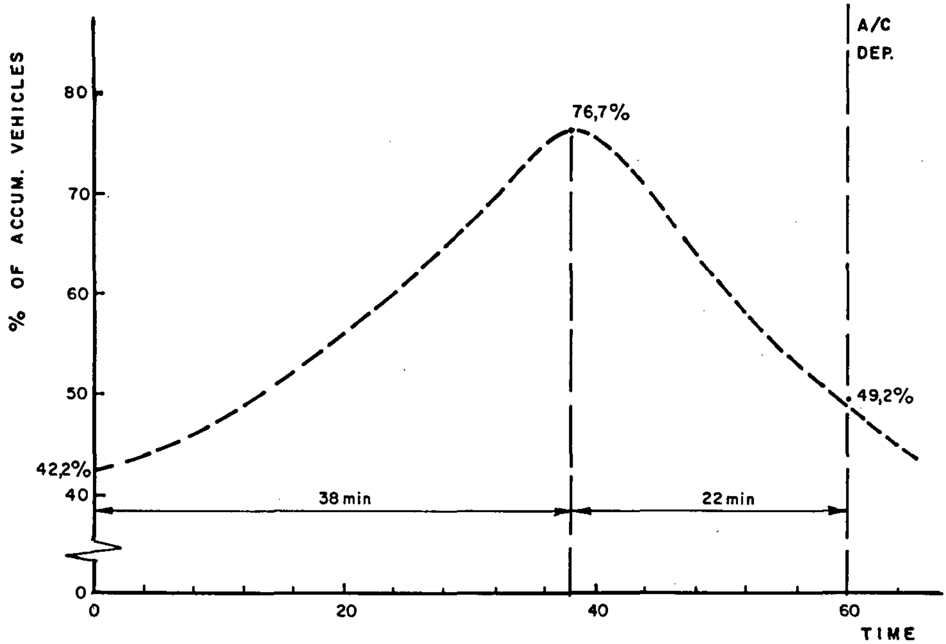

Figure 2 Car distribution at parking lot

they can observe the apron operations. Figure 3 presents a general overview of the processing characteristics at Ribeirão Preto during the morning departure peak period, which is representative of the phenomenon at all surveyed airports.

Baggage is transferred manually from the check-in counter to the baggage make-up area where it is assembled on carts that are pulled manually to the aircraft. The behavior of well-wishers is defined by the passenger behavior and normally they follow the passenger to the apron access door.

Table II presents data collected during the survey that show that the amount of baggage per passenger as well as the number of well-wishers per passenger have quite a large variation about the mean value even for flights that have the same flight number.

As the number of passengers is in general small, and passengers arrive relatively early to guarantee their reservations, operators normally use only one check-in counter to process their passengers. Each operator has one counter, even if airlines do not operate at the same time, because this counter is used also for other operations (ticket selling, reservations). Its size and layout is therefore different from check-in counters at large airport terminals. Each of the counters has normally one scale for weighing baggage.

As can be observed from Figure 3 check-in counter utilization is correlated to the arrival process at curb. The peak arrival flow can therefore be assumed as being a Poisson process within a 28 min period that occurs from STD minus 18 to STD minus 46, assuming a fixed 2 min period from arrival at curb to join the queue at check-in. During the survey it was verified that, although there is normally only one attendant at the counter, no cases of departure delays due to queueing at the check-in occurred. The largest queueing times observed were about 5 min.

Processing times at check-in varied widely. It was observed that they are dependent on passenger arrival flow, and a common technique to improve service is to change the operating procedure at the counter during peaks. Usually the manpower

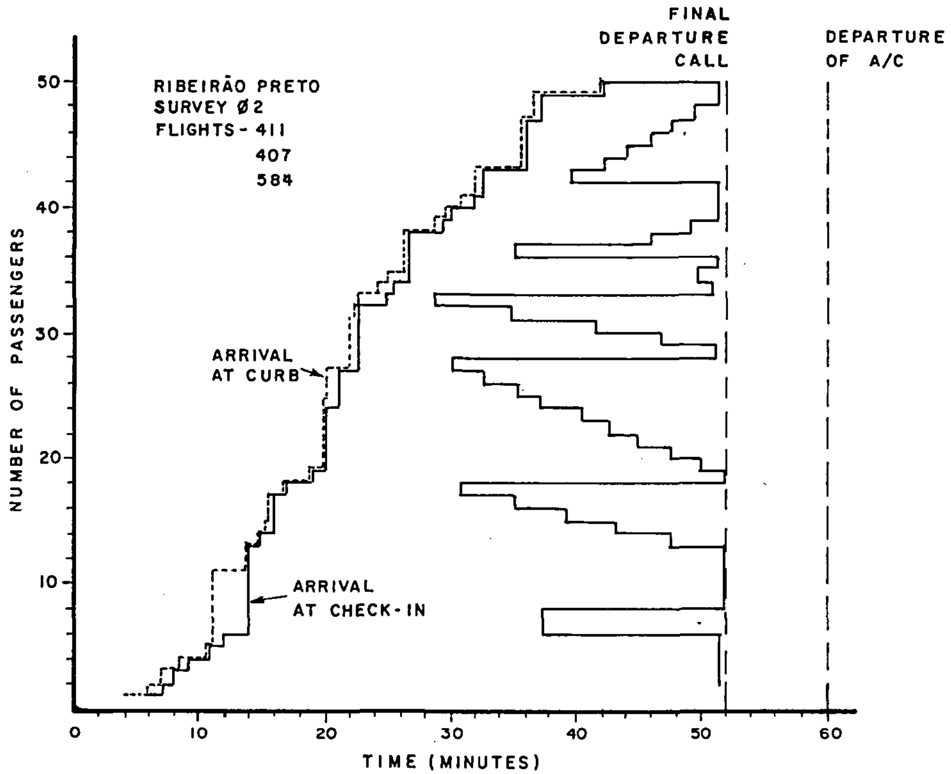

Figure 3 Enplaning flow characteristics

of the baggage processors is used to weigh and tag baggage at the counter during these periods, piling up the baggage within the counter. After the peak the operator resumes his baggage make up function. Another factor that introduces difficulties in measuring the service process is that it is not uncommon to have group processing at the counter that reduces service time. It was observed that on the average 80% of the passengers joined the check-in queue the extreme points being 100% and 50%. Service times measured during periods when steady state flow conditions could be assumed as a reasonable hypothesis, resulted in a second order Erlang distribution with a 1.15 min average. A check at peak flow conditions when more than one attendant was at work at the counter, showed that although there is only one scale, two attendants process about twice the flow of one attendant.

—deplaning

The normal process for deplaning passengers is to follow the shortest route from the aircraft to the baggage retrieval area and from there to the curb.

Only half of the surveyed airports have a segregated baggage retrieval area (Araçatuba, Franca, Londrina, Presidente Prudente and Ribeirão Preto). At some there is just a low shelf in the main hall, at others baggage is retrieved at the check-in counter, or directly from the cart that brings the baggage from the aircraft and is parked near the terminal.

There is no mechanical retrieval device at any of the surveyed airports, because of the simplicity of the process due to the relatively small number of passengers accumulated in the area. The process observed at the airports with a segregated area

Table III Characteristic operating times at the baggage retrieval area

	(Times measured from aircraft engine stop)					
Airport	Flight	Arrival FST PAX	Arrival LST PAX	Arrival FST bag	Arrival LST bag	Number bags
Araçatuba	458	2	10	9	11	11
	458	2	7	7	8	13
	540	2	5	5	6	6
	540	2	8	8	9	10
Bauru	540	4	5	9	11	4
	540	4	6	6	7	4
	542	4	5	8	12	10
	542	4	6	7	8	8
Maringá	534	3	8	14	15	14
	534	2	6	10	13	21
	537	3	4	11	12	8
	537	3	6	7	8	7
P. Prudente	534	3	10	10	11	8
	534	4	13	13	15	10
	536	4	8	9	10	11
	536	5	7	6	7	5
Rib. Preto	410	2	7	7	9	15
	408	4	7	6	8	12
	585	3	9	7	15	13
	414	4	10	9	11	21

is an all manual operation from the cart to a shelf, where an airline employee hands baggage over to the passengers at the same time checking tag numbers. The area is normally located at the terminal apron interface with a door large enough to permit the entrance of the cart from the airside.

Table III presents operating times relevant to the process, that show that usually all passengers are accumulated at the baggage retrieval area when the first baggage arrives.

From the baggage retrieval area passengers normally proceed directly to the curb queueing up for taxis and private cars, or walking across to the parking lot.

—transit/transfer

The majority of transit passengers stay on board of the aircraft due to the short stop over of the aircraft. When deplaning they behave in a way very similar to transfer passengers.

Transfer passengers have some influence only at three of the surveyed airports, due to the hub and spoke network characteristics that transform most airports into origin/destination nodes. The normal behavior of transfer passengers is to remain in the main lobby or the departing lounge waiting for the connecting flight. Transfer passengers are usually booked through, because connecting possibilities without prior reservation are very limited.

PROPOSED DESIGN MODELS

Design of large airports is normally based on peak-hour flows and/or on simulation of flows generated by several aircrafts of various capacities and seat occupancy factors (Ashford and Wright, chap. 8).[2]

For small traffic regional airports however, the peak flow is constituted normally by one, or at the largest regional "hubs" in Brasil, by at most three aircraft being processed simultaneously. In these conditions, seat factor and peak-hour flow concepts, do not work in practice, because the peak-flow is the one generated by a completely loaded aircraft, or in the case of Ribeirão Preto by one Fokker F-27 and two EMB-110 Bandeirantes (80 passengers), and as we shall see, a minimum level of facility for an expected aircraft type, or combination of two types, will offer reasonable levels of service.

Access and Parking System

Number of curb parking stands Based on the traffic survey results the following assumptions are considered valid: arrivals for up to three flights departing at the same time occur at random during a peak flow period of appoximately 20 minutes following a Poisson distribution; service times follow a negative exponential distribution; there are C independent parking stands with identical service characteristics; there is a single queue with FIFO discipline.

The phenomenon can therefore be represented by a traditional M/M/C queueing theory approach[3] with:

$$P_n = \frac{(C \times \rho)^n \times P_o}{n!} \quad \text{for} \quad n = 0, 1, \ldots, c-1$$

$$P_n = \frac{C^c \times \rho^n \times P_o}{C!} \quad \text{for} \quad n \geqslant C$$

with

$$P_o = \left[\frac{(C \times \rho)^c}{C!(1-\rho)} + \sum_{n=0}^{c-1} \frac{(C \times \rho)^n}{n!}\right]^{-1}$$

and

$$\rho = \frac{\lambda}{\mu} < 1$$

where: λ = average arrival flow (vehicle/min)
μ = average service flow (vehicle/min)
C = number of available parking stands
n = number of vehicles at curb at instant t
P_n = probability of having n vehicles in system

The measurement of performance in which one is interested, is a high level of probability that a vehicle arriving at the curb finds a parking stand.

Transforming departing passengers in a given flight into number of vehicles during the peak flow period, Table IV was derived, assuming parking time 2.03 min/car and a 95% probability that an arriving car finds a parking space.

Table IV Curb parking stands × number of passengers

Curb parking stands	Number of passengers
1	1 to 6
2	7 to 35
3	36 to 69
4	70 to 106

Number of slots at parking lot As pointed out in the survey results, the number of necessary parking slots is a function of two parameters, one dependent on passenger arrival flow and the other dependent on specific airport characteristics.

The number can be estimated by a simple formulation as proposed below, because the space is normally inexpensive and there is quite a large uncertainty in the estimation of the parameters.

$$\text{number of slots} = K1 + 4{,}61 + 0{,}72 \times PAX$$

K1 = function of airport
PAX = enplaning passengers

Table V Presents the model results as a function of number of enplanning passengers

Table V Number of parking lot slots × passengers

	Number of parking slots	
Passengers	K2	K1[a]
16	10	
32	17	
48	24	Variable
64	31	
80	37	

[a] Factors that influence the value of K1:
—number of airport employees
—expected activities of fixed base operators and/or aeroclubs.
—industrial activities (maintenance and repair)
—utilization of airport facilities like the restaurant by non airport users.

Passenger and Baggage Processing

Check-in counter At larger airports, where aircraft of more than 100 seats and the requirement of a large number of check-in counters are the common picture, this facility is normally designed using fluid approximations[4] and or tabulated values.[5]

As in the case of curb parking stands, when the number of service channels is small, fluid approximations do not lead to adequate estimations of level of service. Here we have been led to the utilization of a stochastic model of the queueing system that evaluates average waiting times and average number of passengers in system during the peak arrival flow period.

It was shown that during this period the queue can be represented by the theoretical M/E2/C queue the numerical results of which are tabulated by Hillier and Yu.[6] As the problem in this case is to guarantee a minimum level of service when arrival flows reach upper bounds for a minimum level of facilities, the following method was used. Considering 7 min and 5 passengers as upper bounds for average waiting time and average number in system during the peak arrival flow period, the maximum number of enplaning passengers which could be processed by respectively one and two attendants operating at one counter with one scale were calculated and the following results obtained:

—one attendant guarantees these levels of service for up to 38 enplaning passengers;
—two attendants are sufficent to provide these levels of service from 39 to 77 passengers;
—for more than 100 passengers being enplaned in one aircraft, or for example in three Fokker F-27s, either the level of service will be inferior (not uncommon at some trunk line airports) or a third person who only weighs baggage may be necessary (a procedure commonly used at many Brazilian airports).

As can be seen from these results an operation with several small aircraft at different times of day will in principle require less airport personnel than one 100 passenger aircraft operating once or twice a day. One has to point out however that at these airports, check-in counter installations are used also for ticket selling, reservations, etc., which leads to the fact that, each regional operator at the airport, will require his own check-in installation. The area requirements for check-in installations are therefore more related to number of operators then to traffic flow.

There was also no evidence at the surveyed airports that processing times are affected by trip purpose, and as can be observed on Table II, trip purpose split varies substantially even for same flight numbers.

Main lobby As described previously the main lobby is used in away that it is necessary to design the area capacity to permit the accumulation of all enplaning passengers, enplaning well-wishers, deplaning greeters and deplaning passengers, or at least to accommodate their flow through the lobby on their way to the curb. It is also necessary to consider that enplaning passengers and their well-wishers spend periods within this area that require seating opportunities.

The main lobby appeared initially to be the processor where trip purpose split could have the greatest impact on level of service in terms of total number of persons accumulated in the area. As however the results presented on Table II show, there was no possible correlation to be identified in terms of number of well-wishers or greeters as a function of trip purpose.

It is also necessary to consider the number of non regular users who might use the main lobby simultaneously for other operational or non-operational purposes (air-taxi services, aero club or fixed base operators activities).

Given the uncertainties in terms of total number of people expected in the area, and considering a subjective judgement of level of service offered at the surveyed airports, no elaborate method of providing space as a function of expected level of service like the ones described in Ashford[7] is considered a practical value. It is proposed that the area offers seats for 50% of regular users with an area of the order of 3 square meters/regular user (including the check-in counters and their queues).

As a reference to the problem, Table VI presents data associating number of enplaning passengers with total number of users involved in regular air traffic service at the surveyed airports.

Table VI Number regular users and enplaning passengers

No. of enplaning passengers	No. of well-wishers	Total of regular users
16	11	27
32	23	55
48	34	82
64	46	110
80	57	137

A minimum level of facility for the operation of an aircraft in the 15–20 seats range should have a main lobby of approximately 90 square meters. User concentration at some points of the main lobby, as check-in for example, and the main flow routes have to be treated on a case by case approach and considered in the architectural lay-out proposal so as to guarantee a reasonable level of service at these critical points.

Departure lounge As long as peak traffic is small, 30 to 40 departing passengers or less, in not more then two flights, no departure lounge is necessary. When traffic flows are larger and a departure lounge is convenient, it has to be designed so as to accommodate all passengers associated to one or more flights. The level of 2 service however does not have to be very high (0.8–1.0 m^2/passenger) because of the very small period of utilization of this area. Some seating opportunities should be provided for transfer passengers.

Baggage retrieval Usually all passengers travelling with dispatched baggage have already arrived before the first baggage arrives in the retrieval area. Therefore no elaborate modeling technique has to be used.[8] The area has to have enough space for the accumulation of all these passengers, preferably along a shelf (0.8–1.0 m^2/ passenger), where the airline or airport employee will convey baggage back to passengers

$$NPRA = NDP * 0.70$$

where NPRA = number of passengers at baggage retrieval
NDP = number of deplaning passengers
0.70 = average number of bags/deplaning passenger (average value observed at surveyed airports)

To minimize delays baggage should be transported as fast as possible from the aircraft to the baggage retrieval area. The bottleneck is the number of available carts and personel to handle carts and baggage.

Although operating characteristics varied from airport to airport and even for different flights at one airport, it was considered from observation that the following parameters are reasonable. With the usual type of cart one employee is sufficient to tow it manually from the aircraft to the terminal, to discharge its contents on the shelf and check tags of passengers and baggages during the hand over process. For normal sized baggage a cart can carry about 20 units. Table VII presents some estimates of the number of passengers accumulating in baggage retrieval area, the number of carts and the number of attendants as a function of the number of deplanting passengers.

Table VII Passengers and carts at baggage retrieval

# Deplaning	# Passengers	# Baggage pieces	# Carts	# Employees
16	9	11	1	1
32	18	22	1	1
48	27	33	2	2
64	36	44	2	2
80	45	55	3	3

Commercial facilities The area requirements for commercial facilities are variable and depend on the type of facility and the forecast potential users. The important aspect is not so much the dimensions of the areas, but their correct location within the terminal, so as to be visible and accessible but without obstructing main flow routes.

CONCLUSIONS AND COMMENTS

The analysis of the operational characteristics of the surveyed airports has shown that it is possible to model the phenomena with relatively simple tools.

Although parameters might have, in some cases, large variations about mean values, the relative simplicity of the operation and the acceptable changes in levels of service at the terminal processors warrant the use of the numerical results as reasonable estimates of the real requirements. It was shown that, at these small terminals, trip purpose split does not have any systematic effect on design parameters like luggage/pax or well-wishers/pax and therefore has little practical influence over level of service at design level.

If considerable changes in the operational procedures herein described can be forecast for a given airport, and new parameters can be inferred, it is likely that, for comparable traffic levels, the modeling technique continues to be valid.

A very important factor that has to be considered is that operators at these small regional airports can normally not afford large numbers of employees, because of the benefit/cost relationships involved, and they are likely to accept lower levels of service as long as aircraft depart on time.

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