

TRANSFER PASSENGER NEEDS AT AIRPORTS - HUMAN FACTORS IN TERMINAL DESIGN

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HUMAN FACTORS IN TERMINAL DESIGN

by

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Submitted to the Department of Architecture on May 6, 1982 in partial fulfillment of the requirements for the degree of Master of Science in Architecture.

Thesis Supervisor:  
Julian Beinart  
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**abstract**

This thesis analyzes the needs of particular users of airports: transfer passengers. The object of this work has been to produce a set of design guidelines for terminals. These guidelines are framed upon a user-need survey conducted at Boston/Logan International Airport. The investigation has been organized around three important aspects: 1) how present airport terminal environments affect human behavior; 2) what are the physical characteristics and consequences of terminal design on transfer passengers; 3) how can a broader approach to the design of terminals with passengers in mind be applied.

Current terminal design solutions have been "satisfactory" in terms of offering alternatives for incoming and departing passengers. Very few terminals though, are prepared to cope with an increasing number of transfer passengers. This study clarifies passengers' characteristics and highlights those issues important for those who need to change airplanes at an airport. These issues are: time involved in the transfer, means of arriving to the departing airline and the impact of the environment on the waiting passenger.

The design guidelines presented as the conclusion of this study are an attempt to accommodate a set of behavioral variables to a system of physical variables. This environmental design approach is a continuing effort to include the user into the programming and design of projects.

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# THE PROBLEM

We were looking forward to this vacation for a long time, but the trouble started back home when the kids almost drove me crazy while buying the tickets at our home airport. What happened after, though, I couldn't blame on the boys. I really don't know whom to blame.

We patiently waiting for our suitcases and asked for directions on how to transfer to the International terminal. "It's right next door," they said. "Go upstairs and you will see it." So we did. We followed signs that said International departures, but all we could find were the ticket counters of our same airline. We tried walking in the other direction to see if we could get a glimpse of the building next door. Tired of walking around with the suitcases, we decided to ask the janitor for the way out. He pointed to the exist but told us that the baggage carts we wanted to use had to remain in the building. We insisted it was impossible for us to carry three large pieces of luggage and two kids across the road, but nothing could be done. We felt so powerless!

A fellow passenger saw what was happening and inquired why hadn't the airline taken care of our suitcases? We looked at each other blankly. Do airlines do that for international flights also? My husband decided to investigate. After fifteen minutes he came back, took the luggage down and asked us not to move from where we were. He didn't want to risk getting us lost. By now the kids were really restless. How I wished there was someone or something to distract them.

There was supposed to be a bus that could take us from one building to another but somehow we were not at the appropriate level. Or was it that we couldn't find the bus stop? In any case we figured that the terminal was near enough to walk to. We could surely see it. The only thing we never thought of was that the approach was built for cars, not for people. There were no sidewalks! At least we were fortunate enough not to have been carrying our suitcases any more. We saw a lot of people in the same situation and they were carrying theirs!

We reached the next terminal and went in. I think it was some kind of Indian airline. The offices were empty and the only way inside was through a flight of stairs which ended in a closed door. We decided to try our way through those doors rather than go out in the cold again. The doorway opened into a very long corridor. Well, we thought to ourselves, if it is so long it must connect to all airlines. We walked and walked but all we could see were closed doors that looked like delivery entrances. Some had names on them, some not. We arrived at something that looked like a central hall. There were some shops and lots of seats with lots of people sleeping uncomfortably on them. We found out that all airline counters were one level below and that this area was for all passengers who already had been checked. Another very kind janitor (don't know what airports would be without them) opened a back door and directed us to our ticket counters. What a relief!

My brother Alan was supposed to meet us here at noon and it was already one



thirty. Our next plane was leaving at three. We had time enough not only to wait for Alan but to get bored, tired, angry, and, most of all, impatient. We were absolutely exhausted from walking and there was no place to sit. We finally gave up and sat on the floor. Fortunately, Johnny was asleep and little Mike was so tired that he couldn't get into trouble as usual.

Alan finally arrived. At least we had no further chance of getting lost somewhere. We sat quietly in the big gloomy hall and wondered why it had no windows. It would be so much better if you could even see the planes moving about outside. Together we dreamed of so many things to do with this idle time ... but reality was there and it was empty

This brief but tiring account is so familiar to all of us who use airports that it is difficult not to feel sympathy for the characters. After all, many of us can recount similar if not worse stories. The people in the story were all young and healthy, they had a fairly positive attitude, and they coped with adversity. Neither of them was scared of flying and they had plenty of time to catch their next flight. Such qualities are not common at all, but the mishaps they encountered are, unfortunately, very, very common.

Many issues are raised in this apparently harmless story, issues which involve all professionals in and related to the air travel industry. Airport planners, airline architects and designers, and airport managers are all interested in recognizing passenger needs in order to provide for them. This recognition, however, has been slow to come about, particularly in very congested terminals where the operational aspects have grown to be so complex that the human aspects are put aside for "mañana."

From the story we can pinpoint some of the serious problems which transfer passengers confront in any airport in any part of the world. Some of these problems can be easily solved by adding extra equipment to the facilities such as seats, carts, telephones, etc. Others require a deeper look into the architecture of the facility itself. Will we continue to design with the same thoughtlessness?

One major issue which is not reflected in this introduction is the present economic reality which has compelled airlines and airport administrations to make more extensive use of their present facilities instead of creating new and more expensive ones. This downward trend in airport expansion is in response to different reasons. Among others is the fact that airlines can accommodate larger numbers of passengers in the same number of flights due to larger aircraft capacity, thus reducing operation costs. This shift in aircraft type has caused also a change in route service; what was profitable with small planes is not with large ones (Rusconi-Clerici, I. 1976). This policy change has resulted in an overall decrease of direct flights. The trend is even more acute now in the 1980s, due to increasing operating and fuel costs which force all major carriers to concentrate their efforts in the more secure markets. All of this translates into a proportionate increase of transfer passengers at large hub airports.

Among all passenger types, provision for transfers is the least common. Up to very recently, transfers were viewed as a small number of people who happened to travel on non-commercial routes. Being such a small population, transfer problems were considered equal to incoming or departing passenger problems (I.C.A.O., 1966). This assumption prevailed until management of large airports such as Chicago's O'Hare and Atlanta/Hartsfield became aware that more than half of their yearly passenger population was using the terminals as changing stations and not as the origin/ending point of their travel (de Neufville, R., 1976).

As pointed out, given the present trends in the air industry, this situation is bound to become yet another problem for large existing airports. It is already a major concern for Washington/National, New York/Kennedy, Boston/Logan and Miami International, among others. These airports have been designed rather "efficiently" for the direct incoming and outgoing passenger, but are not prepared to deal with a growing number of people moving between facilities. This increasing number of persons has needs which are very specific in nature. Their goals are rather different from direct passenger goals; many transfer passengers spend considerable time at terminals. The questions then become: (1) Are terminals today providing for these particular needs? Which are the needs? (2) Can old spaces be made suitable enough to allow for a shift in the nature of the traffic? (3) Can passengers' comfort and airlines' decisions not to expand be compatible?

There are major difficulties when attempting to deal with the transfer problem at the design level. The first one is the unavailability of complete data on numbers of actual transfers. Many airports today gather this information but not all the movements are recorded. Statistics for international transfers, for example, are not available for security reasons. Statistics collected also do not include the movements of passengers within airports in the same hub, such as Washington's Dulles/National or New York's Kennedy/LaGuardia. In addition, collected data are not meaningful for designers interested in measuring "wants" of users and other qualitative evaluations. These more subjective data are much more difficult to obtain, very difficult to evaluate and almost impossible to verify. They are, however, the kinds of data which aid architects and designers when designing complex projects such as airport terminals.

A second difficulty on terminal design is two-fold. Up to now the design outcome has been a result of architects attempting to comply with increasingly complex

technical requirements without having a thorough understanding of the difficulties involved. On the other hand, design guidelines have been formulated by conscientious engineers and programmers who do not realize that these buildings house more than an intricate network of functions. Terminals handle a world of emotions, a world of human reactions to the unknown and uncontrollable.

In short, the object of this work is to present and illustrate an environmental design approach where human needs are framed in the functional and operational context. The environmental design view includes not only the traditional aspects of programming of a project but also sociological and psychological factors surrounding the activity. In this sense, the thesis will focus on three areas of concern:

- 1) A descriptive analysis of the setting and its particular users, i.e., transfer passengers;
- 2) Investigation of user needs at terminals;
- 3) Application of the findings through design guidelines.

**chapter 1**  
**CONTEXT**

## 1.1 The People

### Defining the Transfer Passenger

Different public and private organizations have defined the transfer passenger in different ways, mainly for the purpose of collecting data on passenger movement. Richard de Neufville (1978), notes that in the United States the Civil Aeronautics Board (CAB) collects data only on interstate passengers on scheduled carriers. This means that transfer movement between Los Angeles and San Francisco, for example, is not recorded. CAB defines the transfer passenger as an air originating passenger who stays at the airport for eight hours or less within a period of twenty-four hours.

de Neufville (1978) also notes that American Airlines (AA) defines the transfer passenger as an airborne passenger who stays four hours or less at the terminal.

These two definitions imply that transfers are only originated within the same airport, that their stay at terminals is not more than eight hours and, for CAB, changes of flights never occur after midnight. All of these assumptions are incorrect. From a passenger's point of view, he/she is a trans-

ferree until he takes his final flight, whether he/she has to change planes at a contiguous gate in the same terminal or whether he/she has to change airports to continue the voyage. More often than not, especially with international flights, these changes take place at odd early morning hours.

The International Civil Aviation Organization (ICAO, 1977) makes a difference between transit passengers and transfer passengers. ICAO specifies that transit passengers only stay at the terminal for the duration of the aircraft turnaround and that these passengers have no particular design need beyond that of arrival and departure passengers. ICAO categorizes transfers under three different types: domestic to domestic, international to international, and domestic to international (or vice versa).

de Neufville (1978) defines the transfer passenger as a person who arrives at an airport by air and whose principal interest is to connect with another flight. de Neufville (1976) has also recognized those passengers who move between terminal buildings searching for their parked car as "crypto" or hidden transfers. This type of passenger behaves like all other transfers in the sense that the latter usually are not provided with the appropriate pedestrian or vehicular connections between terminals or between terminals and parking areas. They are not provided either with orienting clues guiding them to their destination. Crypto-transfers are a definite problem in American airports where the proportion of passenger/drivers is very high. Two other types of passengers can also be included in the category of crypto-transfers; those who purchase a stand-by ticket and remain at the terminal for hours on end until a seat is assigned to them, and those who have missed their flight and remain in the terminals waiting for a connection. These last two types, even when they do not constitute a large group are the least protected of all passengers. Airlines will not be responsible for any suitcase storage or movement and, thus, pas-

passengers must remain with their luggage until the next flight is opened or their seat is assigned.

In effect, transfer passengers are all those who, having initiated a trip, make one stop or more at intermediate airports before reaching their final destination. There are five categories of transfers, each of them with very specific needs:

- a) Domestic to domestic transfers;
- b) International to domestic transfers;
- c) Domestic to International transfers;
- d) International to International transfers;
- e) Crypto-transfers.

Each of these categories can be further broken down into on-line (change of flight within the same airline) and off-line (change of flight and change of airline) transfers. On-line changes present almost no inconvenience for passengers other than loss of time. Off-line changes can take place within the same airport or at different airports within the same hub. Airlines may or may not, depending on individual policies, transfer suitcases within the same airport. They will not, in any case, transfer suitcases outside the airport.

Off-line and off-airport transfers take place in large airport hubs such as Paris, New York or London because all cities are not serviced from all airports. There is considerable ground movement between Kennedy/LaGuardia, Orly/DeGaulle or Gatwick/Heathrow. A transportation network is only created to satisfy the needs of transferring passengers who arrive and depart from different airports. These passengers certainly consider themselves as transfers. The amount of time they spend at the second airport can vary greatly and it is certainly longer than the time allowed for an off-line, on-airport, type of transfer.



## b. Transfer Passenger Characteristics

### Domestic to Domestic:

Short deplaning time. If on-line gates are either contiguous or very near. If off-line departing gates can be at the same building or at a different building depending on the scale of the airport.

### International to Domestic:

Passengers are required to clear immigration and customs at first arrival port. Suitcase handling may or may not be done directly by passengers after customs clearance. The terminal should provide transferring facilities for baggage and passengers. Location of departure gates can be at the same terminal, at a different building within the airport or at a different airport. Thus, usually time allowed for transferring depends directly on the departure gate location and the means available to get there.

### Domestic to International:

Passengers are usually freed from their suitcases at United States airports. This is not the case in other countries or when there is a change of airport. When change of airport is done at the same airport, airlines request at least one hour between flights in order to allow enough time for the passenger to go through the different processes.

### International to International:

This category of transfer is usually defined as transit. Passengers are required in some cases to stay in restricted areas of the airport until their departing time. The length of stay varies and depends on whether passengers are continuing their flight on the same aircraft of arrival or whether they are waiting for a different one. If the continuing flight is just a stopover, the length of stay is usually short but never less than one hour. If there is a change of airplane, the length

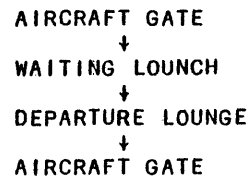
of stay can be as long as overnight.

Crypto-transfers:

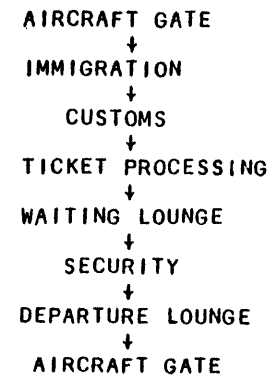
Passengers spend an undefined amount of time at terminals and remain with their suitcases until they reach their vehicles, a seat is assigned, or the continuing flight is open for ticketing. All of these situations are very uncomfortable for passengers unless they are provided with storage facilities and/or baggage carts to move through the terminals.

C. Transfer Flows

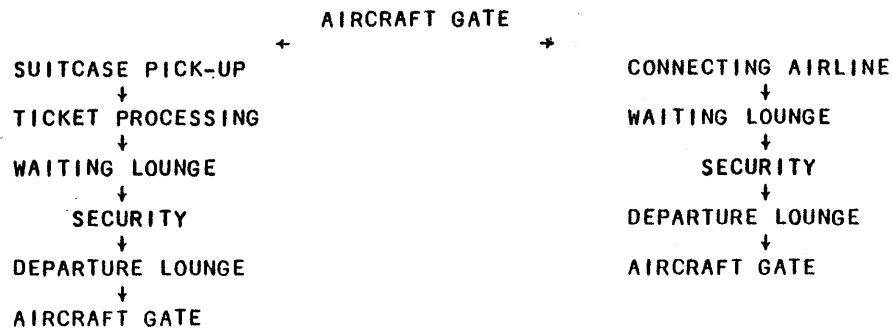
International to international transfer:



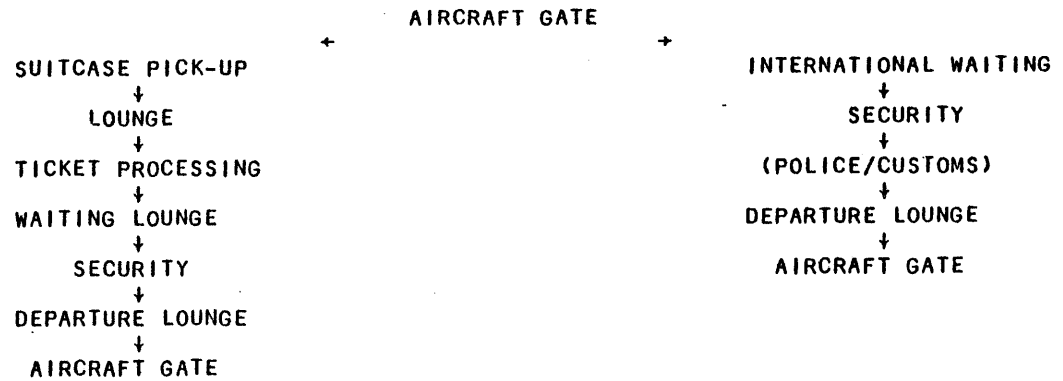
International to domestic transfer:



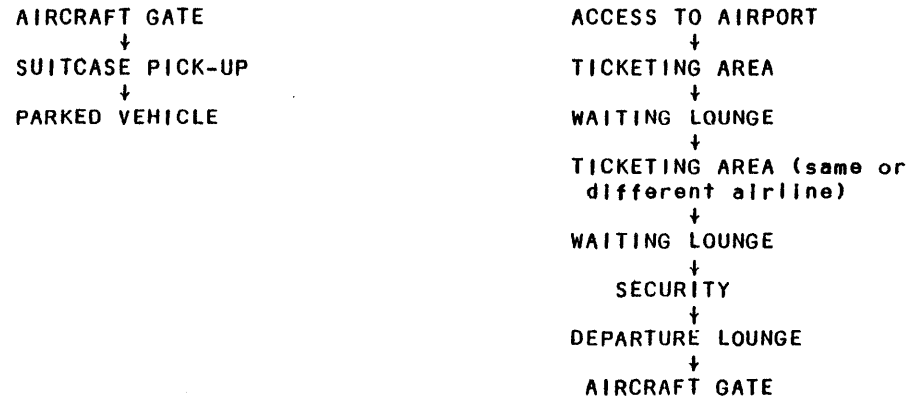
Domestic to domestic transfer (two possible routes):



Domestic to International transfer (two possible routes)



Crypto-transfers (two possible routes):



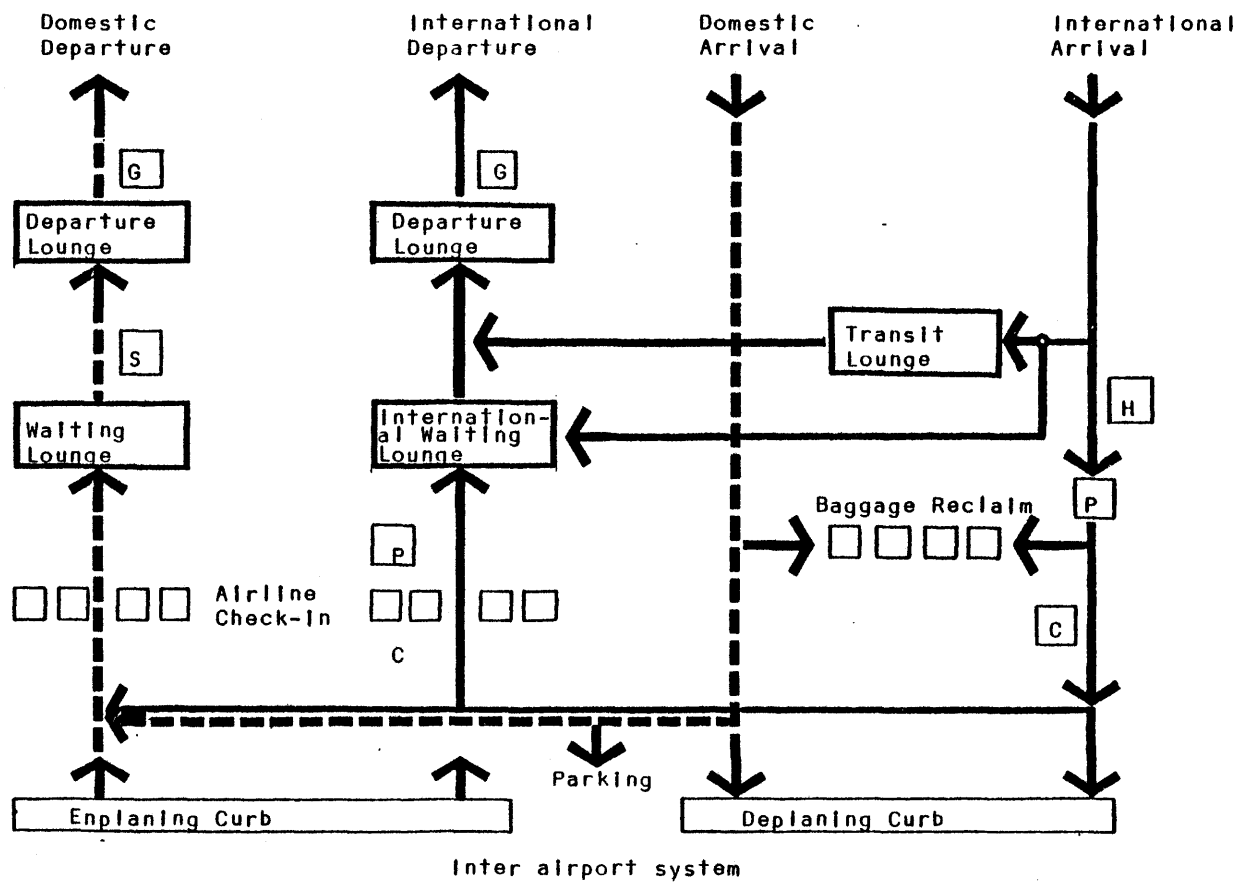


FIGURE 1. TRANSFER FLOW SYSTEM

Source: Ashford, N. and Wright, P., *Airport Engineering*, John Wiley & Sons, 1979, pp. 238.

All of these transfer flows should be interconnected with the appropriate circulation elements which facilitate movement from one step to the other. As it will be seen in the next section, this movement is greatly influenced by the shape of the terminal itself. The design concept defines the different elements necessary for the transfer activity.

### Goals and Objectives of Terminals

Airports today are designed to satisfy the needs of a diverse group of users; airlines, airport administrations, suppliers of all kinds, operators, workers, concessionaires, and, most important of all, passengers. Complex uses of airports raise two important questions; Who have airport terminals been designed for? Who should they be designed for? A simple but accurate answer is that airport terminals are transfer points for people and freight; all other uses are ancillary and serve as a support structure for this main objective.

Passenger objectives in terminals are defined in terms of accessibility to the necessary facilities. Transfer passenger objectives, in general terms, can be categorized as follows:

- a) Minimum delay in processings;
- b) Comfortably attainable walking distances;
- c) Pedestrian and/or vehicular linkages between airlines;
- d) Clear pedestrian connections to and from all critical steps of the passenger processing flows.

## 1.2 The Buildings

- e) Protection from climate in all external pedestrian routes if airport location requires it;
- f) Accessibility to information;
- g) Clear orientation patterns.

All of these objectives are within the realm of use of facilities. It can be said that the use of airport spaces is largely influenced by the passenger's perception of such spaces. For example, pedestrian routes can be perceived as being shorter if they are designed as pleasant walkways and not as mere connections. A last passenger objective, then, is to have aesthetic quality as part of the airport experience.

Since this research examines transfer passenger issues, it seems more appropriate to analyze terminals regarding the major activities in which passengers are grouped: 1) access, 2) departures, 3) arrivals, and 4) exit.

#### Access component:

The access component is formed by all the structures required for the handling of vehicular activity and the linkage of this activity to the terminal buildings. The access elements can be categorized into circulation, unloading and parking.

#### Departures component:

This component is formed by the necessary structures to accommodate the smooth processing of departing passengers. The elements required for this activity are: ticketing areas, waiting areas, support services, concourses, departure lounges and all interconnecting circulation elements. For some countries, police, tax and customs elements are also necessary.

#### Arrivals component:

This is formed by the necessary structures to accommodate the arriving activi-

ties: concourse and circulation areas, immigration hall, customs area, support services and suitcase pick-up areas.

Exit component:

This component is formed by the pedestrian and vehicular structures required to connect passengers to all available types of transportation modes, parking facilities and airport exit roadways.

The transfer activity takes place in all components of the terminal at the same time. Different transfer types will require different elements, but in general, it can be said that the transfer passenger experiences the airport in its totality, while arriving or departing passengers only use half of the terminal facilities.

#### Available Terminal Design Concepts

Airport terminals can be categorized according to their most distinctive characteristics. These characteristics define the size and number of activity spaces and determine which design concept will be used or should be used to satisfy the requirements (de Neufville, 1976).

The three available design concepts are:

- a) Centralized terminals with finger piers or centralized with satellites;
- b) Gate arrival terminals, and
- c) Transporter or open apron concept.

Some of the characteristics that determine the design concept are:

- a) Location: whether coastal (usually considered as airports which handle mostly originating/ending types of travel) or continental (usually considered as transfer points);

- b) Domestic airport, International airport or both;
- c) Nature of passenger traffic: mostly tourist, mostly business or both;
- d) Fluctuation of traffic: seasonal or yearly busy airports;
- e) Size: number of year operations and type of aircraft mix.

A separate characteristic appears in all United States airports where airlines prefer to service their passengers with individual terminal buildings. Thus all passenger activities are processed separately and differently. As a consequence, complications for users multiply when using airports as transfer points. This feature is not exclusive to United States airports. It is also a common trait of many International airports which handle a considerable volume of domestic activity. This transfer problem is observed when the international terminal is separate from the domestic terminal and when no clear linkage between them is available. A good example of this problem is Caracas/Maiquetia.

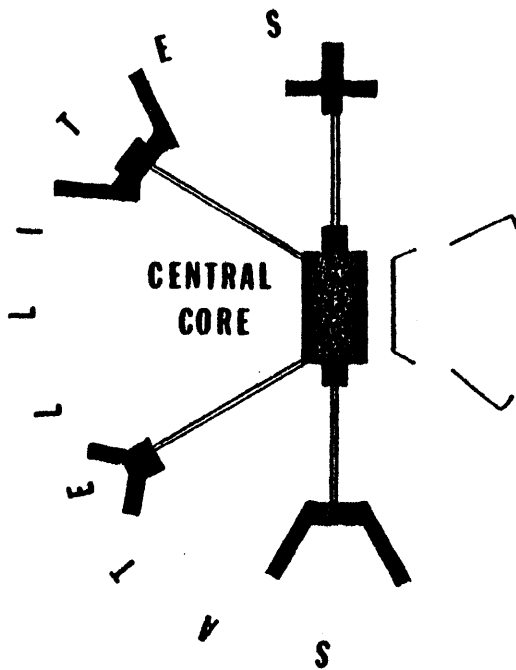


Figure 2 . TAMPA AIRPORT



### 1. Centralized Terminal

Terminals are categorized as centralized when there is a common area where all main activities are concentrated. All passengers have to go through the main building when entering, exiting or moving towards the finger piers or satellites. As a general observation, the central facilities are very large while the satellites or piers appear as weak branches of the same building. The only exception is the new Atlanta/Hartfield airport which was designed specifically to satisfy the requirements of transfer passenger movements and its central core's scale is considerably smaller. Transfer passengers here never reach the central core.

Centralized terminals have advantages for airline operators because main facilities are used intensively, baggage handling is localized in a fixed position and costs of check-in facilities are reduced. Passengers who transfer between flights also have advantages because all possible movements are within the same building. The main disadvantages of this configuration are the enormous walking distances and the confusing,

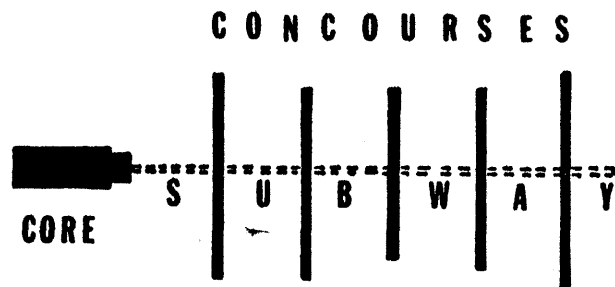


FIGURE 3. ATLANTA AIRPORT

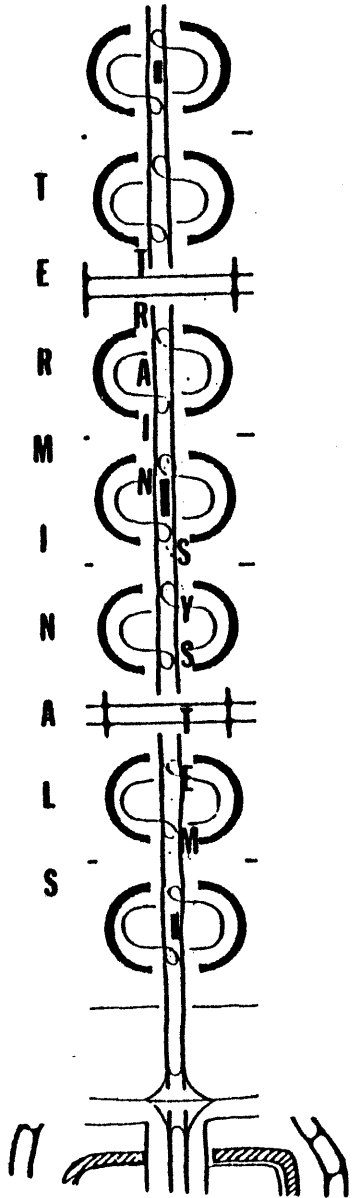


FIGURE 4. DALLAS/FT.WORTH AIRPORT

busy space through which all passengers are forced to go.

## 2. Gate Arrival Terminal

The gate arrival concept allows the departing and arriving passenger to go through the different processes in the fastest possible way. Gate arrival terminals work very well when airports handle mostly originating and ending trips. A good example is Rio De Janeiro/Galeão. Designers have managed to handle problems in a very efficient and aesthetic manner. This concept however does not work at all for transfer movements when there is more than one terminal building. An important example of the application of this concept and its consequences for transfer passengers is found at Dallas/Ft. Worth. A very costly train system had to be built to supply the necessary pedestrian links and passengers never recognize the terminal in which they arrive. Transfer passengers have to allow, as well, one full hour to make connections if they are changing terminals.

## 3. Transporter Concept

All passenger movements between terminals

and aircraft are done at the gate positions where aircraft park to receive and discharge passengers, load and mail. There are two types of aircraft stands; at terminal or remote.

When terminals rely on Apron Passenger Vehicles (APVs) to move passengers to and from aircraft, the terminal is categorized under the Transporter type. Most of the building structures are removed and substituted by vehicles. This concept was originally conceived by Eero Saarinen and applied to Washington/Dulles. The effect of this design concept for transfer passengers is very similar to that in the centralized concept. All pedestrian movements take place in the central facility which makes connections between gates relatively simple.

In real practice all airport terminals are usually a combination of these pure design concepts, especially those airports which have evolved over time, such as Boston/Logan or Miami International. At large United States airports where airlines are located in separated buildings, each building is the result of a particular design concept.

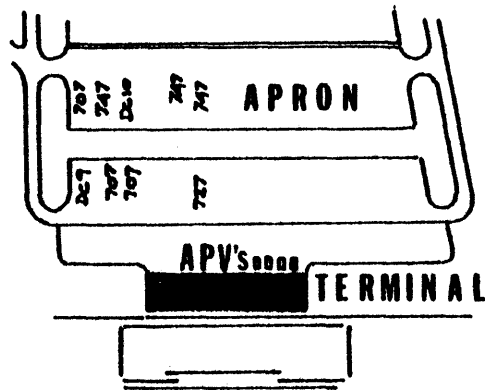


FIGURE 5 . TRANSPORTER CONCEPT  
Source: Airport Forum,  
No.1, 1975, pp.48 .

The effects on transfer passengers then not only are a result of the terminal layout but also of the airport layout. In the case of Boston/Logan, there is no linkage at present to interconnect the four terminal facilities. Transfer movements are slightly less than impossible if passengers do not use the inter-terminal bus, especially between the international and southwest terminals.

The context of the problem, the people and the buildings, has now been explained. Many questions regarding the validity of the present design outcome remain unanswered. Important questions emerge, such as: Why are not all airports culturally defined? What happens with the issue of waiting? Are passengers satisfied with the present terminal options? What happens in the transient world of transfer passengers? How can we reconcile the conflicting objectives of rapid air travel and slow terminal usage?

The following chapter will look at these questions as seen by the passenger/user. It will be assumed that all operational and functional requirements are met when

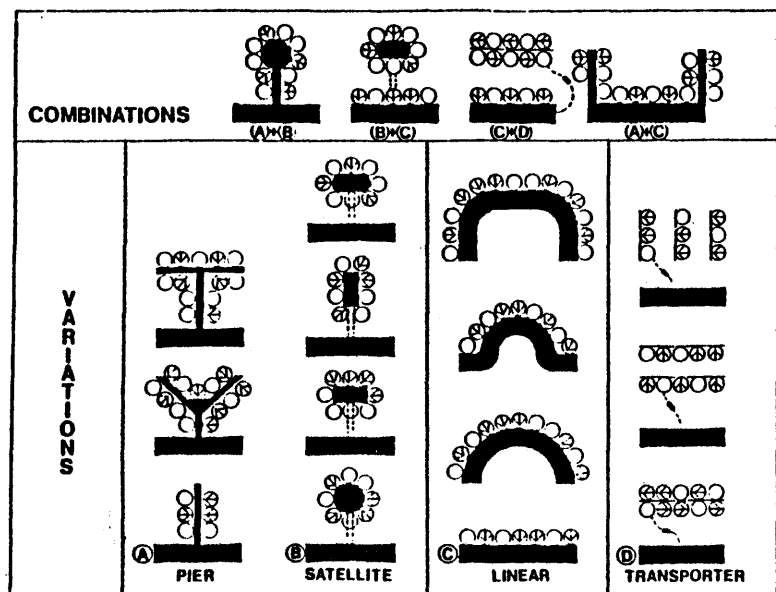


FIGURE 6. TERMINAL DESIGN.  
Available Concepts

Source: Architectural Record, Nov. '74, p.134

formulating the questions.

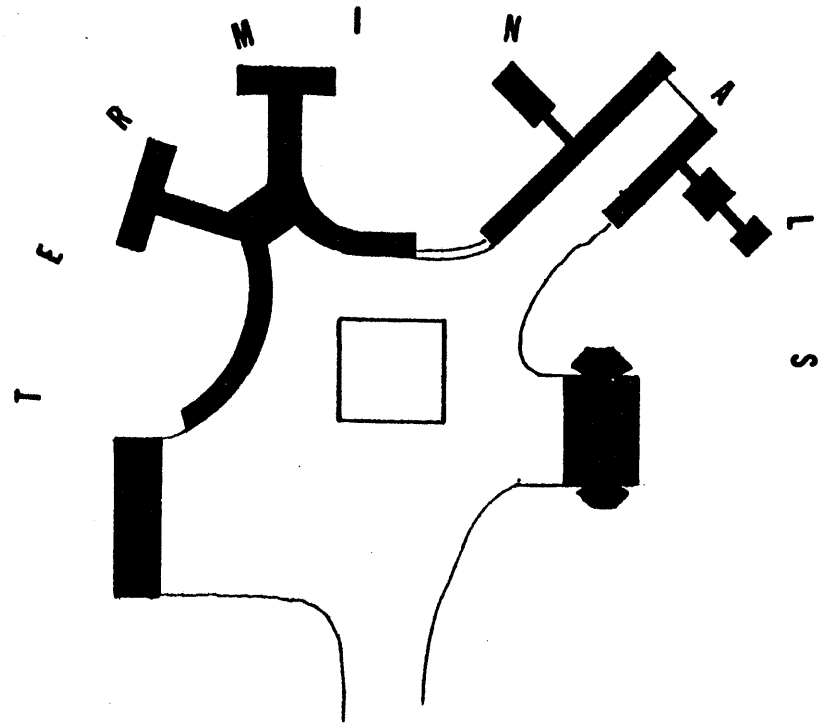


FIGURE 7. LOGAN AIRPORT LAYOUT

# **Chapter 2**

## **PASSENGER NEEDS**

The approach followed to establish passenger needs at terminals was to make a qualitative diagnosis of terminal environments as evaluated by passengers themselves. John Zeisel (1981) has defined diagnostic studies as those which help deepen the understanding of a setting (context); provide suggestive evidence on a broad realm; and offer insight into the structure and dynamics of a whole situation. In this sense, the procedure followed to analyze actual terminal environments was based upon a non-scientific sample survey of selected passengers (see Appendix). Stages of the methodology included:

- a) Pre-field questionnaires;
- b) Field survey of airport users;
- c) Analysis of both pre-field and airport survey results.

It should be noted that data collected in the airport survey are not representative of the variations in traffic that occur at Boston/Logan throughout the year. There is a much more intense use of facilities during the summer months. Passenger problems then become more obvious and critical.

The survey does not cover, either, inter-

## 2.1 Methodology

airport transfer problems because Logan is the only major airport servicing the city.

Other statistical sources have been used to confirm results of this investigation, mainly "Passenger Survey General Tabulations," by Cambridge Systematics, and a summary of observations for the course "Airport Planning and Design," taught at Massachusetts Institute of Technology during the spring of 1981 (see Appendix ).

The pre-field questionnaire sample consisted of forty cases. All respondents were graduate students and professionals from the Boston area. This sample was selected on the premise that choices made by them were not biased by age, physical handicap or ignorance. In other words, if such a privileged group finds problems or is affected by actual terminal design, average people will have problems as well.

The main purpose of the pre-test was to define the key design variables, the common important issues for all passengers. Respondents were placed in hypothetical transfer scenarios from where they selected critical aspects of the terminal environment. The structure of the final passenger survey was based on these variables.

The passenger survey sample consisted of forty-two cases. The selected format was a combination of interview and questionnaire. Questions were used to measure data, but personal observations were recorded in order to follow further lines of inquiry. Interviews were conducted at Logan International Airport's four main terminals between March 7 and March 16, 1982. Interviews were carried out at different hours of the day on different days of the week. Weather conditions were (in all cases) almost perfect. No interview was done after 8 p.m. because airplane traffic sharply decreases at night. All passengers were selected from the different terminals' waiting areas, not in bars or restaurants.



One of the challenges of environmental design is the definition of those critical aspects which influence human behavior. The pre-field questionnaires served to identify three issues common for all transfer travellers: the amount of null time spend waiting for the next flight; the extensive route that has to be traversed in order to reach the next objective; the impact of the surrounding environment on human response in relation to security, pleasantness or interest.

Given the infinite number of air-route combinations there is not much architects can do regarding the length of waiting time. Much can be done, however, to make this compulsory stay more pleasant and productive. In this regard, the field survey concentrated on the following environmental variables: TIME, ORIENTATION and ENVIRONMENT.

#### TIME

Time is related to passenger usage of space in a direct way. The key characteristic of this variable is to find out what do transfer passengers do with the amount of nulled time they have on their hands. To clarify

## 2.2 Design Variables

this issue becomes a very important aspect of terminal programming and design.

#### ORIENTATION

Orientation appeared as the second common problem for respondents. It is actually the most troublesome issue for transfer passengers. The interconnection of pedestrian routes and their identification and location are the major reason for discomfort, frustration and anxiety to travellers (Braaksma and Cook, 1980). It is equally frustrating for the designer to lay-out the terminal so as to minimize disorientation when there is no available tool to help him other than the not-so-common sense.

#### ENVIRONMENT

"Relating environment to passenger terminal design does not require revolutionary concepts. It does demand increasing awareness of basic design principles." (Fruin, 1972). Pre-test respondents showed a large concern for the internal environment of terminals. Issues of comfort and quality were raised. For example; light, sound and aesthetical quality emerged as important to all terminal users. These issues are normal inputs in the design of spaces; they are also very subjective characteristics.

The following chapter sections will review in depth the results of the survey as related to these three concepts.

Terminals are totally controlled environments, very much like hospitals. Users know that their behavior is restricted to so many activities which they are allowed to perform. In between these activities a rather large amount of other time is spent. This time dimension is especially important in view of the fact that many airports, to be self-sustaining, depend on the profitability of their ancillary services (Ashford and Wright, 1979). It can be argued that, if passengers are provided with the type of services they are looking for, and these services are organized clearly within the critical areas, passenger needs then will be satisfied in a cost-effective manner.

Questionnaires were designed to find out: a) how do passengers actually distribute their time in the different services and amenities and b) how they would prefer to spend their time given a finite set of options.

The Logan passenger survey demonstrated that for some passengers the transfer waiting time is longer than the four hour span defined by American Airlines. 27% of respondents stayed up to 2 hours, 48% spent between 2 and

## 2.3 Time

TIME  
(In minutes)

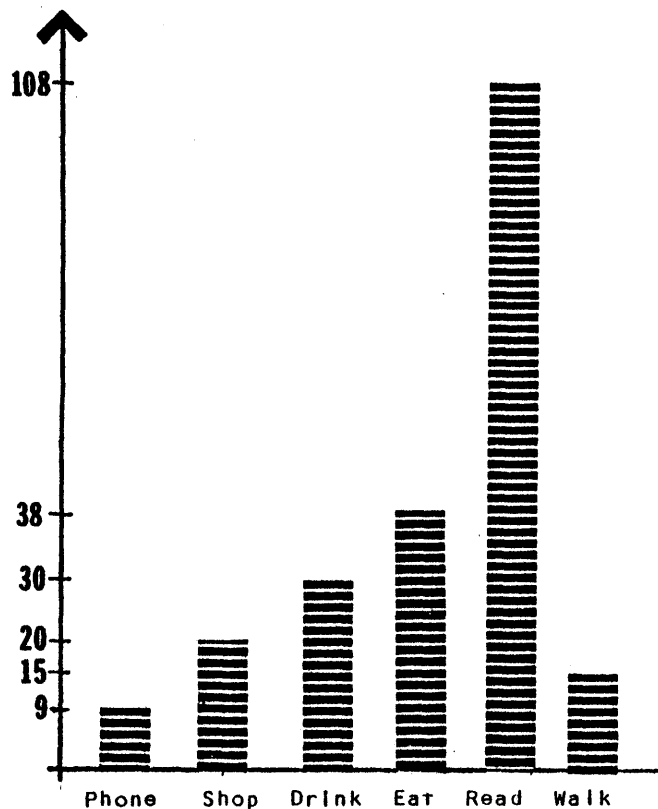
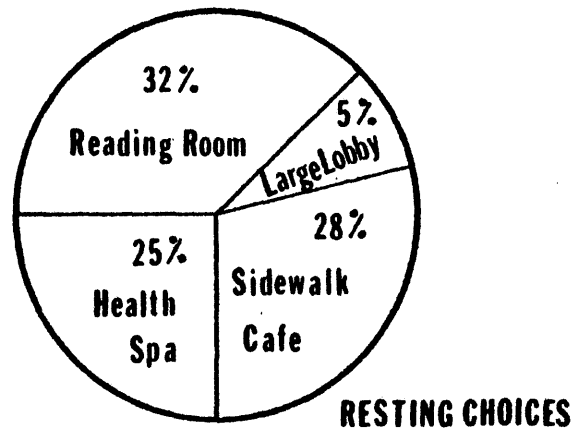
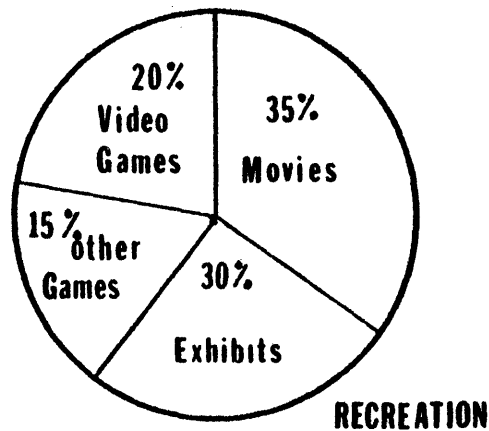
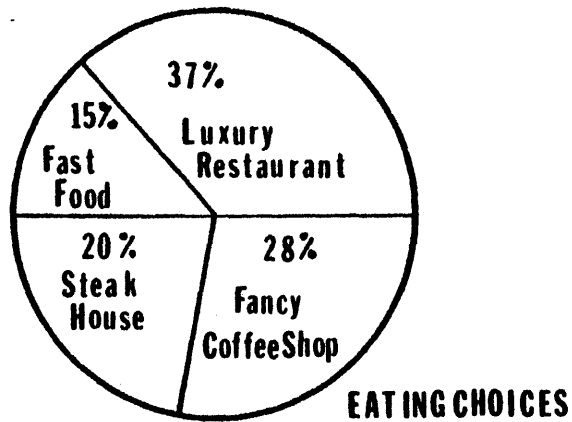


FIGURE 8. AVERAGE TIME SPENT ON ACTIVITIES  
For passengers staying three or more hours at  
the terminals.

4 hours, and 15% spent from 4 and up to 12 hours waiting for their connection.

These percentages are not representative of the totality of transfer passengers at Logan. Passengers with less than 45 minutes between flights had not time enough to answer the questionnaire. This time distribution does not include those passengers defined as crypto-transfers; only two passengers interviewed had missed their flight (and had a six-hour wait). A third one has a twelve-hour wait for a standby seat. Crypto-transfer numbers greatly increase during late spring and summer because of cheap student fares. They also increase when weather conditions are poor or when any delay or accident occurs.

During the span of time spent at terminals most transfer passengers who were there for more than one hour stayed at the waiting areas either reading, working or walking about. The periods in which they engaged in some kind of activity such as eating, drinking or shopping, was very short in comparison to the total amount of time they had to waste. It became very apparent that passeng-



ers spend more than one third of their available time reading to kill boredom. They do it in the only available space for it -- the waiting areas.

Both reading and walking were the two activities in which almost all transfers engaged. They did so more out of necessity than out of pleasure. Walking through terminal areas has a very particular characteristic; time spent walking is a direct function of terminal design and of number of people travelling together. Passengers travelling along spend less time walking (around five minutes) than passengers in couples (around twelve minutes walking). Terminal design consequences on strollers are characteristics which are further explained in Section 4 of this research.

Out of the 55% of passengers who used the shopping areas, little more than half of them did so to purchase minor souvenirs or reading material. The rest of the people used the shopping areas to distract themselves by browsing. Many passengers complained of the cost of items at the airport. Others pointed out the necessity of provid-

ing material as well as writing surfaces. One very creative passenger suggested that a small library where passengers could borrow books would be a good idea for terminals. Passengers at Logan made their purchases mostly at the news stands. This pattern, however, is not a generalized one. It has been observed at other airport terminals, with a wider variety of shopping areas, that passengers purchase items which are small or tax-free. It does not matter what the purchased object is; what becomes important is that it is not perceived as a heavy burden.

Shops become necessary for waiting passengers. They give them an excuse to spend their time while moving about. It was observed that passengers are more attracted to the kiosk-type concession than to regular store-type. It seems that passengers feel pressured to buy when there is a straightforward window exhibit, while slightly disorganized stands give the sensation of free browsing.

One out of two transfer passengers had something to eat in the different facilities. The average time spent eating was slightly more than half an hour. Passengers had two major observations regarding the eating places; for some passengers eating facilities were too expensive, for others, quality of food served was very poor. Both arguments are not mutually exclusive. It would appear that better food would be more expensive. In reality, what passengers are saying is that a variety of choices is necessary. It is a fact that passenger population is not homogeneous. 57% of passengers are willing to pay more for quality, while 30% of passengers require cheaper, more accessible food options. The selection of eating choices is directly related to time spent at terminals and time of day. Passengers staying three or more hours at the terminals expressed their preference to eat in a fine restaurant or a fancy coffee shop; passengers staying up to two hours preferred a cafe or fast food place. This selection means that passengers who are forced to wait prefer to do it in a pleasant environment where time is a factor that does not count. The general

perception is that food at expensive restaurants takes a long time to be served. Time in these places is spent in an atmosphere of attention to small detail which justifies the expense and the waiting. Food here becomes the excuse, not the purpose.

It was assumed, when formulating this research, that airport users who were required to spend long periods of time at terminals would prefer to have some active recreation options. Time could be spent playing some kind of table game, or sport. Results of the passenger survey proved this assumption wrong. Passengers prefer passive recreation as long as the surrounding environment provides comfort and is aesthetically pleasant.

This preference can be explained in several ways: 1) Air travellers are mostly concerned with catching a plane, and as a consequence, they are afraid to engage in any type of activity requiring concentration. Time would be out of their control. In brief, passengers are afraid of missing their flight if they become distracted; 2) Amenities with which passengers are familiar are not designed attractively enough to make passengers use them. Passengers interviewed at south terminal explained they did not use the video games room at the waiting lounge because they did not know it was there or because the entrance was not inviting. It is dark and "you can't see the airplanes from there." In other words, the game room is not well-located, not attractively designed and has no relation to the surrounding context.

Drawing some conclusions, it can be said that whatever amenities exist at air terminals, they have to be related to the flying activity itself, visually and spatially. Passengers have to feel they form part of a whole environment. Isolation and quietness are two very different qualities.

Passengers also prefer to wait quietly in a relaxed environment with a variety of eating options, a cinema, small shops, an exhibition, comfortable seating

spaces with appropriate light for reading and a pleasant walking circuit.

Relating time to transfer passengers is a complex issue. It depends on which are the steps to be completed in the transferring process, location of the different activities and the means available to move from one activity to the other. Time is a concept that varies with expectations. It is perceived differently according to location, type of activity performed and individuals.

Passengers with a short transfer time (one hour or less) view time as a measure of efficiency. These passengers require fast service along the different processing steps. They perceptually divide available time according to the number of activities in which they must engage. For an international passenger continuing on a domestic flight within the hour, time is mentally divided into fourths: one quarter for suitcase processing, a quarter for transportation or movement to his next airline, another for ticketing or rechecking and the last quarter for departing. Time is here a cause for anxiety if any of the four steps gets delayed more than expected.

Passengers who have between one and two hours between planes have a much more relaxed attitude. Their concept of efficiency is not as severe. Perceptually, time starts to get divided in a different way. Depending on how long the first step is delayed, an adjustment in time frames for the other steps will take place.

Time becomes a luxury for those passengers who must stay three or more hours. Since behavior is restricted to a finite set of options, these options have to be filled with comfort and quality. Both these descriptors are an example of detailed observation, not of precision or efficiency.

The following chart gives a relationship of walking times at Logan airport. It measures transfer time between one airline and another, at normal to slow walking speed (approximately one meter per second) carrying no hand luggage and, most importantly, knowing the way.



The point made by the chart is what leads to the next step of this research. Transfer walking times are considerably distorted when passengers do not know their way through the terminals. As will be proven, orientation is one of the most important objectives in the design of terminals. In short, terminals must satisfy the double requirement of efficiency in processing times, including time spent connecting, and to satisfy, as well, the need for spending long waiting time comfortably.

EASTERN								
AMERICAN	9							
NORTHWEST ORIENT	10	2						
U.S. AIR	8	4	3					
PIEDMONT	10	4	6	5				
AIR CANADA	16	8	11	10	5			
DELTA-TWA- UNITED	14	6	9	8	3	3		
NEW YORK AIR	21	16	17	18	9	5	6	
INTERNATIONAL AIRLINES	22	17	18	19	10	6	7	1
	EA	AA	NWO	USA	PD	AC	DL TWA	NYA

FIGURE 9. AVERAGE WALKING TIMES BETWEEN AIRLINES AT LOGAN. At a slow pace, with no luggage and knowing the way.

This section will focus on orientation. Where are the critical points and what the role of information is. Orientation as defined by Webster's Dictionary is the familiarization with and adaptation to a situation or environment; is the interpretation of the environment as to time, space, objects and persons. The premise underlying this variable is that terminal environments are usually not clearly designed. They produce disorientation, confusion and anxiety, especially for transfer passengers who are not familiar with a specific airport or terminal. The key questions to verify here are: a) What is the role of information -- where should it be located and what type of information is necessary? b) How can circulation routes be clearly defined to minimize disorientation and confusion? c) How can spaces be made physically and visually accessible to all passengers?

Questions have to be asked directly regarding specific spaces or sets of spaces in which passengers move or have moved during their transfer route. Major interline movements within Logan airport have been analyzed and categorized in Figure 3. Information in

## 2.4 Orientation

In this matrix indicates: a) the type of pedestrian routes, whether it is indoors, I, outdoors, O, or both in- and outdoors, I-O; b) existence (yes) or absence (no) of signs for pedestrians moving between terminals.

There is no handicapped accessibility where routes in the matrix are marked indoor/outdoor or outdoor. All four terminals handle arrivals and departures to and from aircraft at the second level, but all public transportation is handled at the first level. Volpe terminal (International) has its ticketing areas at the first level; Eastern, South and North terminals have the ticketing areas at the second level. Eastern and Volpe (International) terminals are separate disconnected buildings. Transfer passengers who have to go through the suitcase pick-up areas at North or South terminals have to change levels in order to reach the pedestrian link to the neighboring terminal. Transfer passengers moving to and from Eastern or Volpe have to go outdoors at the first level, identify their departure terminal and, with luck, reach their connecting airline departure area.

AIR CANADA									
DELTA TWA	I* YES								
UNITED	I NO	I YES							
EASTERN	I-O NO	I-O NO	I-O NO						
PIEDMONT	I* YES	I YES	I YES	I-O NO					
AMERICAN AIRLINES	I NO	I NO	I NO	I-O NO	I NO				
U.S. AIR	O-I NO	O-I NO	O-I NO	O-I NO	O-I NO	O YES			
N.WEST ORIENT	I NO	I NO	I NO	O-I NO	I NO	I YES	O YES		
Airlines at VOLPE	O-I NO	O-I NO	O-I NO	O-I NO	O-I NO	O-I NO	O-I NO	O-I NO	O-I NO
	AC	DL	UA	EA	PD	AA	USA	NWO	

FIGURE 10. PASSENGER ACCESSIBILITY AT LOGAN

\*Internal connection, but not handicapped accessibility because of level change

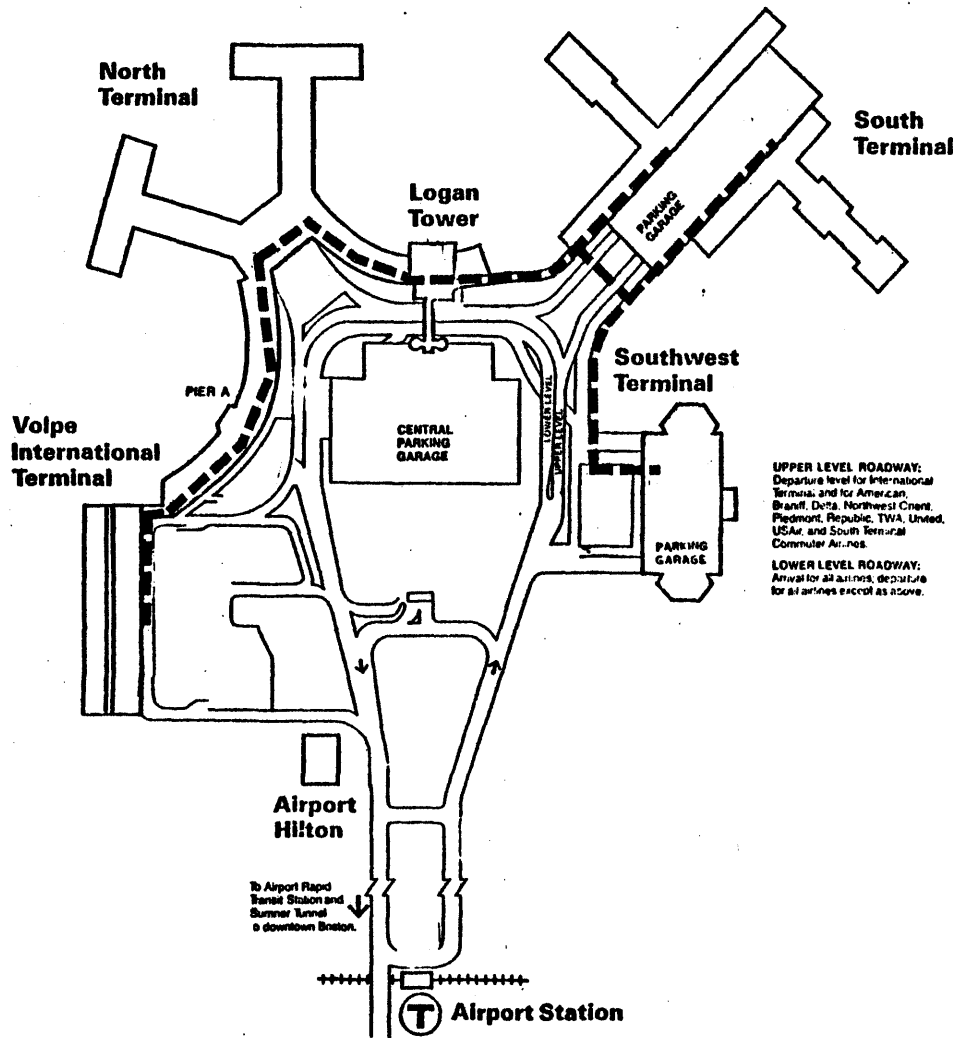


FIGURE 11. EXPECTED INTERLINE PEDESTRIAN ROUTES AT LOGAN AIRPORT

Figure 11 depicts the expected pedestrian routes at Logan. Because of the lack of appropriate signs or well-marked paths, passengers are forced to find their own way to the appropriate departure terminal.

Transfer passengers were asked to remember in which part of their route they required information or assistance. Modal responses were invariably for the gate arrival area, the terminal exit doors and midway between one building the other when a change of building was necessary.

The data showed that 26% of all transfers had used the inter-terminal bus or other vehicular means to arrive at their departing terminal. Out of the 74% who reached the departing area on foot, 35% of them did so because they transferred planes within the same airline or between neighboring airlines. The remaining 35% were passengers who had to change terminals. Half of these passengers had some problem in reaching their destination because of lack of orientation or appropriate signs. It means that one out of two passengers walking inter-terminals become disoriented. These data are confirmed

by the summary of observations made by MIT students (see Appendix). Over half of these students made some mistake when moving from one terminal to the other. It can be safely assumed that if the volume of transfers increases at Logan, problems will increase in the same proportion.

Delta and TWA have partially solved the problem for the airport in the sense that they try to make their passengers continue their flights using the same airline. For international passengers arriving on TWA this system has disadvantages. Passengers have difficulty in understanding that their departing gate is at a different building from that at which they arrived. They cannot "see" the connection, must less figure out they can go walking.

The most common errors in using the pedestrian connections at Logan were: a) difficulty in reaching the second level passage from the suitcase pick-up areas at south and north terminals and from the central garage; b) missing the bridge which connects the two wings of south terminal; c) walking the car route from Eastern to north; d) missing the passageway from north to Volpe.

Another significant issue that became clear within the survey was the fact that 30% of transfer passengers carried their luggage to the departure terminal. half of these passengers were travelling with small suitcases or no suitcases. The other half had some kind of problem such as needing a ticket re-issued or missing their flight. Two passengers interviewed during their transfer between two TWA flights, in from Paris and en route to Washington, D.C., were carrying their suitcases because they did not know the airline provided that service at the customs area.

All of this translates into the fact of slower walking speed than that specified in the transfer times chart (Figure ). It can take a normal passenger up to half an hour to walk from Northwest Orient to Alitalia, if he doesn't know the way.

Other cases of lack of information and disorientation were cited. One of the most critical was the explanation two passengers gave when interviewed at north terminal. They had arrived by Air Canada and were leaving by New York Air, which is located in the international terminal. They said they were at north terminal because they were hungry and found no place to eat at Volpe. It must be said that Volpe is serviced by a cafeteria and a restaurant at the second level, but these services are not made obvious to the arriving passenger.

A third case of disorientation, observed but not measured, was that of passengers getting lost looking for their parked vehicle. In the words of the general manager for Logan Airport, at least once a day a Massport vehicle cruises around the central garage with a returning passenger who does not remember where his car is located. Today Logan is undergoing an identification project where all levels of the garage will be marked with sports figures in order to solve the problem.

Regarding the problem of accessibility, which is part of the general orientation context, 50% of inter-terminal passengers did not use the bus because they did not know it existed. Passengers who did use the bus expressed that the fact that there were two different buses was not obvious. Drivers, in these cases, have to fulfill the function of information booths. As a consequence, bus loop timing is slowed.

Signs were another problem, not only because of their location but because passengers in general prefer to ask a person. Human contact is always preferred to a well-designed and well-located sign. This was confirmed by asking passengers to select their preference, given the options of signs or information booths. The five passengers responding preferred information booths, when they were not familiar with the place, and signs when they were familiar with the terminal. They said

they felt more secure in an unfamiliar place when directions were given in detail and with orientation clues. Examples given included time, distance and landmark clues, all of which provided a sense of security not offered by signs alone. Once directions were clearly given, passengers still searched for signs to confirm their way.

Some passengers have mental images of what to expect at an airport. Two transfers looking for TWA departures arrived at the TWA luggage reclaim area instead. They were immediately aware that they were in the right place but at the wrong level. They were convinced that baggage areas were always on the lower level while ticket counters were above.

This explanation is certainly valid for most American airports and perhaps it is the reason international travellers become lost. Maybe the mental image of a place is defined by design patterns used in the different countries. It is, in any case, a very interesting observation of expected pattern structure in a building.

In summary, it can be said that a two-fold problem of orientation exists throughout the airport system. It involves both horizontal and vertical circulation paths. Passengers can orient themselves when they see a familiar landmark or sign. Since the nature of transfers is that of unfamiliarity with a terminal, the only remaining alternative is to provide a clear information system.

Orientation becomes a larger problem than appropriate location of information. A complete direction system involving visual, aural and tactile clues should be part of the whole communication network of a terminal (Braaksma & Cook, 1980). The visual stimulus still remains the most important orientation means, but it should be reinforced by the use of loudspeakers, booths, telephones and textured surfaces.

Sign location and installation cannot be generalized; each site has its particular characteristics and as such as to be evaluated separately. However, there are critical points where passengers should be "taught" how the information system of a terminal works. These critical points are all accesses and exits. Passengers entering by car or plane should be able to see clearly to a general directory or map where airport symbols appear. This initial information need not be specific or contain all possible directions. It is the initiation of a route where the first steps are marked and where location of more detailed information can be obtained.

Information should also appear at exits following the same general rules of simplicity: a) where pedestrian paths divide or cross; b) at suitcase pick-up areas; c) right after terminal exit doors.

In short, orientation is a process that follows progressive steps:

1. Sense of one's location;
2. Location of desired target;
3. Direction of travel to desired target;
4. Awareness of level changes, if any;
5. Reassurance of correctness of direction;
6. Identification of target.

Status orientation (steps 1, 2 and 6) can be achieved with graphic indicators. Motion orientation (steps 3 and 5) should be a composite of visual clues -- color, directness of path, or signs -- acoustical clues (telephones, personnel) and surface treatment clues.

Accessibility and directness of paths are the keys to good orientation; accessibility in physical and visual terms. As a general rule, space accessible for the handicapped is accessible to all. In this sense, design of spaces should take into account, from the very beginning, the access needs of the handicapped, elderly and passengers using equipment such as luggage carts.



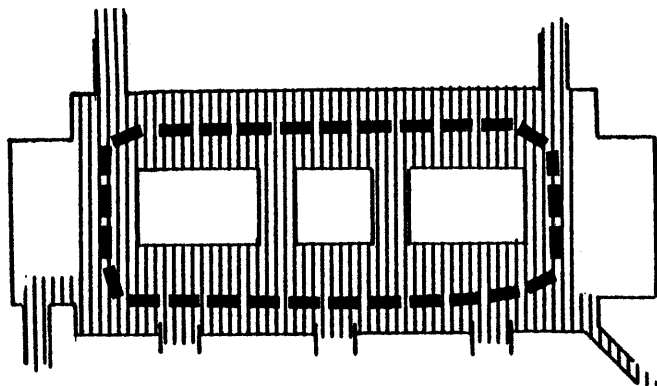
## 2.5

# Environmental Impact

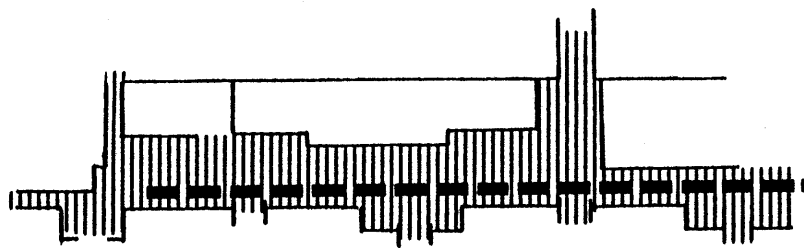
This section will analyze and evaluate how the terminal environment is perceived by passengers. It must be clear, though, that evaluation of spaces is very much like design of spaces; the ultimate result is determined by ideas, thoughts and feelings which are difficult to prove and very sensitive to criticism.

As already explained reading and walking were identified as the two major activities. Terminal buildings, while offering seating areas, do not provide appropriate light for reading, especially in waiting areas where there are no views: Piedmont and Volpe.

A very important consequence of terminal design on walking passenger behavior was discovered. It was observed that passengers felt more comfortable walking about North Terminal because they make an "incognito" circuit and return to their seats. At South and Volpe terminals, walking was not felt to be pleasant and because the narrow layout of the buildings did not allow for a clear definition of circulation areas. In addition, seated passengers could identify those walking without a purpose. This made strollers feel very un-



north terminal



south terminal

FIGURE 12. PASSENGER WALKING CIRCUIT

comfortable. It is perhaps a fixed behavioral pattern that there must be a purpose for walking, even at places like airports where wandering about is considered normal behavior. This phenomenon occurred particularly to passengers travelling by themselves. It didn't occur when passengers had an excuse for walking, such as being with a baby or walking a dog. The passenger walking with her baby received approving nods from those sitting down; the passenger walking his dog received attention and sympathy. Passengers walking in couples were usually engaged in conversation and didn't care about others. But single passengers were intensely observed, maybe out of boredom, maybe out of curiosity. In consequence, these passengers walked only once and then returned to their seats. Figure represents both layouts and the passenger walking circuit.

The use of facilities at terminals also follows differing behavioral patterns. Single passengers, which account for more than half of the transfer population, feel constrained to eat or drink. These activities are considered social interactions. As a result, few

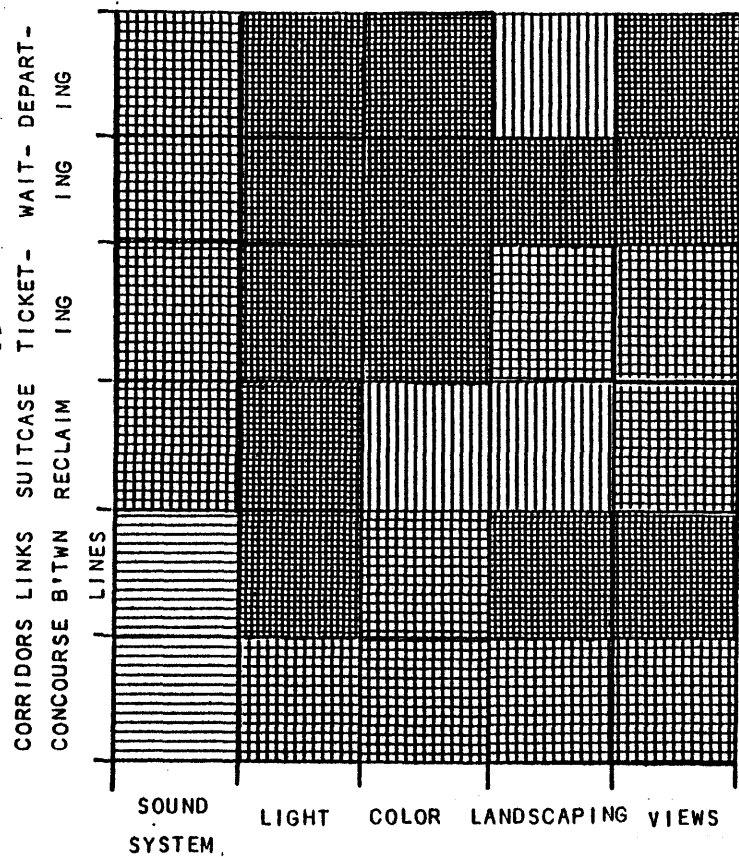




FIGURE 13. PASSENGER EVALUATION OF ENVIRONMENT

passengers ate by themselves, and even less were drinking by themselves. No single woman was observed at any of the bar facilities of the airport.

Some design alternatives can be developed to make eating and drinking facilities attractive to single travellers. A sidewalk cafe, with small tables and open to terminal movement would successfully link individual travellers to the environment, without giving the impression of encouraging inappropriate behavior.

In order to measure passenger reaction to the airport respondents were asked to evaluate the surrounding environment. This evaluation was based upon the response to a chart of possible improvements. Improvements were separated into environmental, orientation, equipment, and service options categories, Chart 13 shows the intensity with which passengers measured the five environmental qualities of the different airport areas. MAXIMUM intensity  means that passengers regarded qualities as necessary; MEDIUM intensity  means that terminals would have a better environment if these qualities

were present; LOW Intensity means that qualities were appreciated but not necessary.

The need for landscaping was strongly felt by the majority of passengers. Out of a total of 274 responses to the fourteen different categories, 52 answers directly pointed to the need for landscaping improvements throughout the terminal areas. Landscaping was perceived by passengers to be a means to provide life and color to places. Passengers made a point of differentiating potted greenery from landscape. The idea is received with enthusiasm; people like the changes in texture of the environment. Fresh air and pleasant conditions seem to be lacking at any terminal.

Many opportunities for utilizing dead spaces and/or climatically appropriate locations are lost inadvertently. Landscaping is felt to be very expensive. The truth is that any kind of solution has some cost involved. The point is to make the environment respond to the different expectations of both users and management.

Everyone appreciates the feeling of physical and psychological relaxation that a natural surrounding can offer. It need not be a radical substitution of cement or carpet by gravel or grass but a well-balanced amount of plant life within a large built environment is a welcome thought. Transitions in activities, buffer zones and definition of spaces can and should be accomplished through changes of vegetation, textures and materials. Elements like water, light and shadow can perform as effectively as the best designed sign, but more aesthetically. This issue encompasses the other two environmental concerns; color and warmth of ambience. If landscaping is part of a space, so are color and light. They are also design elements that could be used to identify culturally and physically the airport location.

Pleasant views were considered essential in all waiting areas. Passengers especially evaluated the space in which they were, based on environmental and orientation variables. 71% of passengers thought that views, light, color and sound were more important for waiting areas than organization, circulation clarity or orienting

signs. 37% of passengers considered that sound systems never worked at airports, 38% regarded the area as bland, grey or dead, and 32% thought that the general ambiance was dull or dark.

The passenger survey has demonstrated that transfer passengers are more concerned with the environment itself than with the type of activities offered. For these passengers, the most important issue was to have a pleasant atmosphere in waiting areas and clear visual lines to all important services and amenities. These findings are strongly related to the time spent at terminals and the visual accessibility to spaces.

Responses confirm the assumption that passengers accepted the terminal environment as a "necessary evil." When passengers were asked to rank their choices for improvement the first were: environmental quality and functionality of the architecture; the second was effectiveness of service with respect to airline efficiency, general information and equipment. The chart (Figure 14) illustrates different services and equipment which passengers look for at the waiting areas.

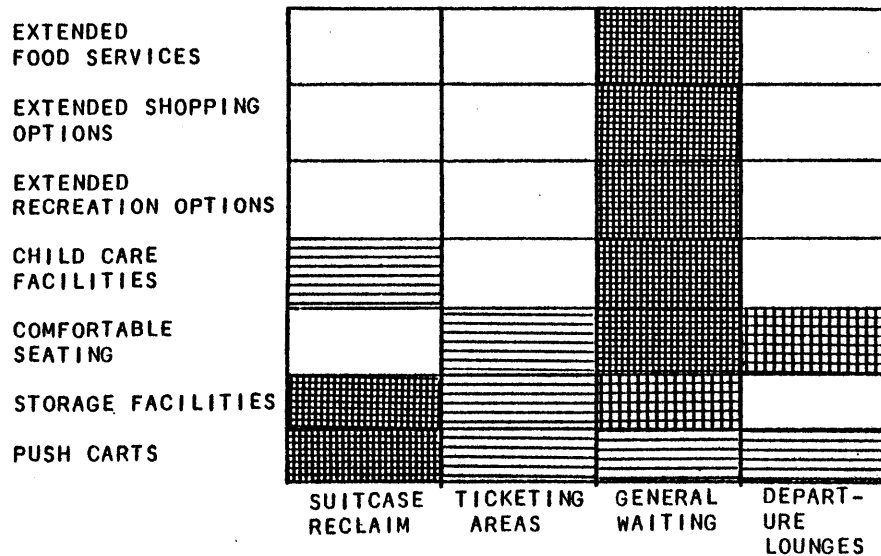


FIGURE 14. PASSENGER NEEDS AT WAITING AREAS  
 [Maximum Intensity] Maximum Intensity; [Medium Intensity] Medium Intensity;  
 [Low Intensity] Low Intensity.

Along the different pedestrian routes which transfers traverse, minimal services are necessary. These services are not of any particular kind but they constitute the minimum support structure expected from large built environments: restrooms, water fountains, seating and telephones. Many passengers regarded these services as missing, particularly at ticketing areas, pedestrian links and departure lounges (except for telephones which were very well located). 77% of passengers thought, as well, that baggage cards should be provided to facilitate transportation of hand luggage to and from all areas of the airport. All passengers travelling with small children felt child facilities were a necessity. They believed the most important were playrooms or nurseries and areas in restrooms to change diapers or feed babies.

As already seen in Section 3 of this chapter, passengers do distribute their waiting time among different available activities. There is a precondition for this though. Passengers need to have a general overview of what is available. Amenities and services have to be visually related to the general waiting areas. This general overview gives a spatial reference to a particular position from where passengers can decide their movements. The waiting areas should then be designed according to this principle.

The second part of this evaluation of the environment concentrates on images passengers have formed from previous experiences at airports. Respondents were asked to select from a group of airport scenarios those which accurately described their experience at terminals in general. Time perception and common design mistakes are the basis for the different scenarios.

Out of the total, only 14% of the passengers had not specific strong feelings regarding the internal airport environment. This left a full 86% of passengers feeling affected in some way. These passengers arrived at the airport with a preconceived image of what to expect and how to behave accordingly. 20% of the passengers said

they never understood loudspeakers at terminals; 24% said they always got bored; 20% said they wanted to leave as fast as possible; 18% recognized that they couldn't identify spaces because they all looked alike; 9% always had problems with children; and 9% said they were confused and/or couldn't manage the level changes.

Explanations of the different responses can follow several lines of argument. When respondents say they want to leave as soon as possible it can mean that they are in a hurry or anxious to be somewhere else. It can also mean that the general atmosphere is so unpleasant and not conducive to a longer stay. It must not be forgotten that the purpose of terminals is to provide accommodation between modes of transportation. Transitions, however, can be made pleasant, comfortable and beautiful. They have to be. It is the only way to provide a sense of security for those who fear flying. The idea of flying is accepted as a common mode of transportation but it is still an adventurous idea because it is an activity out of the individual's control. The only way to mitigate the sense of insecurity is to provide an image of efficiency through a well-developed

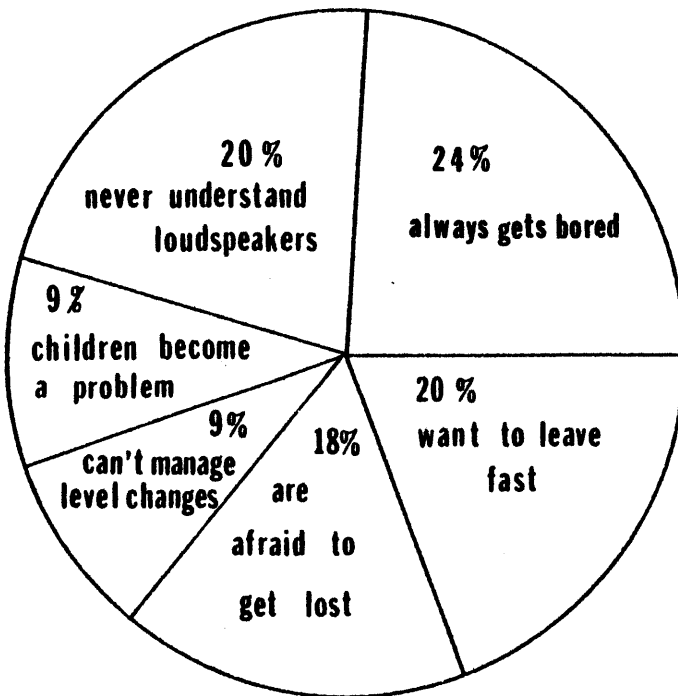


FIGURE 15. PASSENGER IMAGES OF AIRPORTS

Internal environment.

Passengers identified as well with the scenarios which showed airport terminals as places where spaces were difficult to recognize and where changes of levels presented an obstacle. This further proves the assumption that terminal environment is not satisfactory. The loudspeaker problem which many passengers identified is a technical issue that should be easily solved with appropriate expertise. Regarding the boring time spent at terminals, it has been demonstrated here that passengers don't really want to engage in any concentrating activity. On the other hand, stimulus factors such as repetitiousness, lack of novelty and monotony generate boredom (Smith, R., 1980). All these factors are present in the terminal environment, but, at the same time, movement, excitement and continuous change are also present. Design for a less monotonous environment is dependent on the effective handling of the different environmental qualities.





















In summary, human behavior is affected not only by physical factors such as the design of waiting areas, length of walking distances or accessibility, it is also affected by the different impressions users have formulated from their past experiences and by the improper use or lack of aesthetic qualities in the surrounding environment.



Time, orientation and impact of the environment on users are variables which, in effect, overlap. Many issues in this research have been separated for purposes of clarity. In reality, however, time influences perception of spaces as well as defining "wants" of passengers. Wants also vary by type of activity; needs of passengers at waiting areas are different from needs at the pedestrian links between airlines. This research has shown that passenger needs are not overly sophisticated. On the contrary, passengers require a set of basic elements which, by definition, should be provided. A summary of the survey results can be presented graphically utilizing symbols for the different needs.

Some of the symbols utilized here are the common sign language already in practice in many airports. Figure 16 represents the location of those elements necessary for transfer passengers along their connecting route. Figure 16 also is the graphic summary of the user need research.

## 2.6 Summary

landscaping		extended food services	
restrooms		Information	
natural light		storage	
views		shops	
childcare facilities		water fountain	
recreation		cafe	
baggage carts		handicapped access	
seats		telephones	
comfortable seats		bar	
transportation information		visits	

KEY TO SYMBOLS:

passport police		gate		security		customs	
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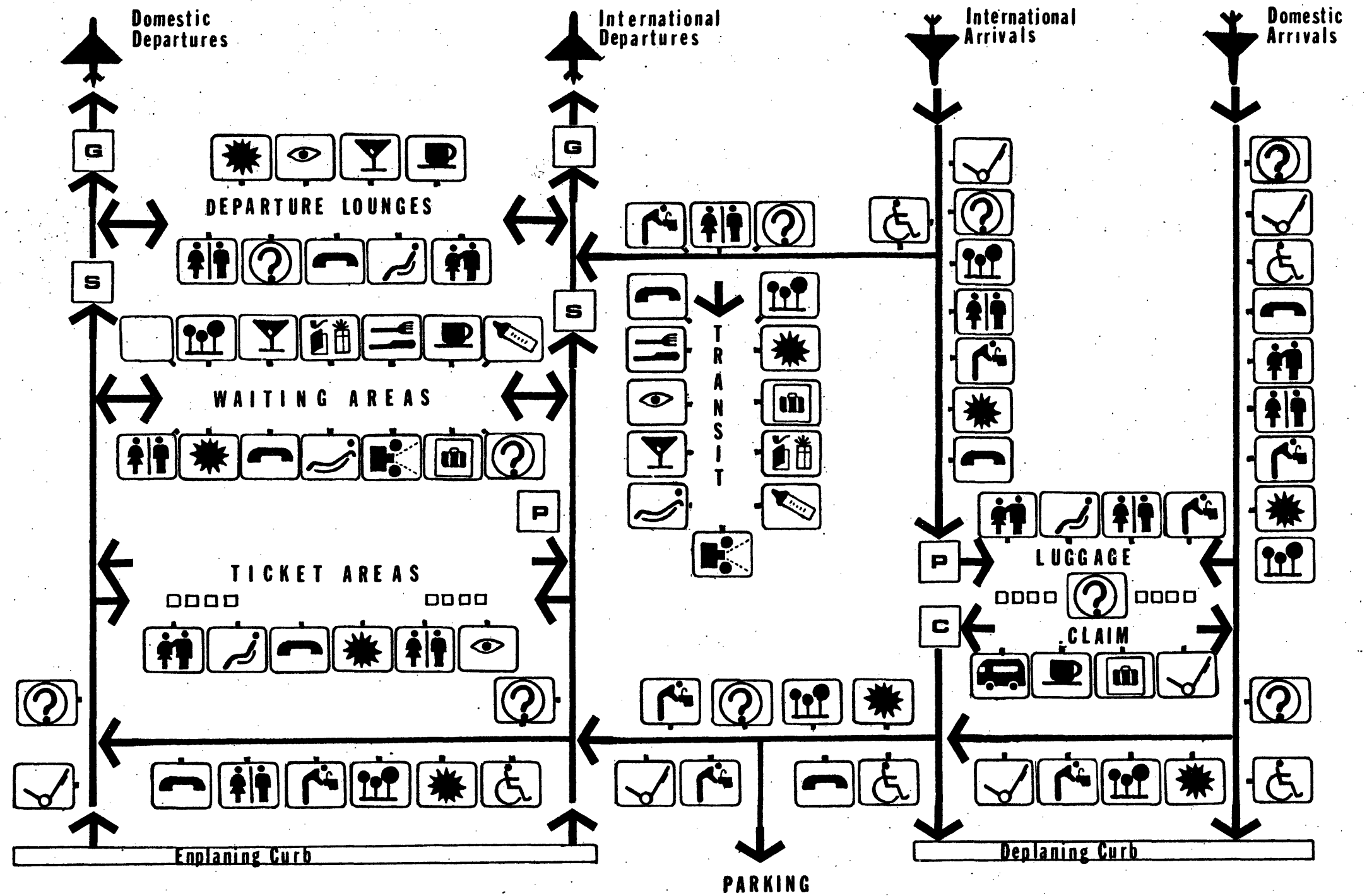


FIGURE 16. TRANSFER PASSENGER NEEDS

# **Chapter 3**

## **DESIGN GUIDELINES**

# Principles

As outlined in the Introduction, design recommendations will be developed here according to specific user requirements. Users have been defined in Chapter 1. Chapter 2 has determined which are the important design aspects that influence the transfer passenger.

It has become apparent with the research that transfer passengers are more specific in nature than what has been regarded up to now. Because of the difference in timing between flights, some passengers require facilities that permit fast access to their departures. Conversely, other passengers look for details in the designed environment; details that provide a pleasurable, lengthy stay.

In this chapter an attempt will be made to provide guidelines that meet both these objectives. Two relevant issues surface when dealing with guidelines for design of spaces: 1) the completeness of information regarding a "good environment" and 2) allocation of space, sizes.

Obviously, all important environmental factors cannot be summarized in few norms. Many key inputs remain in the realm of the particular conditions for each case. Guide-

lines thus are the results of findings of the transfer passenger needs research. They should be viewed as part of the broad number of considerations that constrain a design problem, as important factors which influence design decisions.

Design recommendations are closely related as well with Christopher Alexander's work on environmental design. Relevant research by Alexander on this subject of programming with man in mind can be found in the references.

Terminal design guidelines will not define the amount of space required for the different activities at the terminals. Allocation of space is today calculated upon the Typical Peak Hour Passenger demand on terminals. TPHP is the demand in the peak hours, which is not the absolute peak, but an estimate of a figure that supposedly is exceeded for only very short periods (Ashford & Wright, 1979). These parameters, in use worldwide, are based mostly upon practical experience, particularly in the United States.

There are two main reasons for not providing size guidelines for facilities; 1) each terminal has individual passenger loads with particular passenger characteristics. In order to generalize or draw conclusions that could be used, space would have to be analyzed according to ergonometics. Ergonometics is the study of the human body and the space it needs to perform the different activities. This is in itself a huge research project which has been addressed elsewhere (Ramsey, Sleeper ). Use of space is representative of cultural idiosyncracies. Much has been written about differences on personal proximity for different cultures. As a consequence, space has probably been grossly misallocated when American indexes are adopted in other countries. This issue of standard indexes has proven to be, even for American airports, not an appropriate way to approach the problem. Indexes are not specific in determining how much space should go where. For a more ample discussion on this topic see de Neufville "Design of Pedestrian Space in Airport Terminals."

As R. Sommer (1969) has outlined, social and spatial orders serve similar functions. It is not surprising then to find spatial correlates of status levels and social correlates of spatial positions. Implications of this discussion are that terminals also reflect space allocation according to status. Passengers travelling first class or passengers belonging to air clubs are not as affected by terminal design as all other "normal passengers." The analysis carried out in this work and the following guidelines cover the most important issues for those "normal passengers" which constitute the majority of the terminal population.

Guidelines will be developed following the sequence of transfer passenger activities:

1. Arriving
2. Immigration
3. Baggage reclaim
4. Customs
5. Connection between airlines
6. Ticketing
7. Waiting
8. Departing

Activities will be explained in terms of: a) context; b) necessary architectural elements; c) passenger requirements for good performance of spaces; d) graphic symbols used for explaining the research summary are used for these examples, thus avoiding issues of scale and proportion for the different spaces.

CONTEXT: Domestic and International terminals  
ELEMENTS: a) Enplaning/deplaning aircraft connector

b) Circulation; corridors

Sub-elements: Information, services, environment adequacy.

PERFORMANCE REQUIREMENTS:

Getting off the plane can be done by means of a mobile staircase or a fixed connector or bridge. Staircases present problems for parents with children, the handicapped and the aged because staircases are usually feeble, unstable and give a sense of insecurity. Also, the steps are usually higher than normal. It is difficult for passengers to ascend or descend with hand luggage. When this system is used, the line of passengers waiting to go up forms at the apron, exposing passengers to aircraft noise, weather and apron vehicles, all of which make the use of stairs very inconvenient.

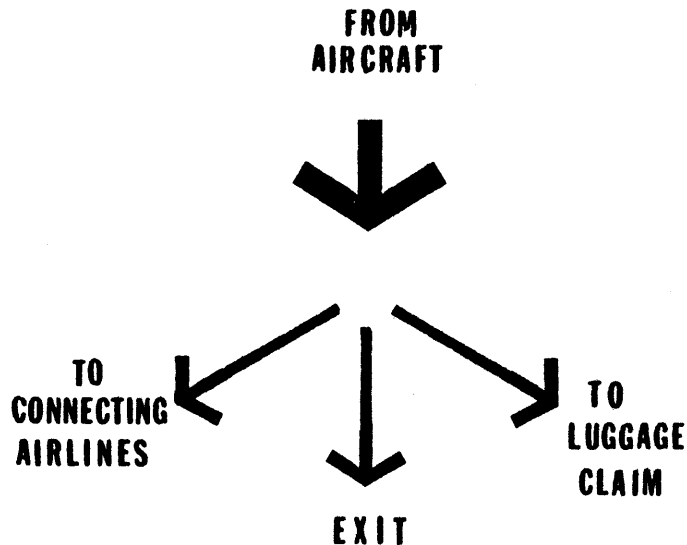
The minimum width for stairs and connectors should be 1.5 meters. This allows a person to walk comfortably with a small suitcase. A more adequate width is 2.5 meters which would allow two persons to walk side by side

## 3.1 Arrival Areas



with their hand luggage. Measurements depend on the length of the connector. After 15 meters the tunnel should grow wider in order to allow passengers to bypass others.

The moment the connector links to the building, space opens up and a sense of disorientation is immediate. Passengers tend to follow a leading passenger instead of looking for orientation clues. However, orientation clues must be there at eye sight from connector exist. Information for transfer passengers can be handled in different ways. At international terminals, transit passengers can be personally directed to the appropriate space, if any; airlines should make passengers aware before they descend the aircraft, of the location of connecting flights information and location of baggage connection services. If the terminal is provided with particular information clues, passengers should be alerted to the kind of clues they should look for.



In very rare instances, passengers are immediately directed to the suitcase pick-up area. The usual pattern is to traverse quite a distance before reaching the next objective.

Distances are connected by corridors or concourses. Passengers require minimal services along all circulation elements, good environmental conditions and, most important, clear orientation. Orientation at circulation routes follows a process which should be made explicit by signs and by location of information booths at the critical crossroad points.

Orientation is not a graphics or personnel problem. It is mostly a design problem. Design of links is a result of flow analysis. Direction of flows must be kept as unambiguous as possible and differentiated from any activity running parallel to them. Passengers should not be presented with more than one option to choose at a time. Crossroads and counterflows are a source of confusion and anxiety. Sharp turns and/or immediate level changes should be specifically avoided at aircraft gate exit/access. Accessibility of spaces is also a design responsibility. All connections must be made without abrupt level differences or abrupt change of direction. These are inevitable, smooth transitions are necessary. Figure 17 shows different patterns of corridors and the type of trans-

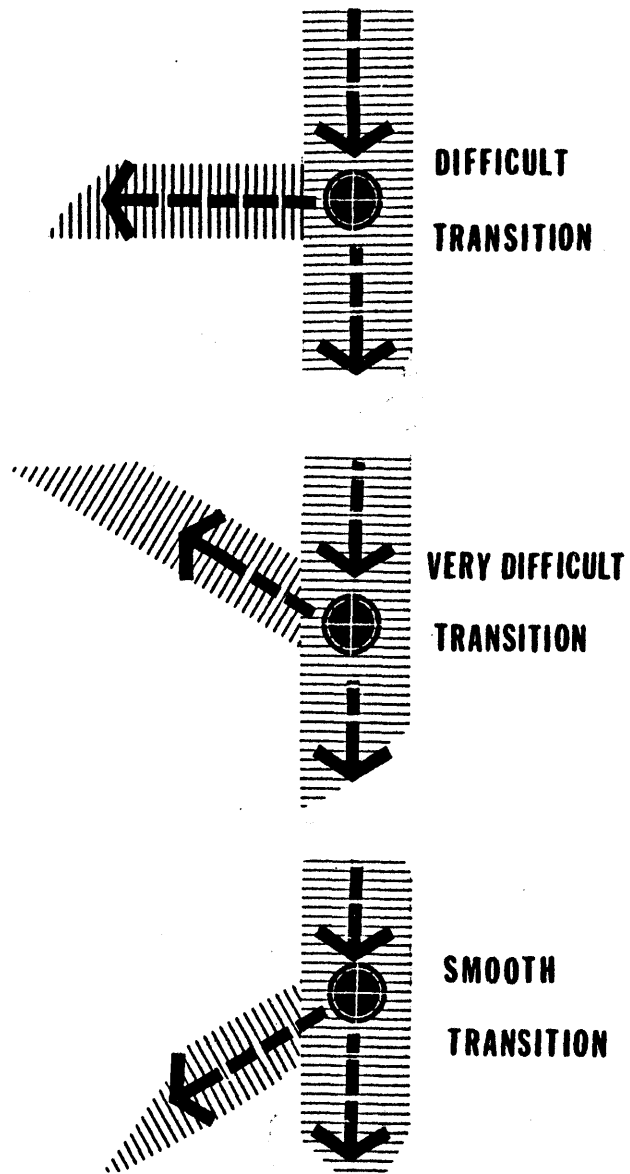
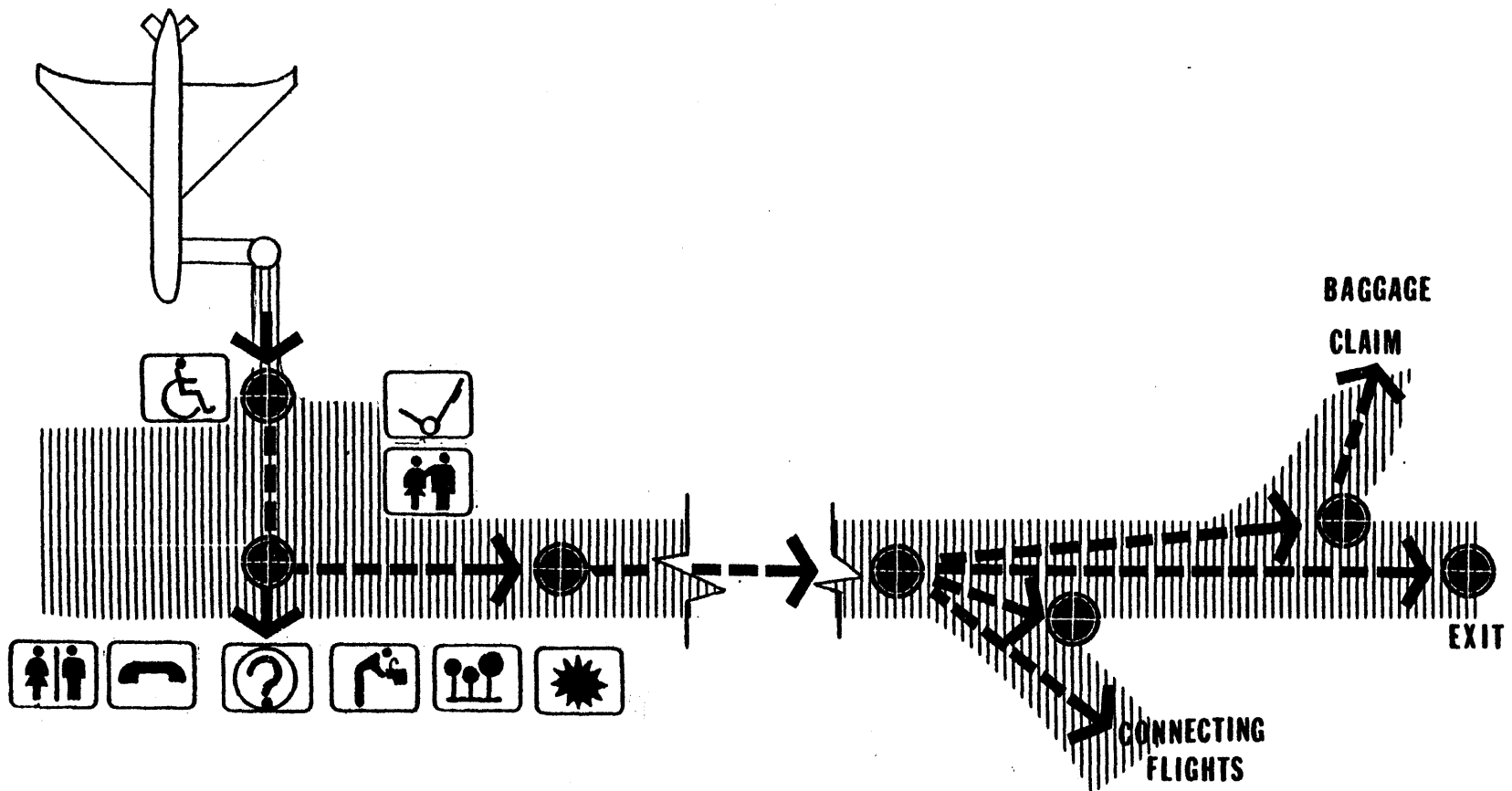


FIGURE 17. PEDESTRIAN TRANSITIONS

tions to be avoided.

The main differences between this set of guidelines and normal design procedures are: 1) particular considerations to critical orientation points, 2) provision of smooth transitions in activities and 3) provisions in orienting clues such as vegetation and textured surfaces.

An example of information location and the type of transitions which facilitate pedestrian movement appears in Figure 18.



 Orientation Point  
 Visual Lines

FIGURE 18. PEDESTRIAN DIRECTIONAL SCHEME

CONTEXT: International terminals

ELEMENTS: Access

Reception Hall

Officers' counters

Immigration/Police offices, Interview rooms

Health Inspection

PERFORMANCE REQUIREMENTS:

In passenger terms, passport inspection is an annoying step between arriving and picking up baggage. Passengers should recognize the appropriate booth immediately upon arrival to this area in order to avoid unnecessary movements. There should be sufficient space to form lines, visual accessibility to restrooms, telephones and water, and a non-threatening treatment of space, color and light. This last issue being the most important. Passport and police inspection is by definition a cause of anxiety, even to normal people. Space should be treated in such a way as to diminish this sensation to allow people to behave naturally. Police and security officers can have an overview of passengers, without letting them feel pressured.

During immigration checks and/or Imme-

## 3.2 Immigration

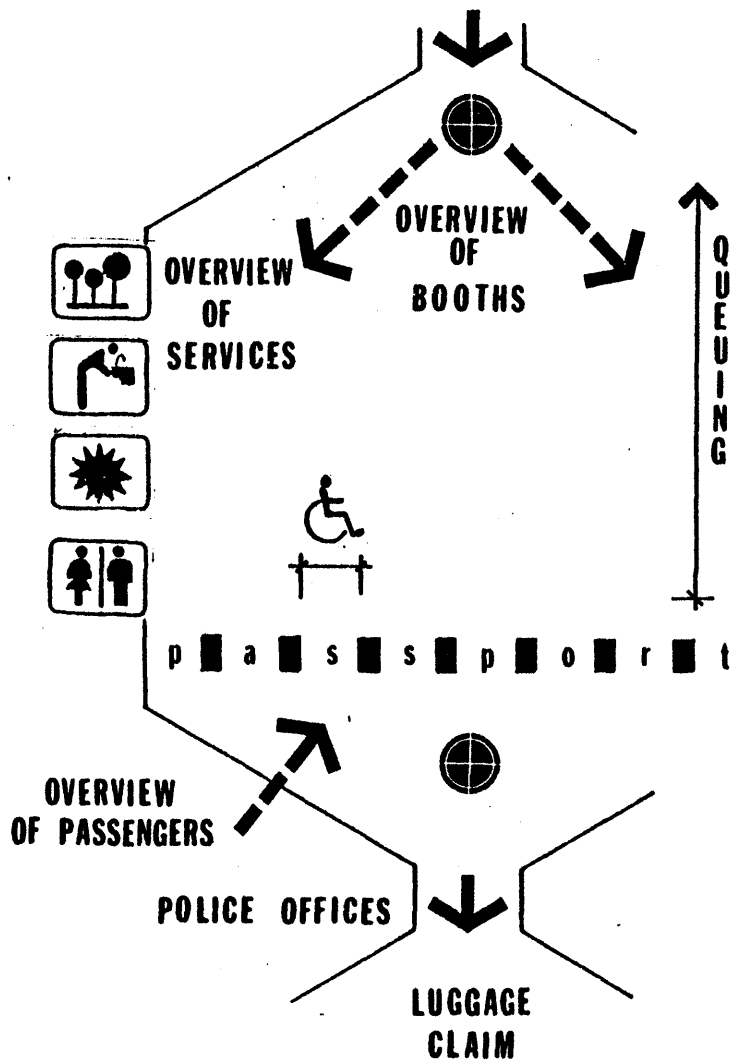


FIGURE 19. PASSPORT INSPECTION DIAGRAM

diately after, passengers should see the location or direction of the baggage pick-up area. Figure 19 represents characteristics of the passport inspection area.

There are no specific passenger requirements within this area. All passengers must go through the same process

The approach shown (on next page) differentiates from the standard immigration hall design in that: 1) passengers should be capable of making the correct decision at the entrance to the space; 2) that this space is provided with services and 3) that authorities are visually independent but forming part of the whole

CONTEXT: Domestic and International terminals.

ELEMENTS: Baggage conveyors

Pushcarts

Sky-cap area

Support services

General information: tourism

transportation

airport

Rental cars offices.

PERFORMANCE REQUIREMENTS:

At arrival to the baggage pick-up area, passengers with luggage search first for pushcarts, then they locate their assigned baggage conveyor. Passengers without luggage should not be forced to go through the baggage claim area. A direct connection to information and terminal exist must be provided for these passengers. Domestic transfers should not need to go through this area at all. But as the research demonstrated, 15% of transfer passengers do move their own luggage. Straight links to other airlines must be provided from the arrival concourses as well as from the baggage areas. Guidelines for these pedestrian links will appear in the next section of this chapter.

## 3.3 Luggage Claim

Transfer passenger requirements for the baggage pick-up area are the same as incoming passenger requirements. 1) access to push-carts; 2) clear identification of assigned conveyor; 3) visual accessibility to all support services, information signs and information booths; 4) direct views to exit locations; 5) visitor space; 6) seating; 7) clarity of space assigned by activity, i.e., rental car booths should be visible, but its location should not interfere with any other activity, such as exiting or greeting; 8) color and warm light; 9) accessibility to sky-caps, and 10) good sound system.

The salient features of this approach are that the transfer passenger needs are included in the design of the baggage claim area. A. Domestic transfers must be provided with the adequate information immediately after reclaiming their baggage. Information should include direction, time involved and means available to reach their destination. B. International transfers have to continue their processing through customs as all other incoming passengers, their requirement here is to have access to



departure schedule screens. This type of information is rarely provided at baggage claim areas. It is a reassuring element that provides good time relationships to connecting passengers.

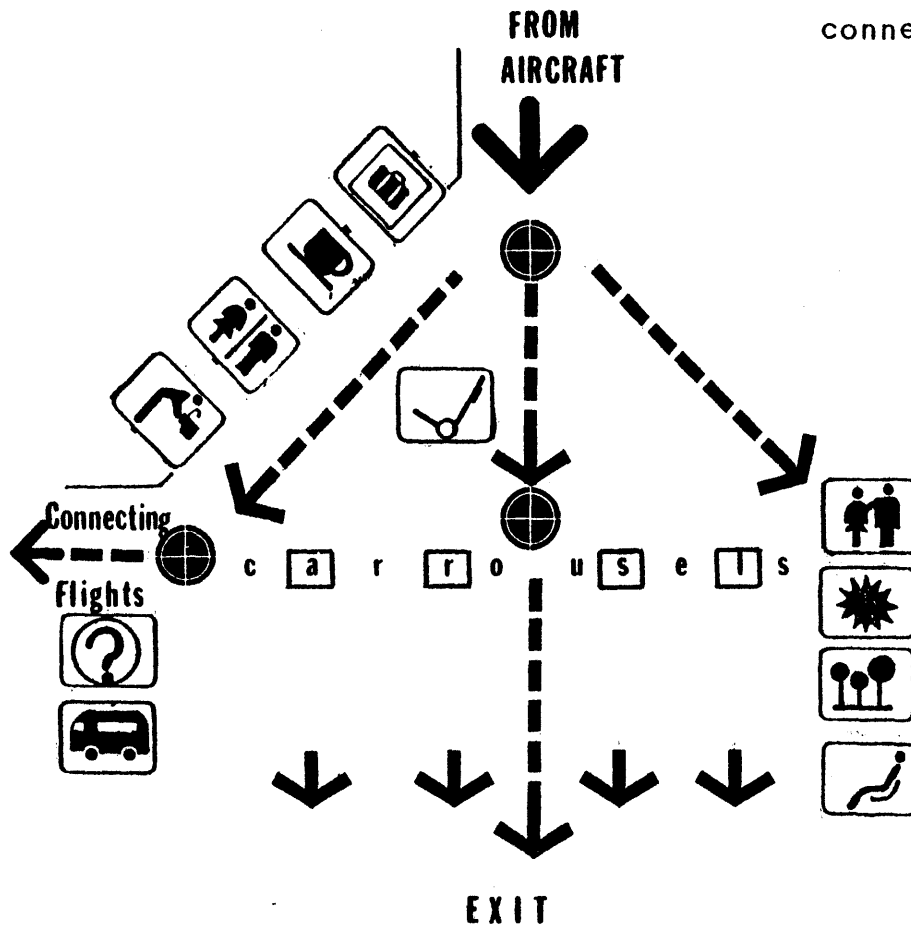


FIGURE 20. LUGGAGE CLAIM

CONTEXT: International terminals

ELEMENTS: Customs counters

Customs offices

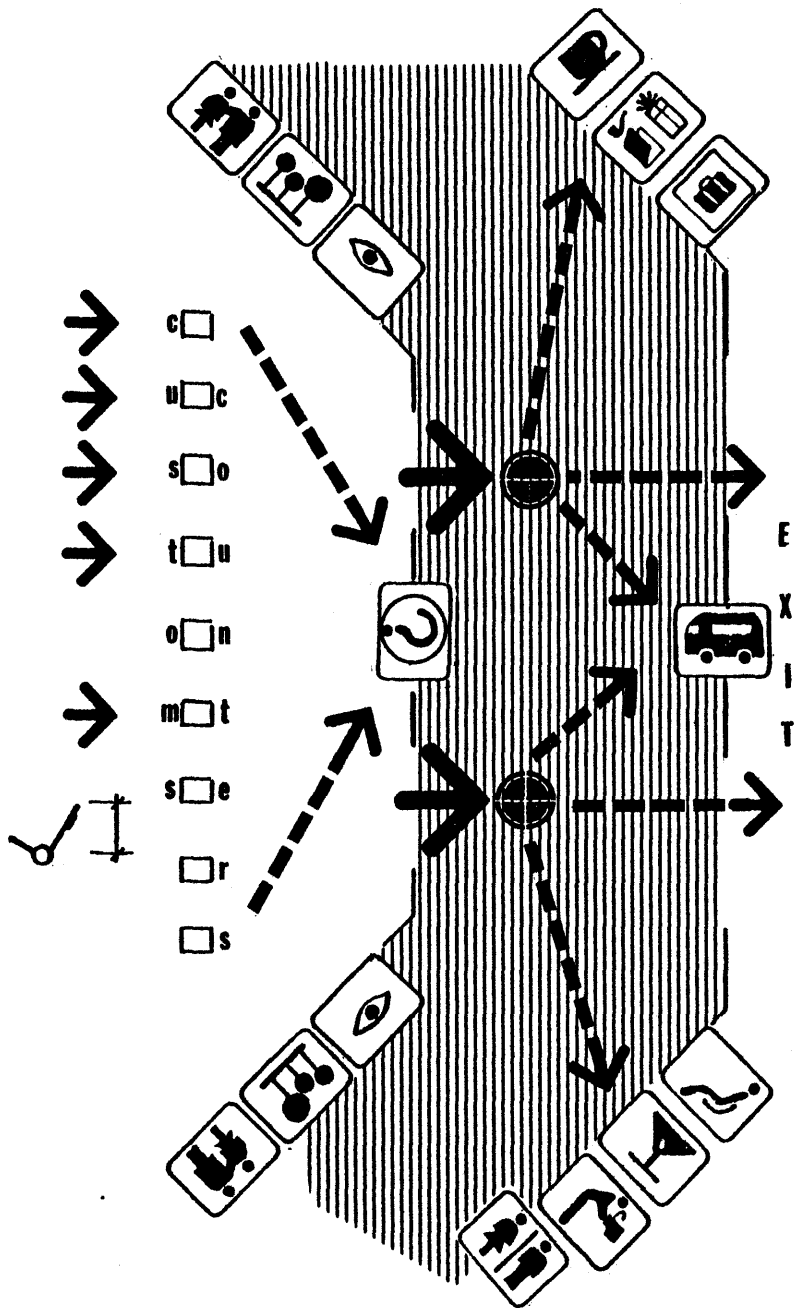
PERFORMANCE REQUIREMENTS:

Passenger requirements here are simply to go through with the minimum physical effort. Several experiments have been tested to meet this objective while at the same time provide authorities with a proper overview of passengers. Some Latin American and European airports have successfully implemented the "nothing to declare" aisle. Passengers are only stopped at random or when something is suspected. This system is an excellent way to avoid delays and troubles. Spacing between counters and aisles should be ample enough to permit wheelchairs and baggage carts to go through. This may appear a logical thing to do, but surprisingly, it is not a common procedure.

Information on connecting flights, tourism and available transportation modes should appear immediately after customs counters.

Greeters are never sure if friends or relatives have arrived until they see them.

## 3.4 Customs



Thus, it is only human to want to see through the customs area. Some airport authorities have considered this practice not convenient and consequences are that greeters group together at the customs exit doors not allowing for a free flow of exiting passengers and diminishing the view of orientation signals. Figure depicts passenger needs at customs areas.

The diagram reflects the importance of locating the appropriate information for transfer passengers. It should be placed at an angle visible from the center of the space and from all the customs counters. Information provided should define time, direction and means available to reach the departing airline.

FIG. 21 CUSTOMS AREA DIAGRAM

CONTEXT: International and Domestic Airports

ELEMENTS: Deplaning curb

Internal links

External links

Enplaning curb

PERFORMANCE REQUIREMENTS:

Connecting between airlines is the critical transfer activity. There are infinite possibilities for how to solve this movement. It mostly depends on the airport layout scheme and on the terminal design concept. When the passenger terminal is a single building all connections take place within the building. The critical issue here is to identify the location of the desired airline. This identification process can be tremendously complicated. Shape and scale of the facility define ease or difficulty of orientation. One example is Chicago/O'Hare, where the location of information is the only orienting clue.

Centralized terminals with a circular concept like Paris/Roissy, are also disorienting by nature. Passengers coming in through any satellite find it hard to recognize their position with respect to the

## 3.5 Pedestrian Links

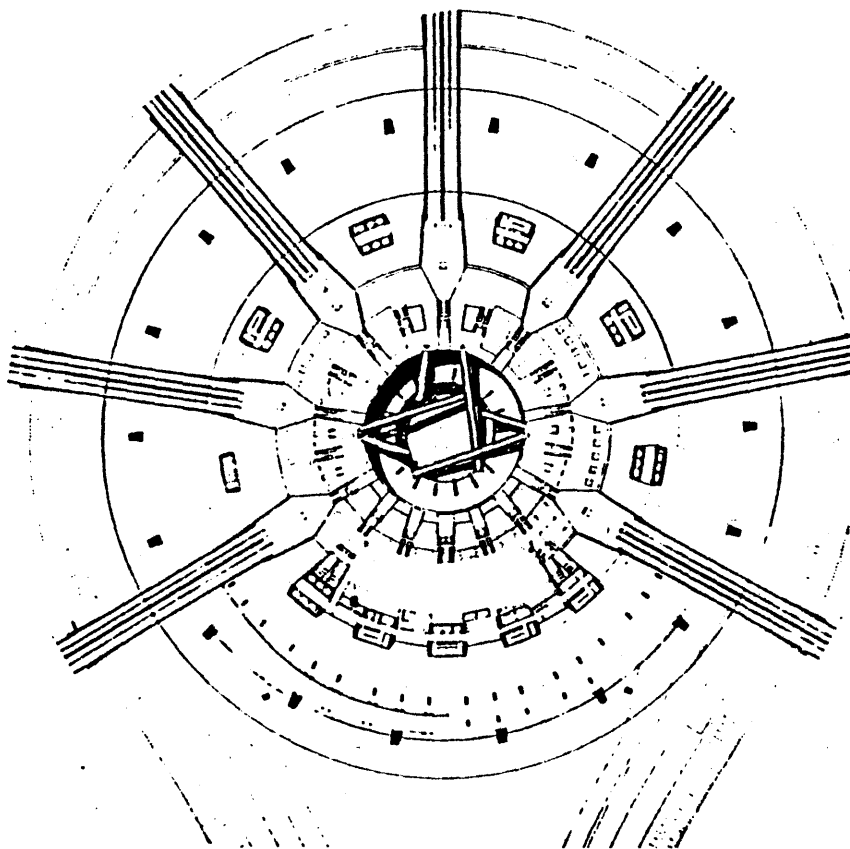


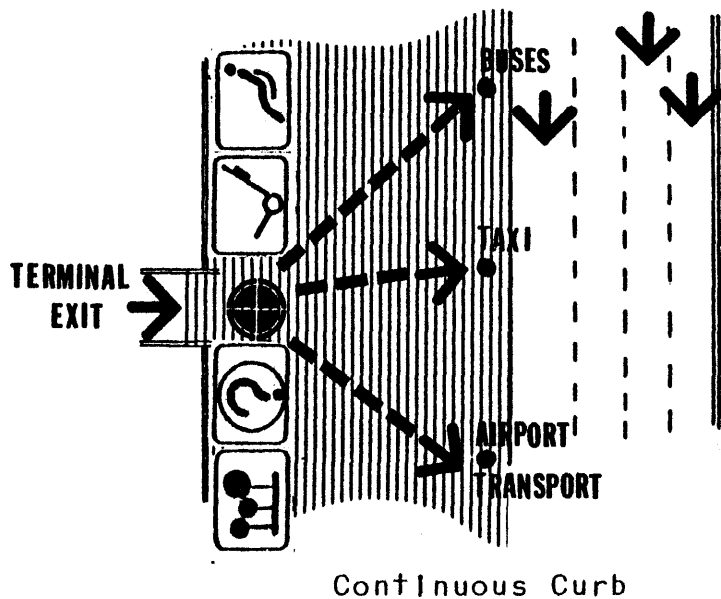
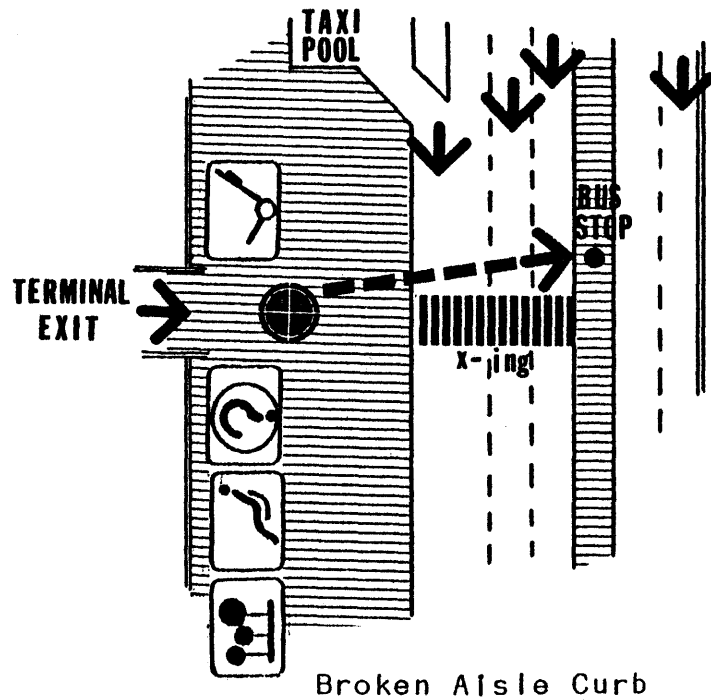
FIGURE 22. PARIS/ROISSY TRANSFERS LEVEL

Source: Architecture d'aujourd'hui  
Vol. 156 June 71. pp 20-21

terminal. The only advantage here is that walking in any direction will always lead to the desired destination. The problem becomes, as well, a problem of identification.

Gate arrival terminals and decentralized airports cause infinite problems for transfers. All problems regarding information, access, disorientation, space identification and long walking distances are present. If inter-terminal transportation is not provided, chances are that transfer passengers that can get lost, will get lost. When inter-terminal transportation is provided, passengers want to be aware of the time and cost involved in the process. Such information is rarely provided. It is however a very important issue. It provides passengers with a sense of efficiency that translates into a sense of security.

The possibility of transfer passengers moving between facilities, without using the transportation system, must be taken into account by all airport designers and airport managers. All pedestrian linkages must be clearly designed, clearly marked, and accessible. This not only facilitates passenger



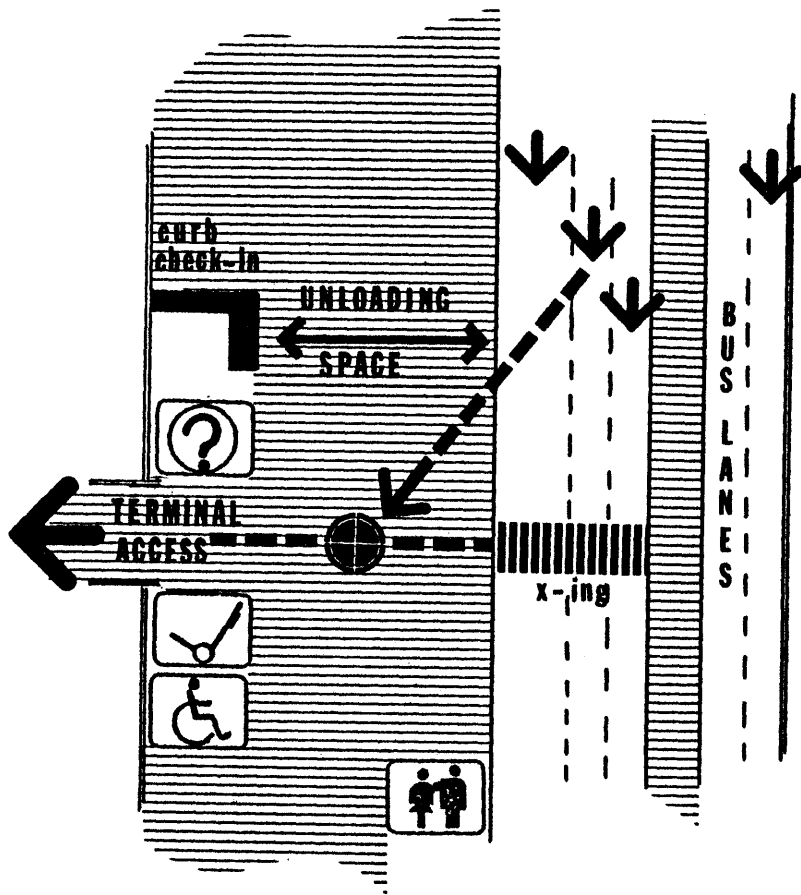
movement it also facilitates employee and supply services movements.

Links can be external (sidewalks), internal (corridors), or a combination of both. The best designed pedestrian link is one which not only is accessible and direct but that also provides a pleasant walking environment through the use of vegetation, resting pockets and services for pedestrians.

The curb system has to accommodate the different types of public and private passenger vehicles. Length of curb is determined through the Typical Peak Hour Passenger. Width of the curbs must allow for an efficient organization of the different functions which are to be performed.

Deplaning curbs must be provided with all the visual indicators to the different transportation modes. Modes can be: taxis, cars, airport transfer, vans, limousines, city buses, rapid transit and rental cars, among others. All of them must be easily recognizable from the terminal exit. For some airports like Boston/Logan, the most efficient system for loading and unloading vehicles is when large vehicles are separa-

FIGURE 23. DEPLANING CURB



Enplaning Curb

FIGURE 24. ENPLANING CURB

ted from the main terminal curb. Buses and large vans or limousines have to load/unload at a separate curb. In this way a fast rotativity at the main curb is achieved. Deplaning curbs must also allow queuing space for taxis.

Enplaning curb efficiency depends on time allowed for curb use and on design of the curb system. The breakdown of the arrival process by three types of vehicles will give the maximum time of stay at the curb.

Taxi unloading times: stop car and meter, 15 seconds; passenger pays for ride, 30 seconds; unloading of suitcases, 40 seconds; driver gives change, 15 seconds; driver leaves, 10 seconds. Total taxi stay at curb: 1 minute 50 seconds.

Friend drop-off unloading time: stop car, 10 seconds; unload suitcase, 40 seconds; farewell, 2 seconds; driver leaves, 10 seconds. Total friend drop-off time at curb: 3 minutes.

Bus unloading times depend on bus size and type. If it is assumed that all passengers have already paid for the ride, time is a function of suitcase unloading: stop vehi-

cle, 20 seconds; passenger unloading, 5 seconds; suitcase unloading, 10 seconds. Time for bus to unload at curb and leave: 16 minutes.

Figure 24 shows a curb designed with separate bus platform, Figure 23 is a curb diagram with no bus lane separation.

This approach to the design of pedestrian links differentiates from the standard design model in the sense that it includes 1) landscaping as an orientation means, 2) color, light and comfort in all walking areas, 3) resting pockets with minimal services, 4) adequate information every 20 meters of pedestrian routes, 5) width considerations for curbs and paths.



CONTEXT: Domestic and International terminals

ELEMENTS: Accesses

Ticket counters

Queuing spaces

Circulation spaces

PERFORMANCE REQUIREMENTS:

Domestic departing passengers can be processed in three alternative ways: curb check-in, counter check-in or gate check-in. Transfer passengers usually proceed directly to the gate without need to verify their tickets. However, as the research has shown, this is not always the case.

The first impression passengers receive of airline efficiency is at their ticket counters; this is why air carriers are in the continuous process of diminishing passenger queues. Passengers who have to check at the counters require not only speed in the process but a number of other factors. These factors are: 1) a recognizable direct entrance; 2) specific counter identification; 3) visual access to departure screens from access doors; 4) adequate space for queuing; 5) access to information booth; 6) visual connection to basic services; 7) visual con-

## 3.6 Ticket Areas

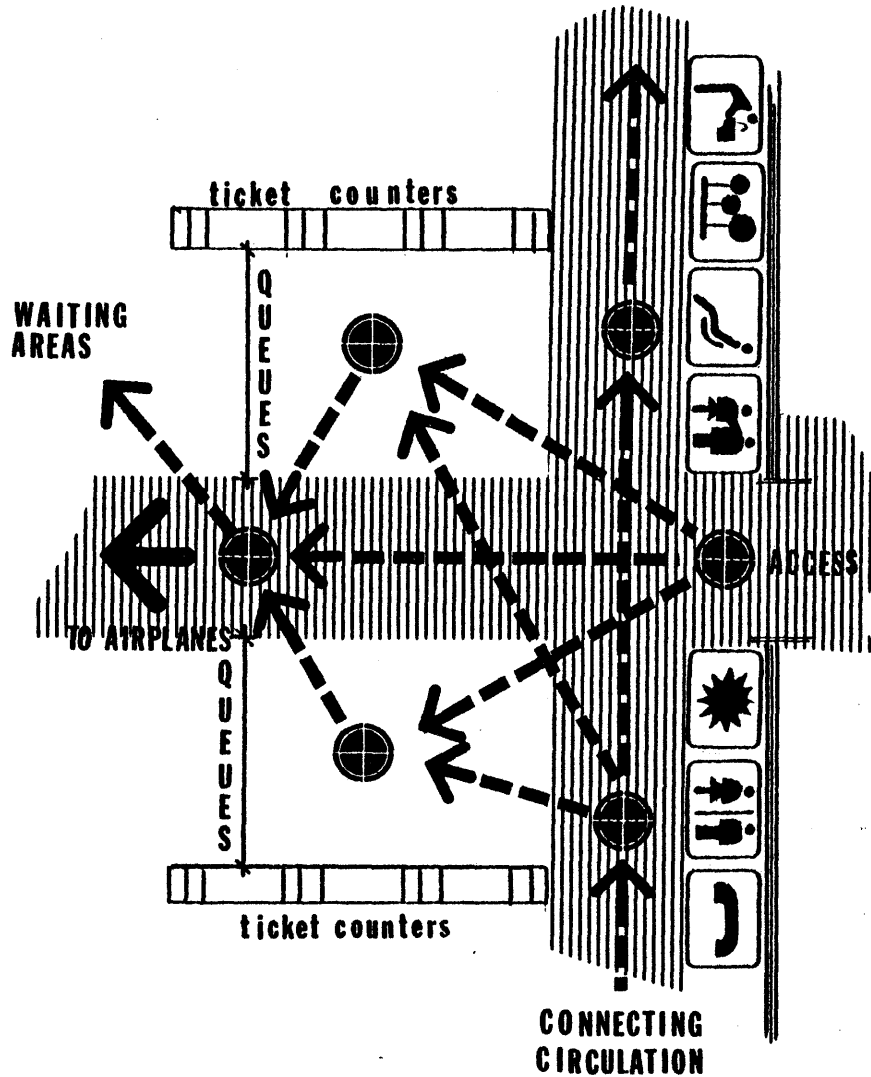


FIGURE 25. TICKETING AREA

nection to circulation path to be followed after ticketing; 8) Identification of gate direction; 9) seating for accompanying passengers and farewellers; 10) straight path from access to departure lounge; 11) natural light, color and good sound system; 12) visual relation to waiting area location; 13) accessibility for handicapped and carts; 14) differentiation of circulation and queuing areas. Specific transfer passenger needs are to have all the mentioned relationships directly from the arriving path. Figure 25 depicts a possible arrangement of ticketing areas taking into account passenger requirements.

Design of ticketing spaces is related not only to the administrative functions of airlines but to all the spatial relationships that passengers need to perceive. This is the main difference between a normal ticket area design and this environmental approach.

CONTEXT: International and Domestic terminals

ELEMENTS: Support services

Ancillary services and amenities

Seating hall

PERFORMANCE REQUIREMENTS:

This survey has highlighted all the characteristics which passengers are looking for in the waiting areas. Conditions for passenger comfort are both physical and visual. Passengers expect waiting areas to have: 1) visual links to airplane movement; 2) easy access to information (staffed booths, schedule screens, graphic signs); 3) visual access to all support services; 4) visual access to ancillary services and amenities; 5) definition of circulation areas; 6) color, light and warmth of ambience; 7) appropriate reading light and comfortable seating; 8) landscaping and surface treatment; 9) identifiable entrances to amenities, concourses and services; 10) a reading room; 11) movies or television screens; 12) varied eating options -- food bars, fast food, sidewalk cafe, luxury restaurant; 13) open bar; 14) storage facilities and 15) childcare facilities.

## 3.7 Waiting Areas

The main differences between these recommendations and the actual waiting area designs are that: 1) there is a space clearly identified as waiting space; 2) all services open off a common area; 3) the outside views form part of the internal environment; 4) the mayor airport pedestrian traffic forms part of the cafe/cocktail environment and is visually connected to both waiting spaces and apron views.

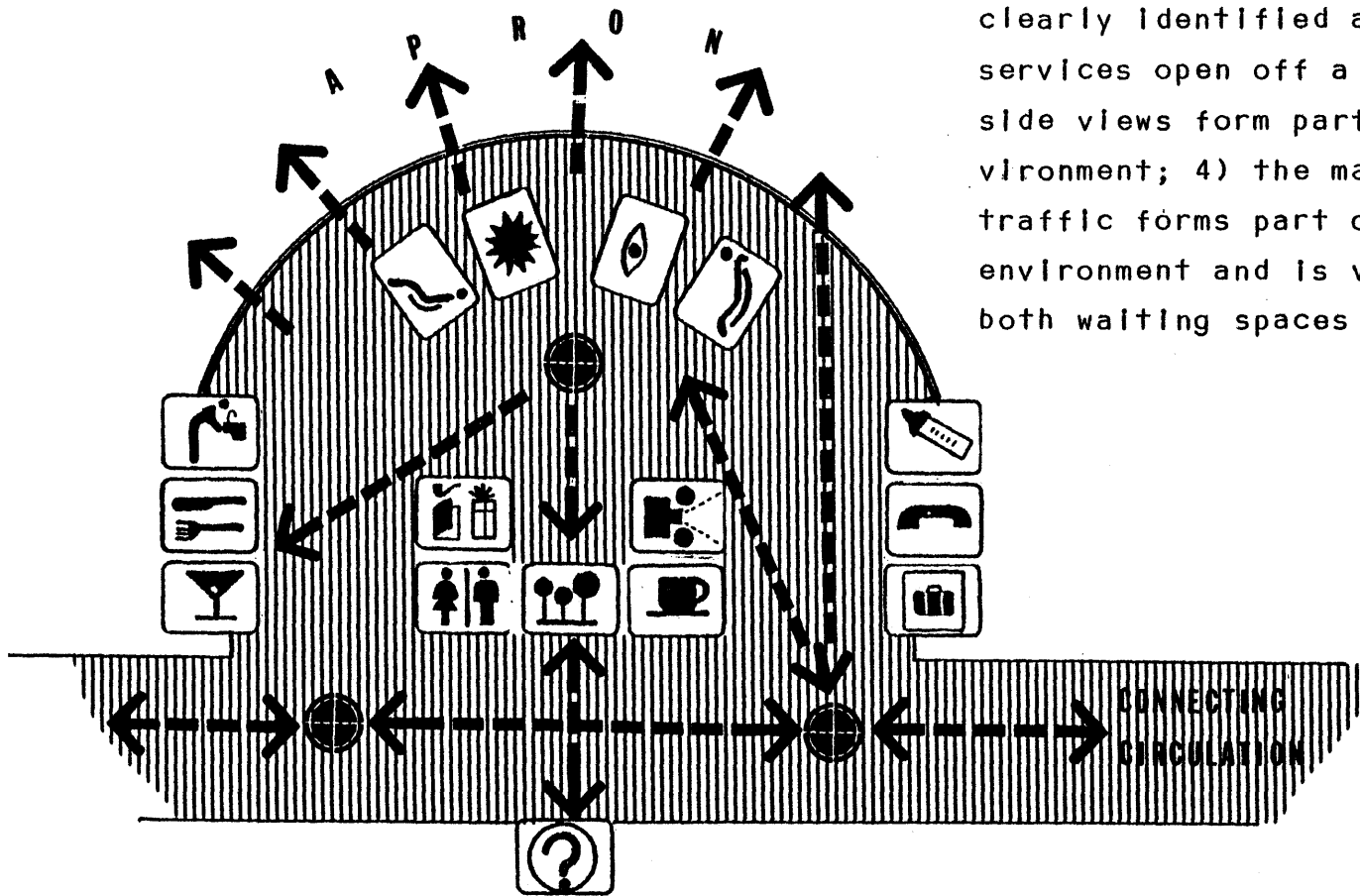


FIGURE 26. WAITING AREA DIAGRAM

CONTEXT: Domestic and International terminals.

ELEMENTS: Departure lounge

Support services

Connector to aircraft

#### PERFORMANCE REQUIREMENTS

Departure lounges fulfill the double function of housing immediate departing passengers as well as serving as a reception hall for incoming passengers. The shape of departure lounges depends on the system utilized to connect the aircraft to the passenger building, i.e., it depends on the terminal concept. Satellite connectors are usually developed with circular forms which allow for a flexible use of the space. Finger piers have elongated departing lounges which allow for space to be utilized only when there is gate activity. In the United States where gates are owned by individual airlines, there is a low usage of space. It can be said that space is wasted. If gates were shared, a higher rotativity in use would be achieved and space would be more effectively utilized. Gate arrival terminals have departing lounges forming part of the convex curvature of the building, or better

## 3.8 Departure Areas

put, forming part of the apron facade of the terminal. In many cases there are not specific departure lounges, waiting areas serve the function, specially for domestic gate arrival terminals where no passenger separation is necessary.

Transfer passenger requirements for this area do not vary from regular departing passengers: 1) visual connection to aircraft movement; 2) minimal support services; 3) clear identification and definition of departing area, differentiation of circulation and seating area, and access to information.

An example of a departure lounge arrangement appears in Figure 27.

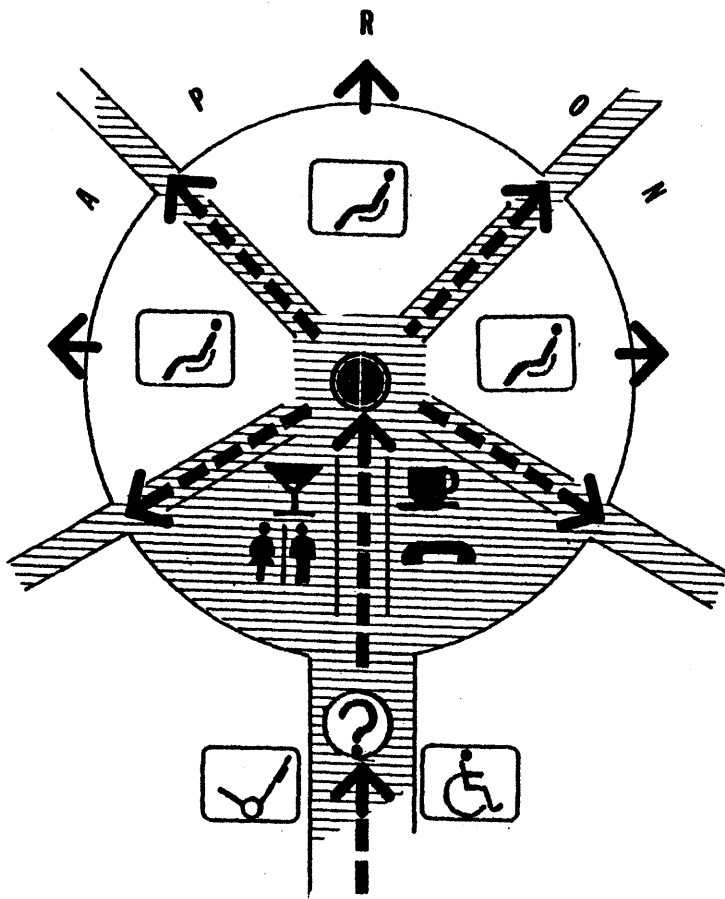


FIGURE 27. DEPARTURE/ARRIVAL LOUNGES

This thesis has presented a broader approach to design of airport facilities. It has included the user in the process of programming and evaluation of spaces. The object of this work has not been to produce a unique set of rules, but instead to open ways of viewing architecture -- of making design of spaces a shared enterprise by which ideas get collected from many sources, not only from the architect's head. When people say they like something or show, by their behavior, that they prefer it, this should be a value fed into the design process, even when it can't be measured in terms of loss or profit. Many performance criteria set by this work deal only with subjective or individual aspects within a practical, multi-goal building. This is not to say that other requisites are not important or that they should be discarded. The point is that in an evolving world it is reasonable to clarify all the important inputs to a problem; to establish clearly defined and highly valued rules.

The concluding contention is that perhaps a good airport environment is that which is not negatively felt by its users. The pro-

## Epilogue

cess of arriving, departing or moving should present no obstacle or impose no effort from passengers.

The principles set in this work will be of help in large transportation environments where occupants have little control of their surroundings. "To an increasing extent we find ourselves being arranged by impersonal environments in halls, waiting rooms, airports and lobbies." (R. Sommer, Personal Space, pg. 73). It is this impersonal nature of terminal buildings which creates an inappropriate context for human relationships. On this basis it is the responsibility of designers and planners to formulate and maintain functional spaces where human relationships are not thwarted.



- A. PRE-TEST QUESTIONNAIRE
- B. AIRPORT SURVEY FORMAT
- C. SUMMARY OF OBSERVATIONS, M.I.T. Spring  
1981
- D. SURVEY CENSUS DATA

# appendix

**A. PRE-TEST QUESTIONNAIRE**

1. How frequently do you travel by plane? Please check one.

- a. RARELY \_\_\_\_\_
- b. LESS THAN ONCE A YEAR \_\_\_\_\_
- c. ONE TRIP/YEAR \_\_\_\_\_
- d. TWO TRIPS/YEAR \_\_\_\_\_
- e. THREE TO FIVE TRIPS/YEAR \_\_\_\_\_
- f. MORE THAN FIVE TRIPS/YEAR \_\_\_\_\_

2. How do you most frequently move to and from the airport? Please check one.

- a. OWN CAR \_\_\_\_\_
- b. TAXI \_\_\_\_\_
- c. FRIEND/RELATIVE CAR \_\_\_\_\_
- d. PUBLIC TRANSPORTATION \_\_\_\_\_
- e. LIMO OR OTHER VAN/BUS \_\_\_\_\_
- f. RENTED CAR \_\_\_\_\_

3. Why? Please check one.

- a. CHEAPER \_\_\_\_\_
- b. FASTER \_\_\_\_\_
- c. NO CAR \_\_\_\_\_
- d. MORE COMFORTABLE \_\_\_\_\_
- e. OTHER (SPECIFY) \_\_\_\_\_

The following question does not refer to any specific place or terminal. Please make an abstraction of the situation and select or add your preference.

Imagine yourself waiting 3 hours for a delayed plane. Which of the following services would you like to have? Please select only one.

- a. MORE RECREATIONAL ACTIVITIES \_\_\_\_\_
- b. SLEEPING SPACE \_\_\_\_\_
- c. CHILD CARE FACILITIES \_\_\_\_\_
- d. IMPROVED EATING PLACES \_\_\_\_\_
- e. OTHER (SPECIFY) \_\_\_\_\_

Please make an effort to remember your last stay at Logan Airport. Which airline did you use?

Can you point out which of the following areas could be improved for the terminal you just mentioned? Select only one.

- a. PARKING \_\_\_\_\_
- b. TICKETING AREAS \_\_\_\_\_
- c. SHOPPING AREAS \_\_\_\_\_
- d. BARS, CAFES, RESTAURANTS \_\_\_\_\_
- e. CONCOURSES/CORRIDORS \_\_\_\_\_
- f. DEPARTURE LOUNGES \_\_\_\_\_
- g. WAITING AREAS \_\_\_\_\_
- h. PEDESTRIAN COMMUNICATIONS BETWEEN TERMINALS \_\_\_\_\_
- i. BAGGAGE PICK-UP AREAS \_\_\_\_\_
- j. OTHER (SPECIFY) \_\_\_\_\_

7. How would you improve this area. Select one or several and rank your choices in order of priorities. (1,2,3 etc.)

- a. BETTER MAINTENANCE \_\_\_\_\_
- b. BETTER SIGNAL SYSTEM \_\_\_\_\_
- c. ADDITIONAL SPACE \_\_\_\_\_
- d. BRIGITER(MORE LIGHT) SPACE \_\_\_\_\_
- e. ADDITIONAL EQUIPMENT -PUSH CARTS \_\_\_\_\_  
 AIRPLANE SCHEDULE SCREENS \_\_\_\_\_  
 TELEPHONES \_\_\_\_\_  
 OTHER EQUIPMENT (SPECIFY) \_\_\_\_\_
- f. ADDITIONAL SERVICES: FOOD \_\_\_\_\_  
 RESTROOMS \_\_\_\_\_  
 INFORMATION BOOTHS \_\_\_\_\_  
 BANK/CHANGE \_\_\_\_\_  
 SUITCASE STORAGE \_\_\_\_\_  
 OTHER (SPECIFY) \_\_\_\_\_
- g. BETTER ORGANIZATION IN TERMS OF PASSENGER FLOW FROM ONE ACTIVITY TO THE OTHER \_\_\_\_\_
- h. ADDITIONAL SPACE FOR VISITORS \_\_\_\_\_

8. Do you have any specific apprehension towards airports? Please check one:

- a. CROWDS \_\_\_\_\_
- b. IDLE TIME \_\_\_\_\_
- c. LONG LINES \_\_\_\_\_
- d. FLIGHT ANXIETY \_\_\_\_\_
- e. SIZE OF BUILDING (SCALE) \_\_\_\_\_
- f. TIME PRESSURE \_\_\_\_\_
- g. NONE OF THE ABOVE \_\_\_\_\_

9. With which of these situations do you identify the most? Please check one.

- a. CAN'T FIND MY WAY \_\_\_\_\_
- b. DON'T UNDERSTAND LOUDSPEAKERS \_\_\_\_\_
- c. STAIRS/ESCALATORS SEEM (OR ARE) AN IMPEDIMENT \_\_\_\_\_
- d. ALL CORRIDORS AND SPACES LOOK ALIKE. I NEVER KNOW WHETHER I'M COMING OR GOING. \_\_\_\_\_
- e. EXCESSIVE INFORMATION CONFUSES ME \_\_\_\_\_
- f. I ALWAYS GET SO BORED \_\_\_\_\_
- g. I ONLY WANT TO GET OUT FAST. \_\_\_\_\_

10. In your opinion, which is the most comfortable airport you have used and why? Please write a short description. Not more than three or four sentences.

11. Please describe what would be an ideal or perfect airport for you to use. You can this in one or several ways:

- a) Describe a fantasy or imaginary place. Don't worry whether it is realistic or possible. Just make it the way you want it.
- b) Describe a place or airport somewhere else in the world. No matter where. It should be a place which you think would be ideal for all travellers to use.
- c) Describe how Logan airport should be changed. What should be changed or what eliminated to make it ideal for you to use.

**B. AIRPORT SURVEY FORMAT**

**PROGRAMMING THE TERMINAL FOR THE TRANSFER PASSENGER**

LOGAN INTERNATIONAL AIRPORT SURVEY, MARCH, 1982.

This survey will measure how well is the terminal environment satisfying the needs of transfer passengers. The results of this questionnaire will be used as data base for a Master of Science thesis at M.I.T. Thank you for your cooperation.

**Part I: Census**

1. Where is your permanent resident? \_\_\_\_\_  
City \_\_\_\_\_ State/Country \_\_\_\_\_
  
2. Occupation? \_\_\_\_\_
3. Sex \_\_\_\_\_  
male \_\_\_\_\_ female \_\_\_\_\_
4. Age group? 15-25 26-35 36-45 45-60 60 - +  
\_\_\_\_\_
  
5. Purpose of your travel? business pleasure school emergency other  
\_\_\_\_\_
  
6. How many friends/relatives/associates, are flying with you today? 0 1 2 3 4 or +  
\_\_\_\_\_
  
7. How many are under 10? 0 1 2 3 4 or +  
\_\_\_\_\_
  
8. How many visitors came to see you during your stay at the airport? 0 1 2 3 4 or +  
\_\_\_\_\_
  
9. How many air trips have you made last year? 0 1 2 3 4 or +  
\_\_\_\_\_
  
10. How often do you fly from Logan Airport? RARELY 1/YEAR 2/YEAR 3/YEAR 4 or+/YR.  
\_\_\_\_\_

11. Which is your ARRIVING AIRLINE? \_\_\_\_\_

12. Which is your DEPARTING AIRLINE? \_\_\_\_\_

**PART II: Movement**

13. Please check type of transfer:
- |                             |       |
|-----------------------------|-------|
| DOMESTIC-DOMESTIC           | _____ |
| INTERNATIONAL-INTERNATIONAL | _____ |
| DOMESTIC-INTERNATIONAL      | _____ |
| INTERNATIONAL-DOMESTIC      | _____ |

14. How much time do you have between flights? \_\_\_\_\_

15. Did the airline transfer your suitcase? YES NO  
If not, WHY? a) you preferred to take it yourself? \_\_\_\_\_  
b) Brought no suitcase \_\_\_\_\_  
c) No time for airline to transfer it \_\_\_\_\_  
d) Didn't know airline would do it \_\_\_\_\_  
e) Had to go through customs first \_\_\_\_\_  
f) Other reason (specify) \_\_\_\_\_

16. Are you carrying heavy hand luggage? YES NO  
\_\_\_\_\_

17. How did you arrive to your departing terminal?  
a) walking \_\_\_\_\_  
b) by BUS \_\_\_\_\_  
c) other means (specify) \_\_\_\_\_

18. If you didn't use the BUS, WHY?  
a) didn't know there was a BUS \_\_\_\_\_  
b) BUS takes too long \_\_\_\_\_  
c) Departing airline very near \_\_\_\_\_  
d) No handicapped access in bus \_\_\_\_\_  
e) Stayed at the hotel \_\_\_\_\_  
f) Other reason (specify) \_\_\_\_\_

Part III: WAITING

19. Please check if you have done any of the following activities during your stay at Logan.

- a) Did you EAT? YES  NO
- |        |                 |  |  |  |
|--------|-----------------|--|--|--|
| Where? | Food machines   |  |  |  |
|        | Coffee shop     |  |  |  |
|        | Restaurant      |  |  |  |
|        | Fast food place |  |  |  |
- About how long were you there? \_\_\_\_\_
- b) Did you go to a BAR? YES  NO
- Where was it located? \_\_\_\_\_
- About how long were you there? \_\_\_\_\_
- c) Which SHOP or SHOPS did you go into? \_\_\_\_\_
- \_\_\_\_\_
- Did you purchase anything? YES  NO
- About how much time did you spend shopping? \_\_\_\_\_
- d) Did you do any work while waiting? YES  NO
- Where did you do it? \_\_\_\_\_
- e) Did you make any phone calls? YES  NO
- What was the nature of the call? SOCIAL FAMILY WORK OTHER
- Were the telephones at an easily available location? YES  NO
- Were there enough telephones? YES  NO
- About how long were you using the phones? \_\_\_\_\_

- f) Did you? WATCH TV YES  NO  LISTEN TO MUSIC YES  NO
- READ YES  NO
- Where? \_\_\_\_\_ Where? \_\_\_\_\_
- Where? \_\_\_\_\_
- How long? \_\_\_\_\_ How long? \_\_\_\_\_
- How long? \_\_\_\_\_

g) During your transfer time did you require any particular service and couldn't find it? YES  NO

Which service was it? \_\_\_\_\_

- h) Did you walk around the terminal? YES  NO
- Were you walking because: There was no place to sit \_\_\_\_\_
- For the pleasure of walking \_\_\_\_\_
- To stretch your legs \_\_\_\_\_

20. If you had about three hours between flights, which of these activities would you prefer to do?
- |  |                                    |
|--|------------------------------------|
| EAT IN: a fine restaurant _____        | GO TO: a movie _____               |
| a steak house _____                    | a theatre _____                    |
| a fancy coffee shop _____              | an exhibition _____                |
| a fast food place _____                | a reading room _____               |
| SLEEP IN: a hotel room _____           | PLAY: table games (monopoly) _____ |
| a couch _____                          | video games _____                  |
| a cushioned bench _____                | table sports (pingpong) _____      |
| an easy chair _____                    | indoor sports (bowling) _____      |
| WORK IN: a quiet place _____           |                                    |
| a meeting room _____                   |                                    |
| a small hall with writing tables _____ |                                    |

TAKE YOUR CHILDREN TO: a playground \_\_\_\_\_  
 a nursery/childcare \_\_\_\_\_  
 a playroom \_\_\_\_\_

ANY OTHER: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

21. You have been in many places in the airport. Please choose from the list on the left which improvements you regard as necessary.

	corridors/ concourse	pedestrian connections between airlines	suitcase pick-up area	ticketing lobby	waiting areas	departure lounges
BETTER VIEWS	89	_____	_____	_____	_____	_____
IMPROVED MAINTENANCE	_____	_____	_____	_____	_____	_____
IMPROVED EATING OPTIONS	_____	_____	_____	_____	_____	_____
IMPROVED SHOPPING OPTIONS	_____	_____	_____	_____	_____	_____
CHILDCARE FACILITIES	_____	_____	_____	_____	_____	_____
IMPROVED RECREATIONAL OPTIONS	_____	_____	_____	_____	_____	_____
LARGER SEATING AREA	_____	_____	_____	_____	_____	_____
MORE INFORMATION BOOTHS	_____	_____	_____	_____	_____	_____
LANDSCAPING	_____	_____	_____	_____	_____	_____
BETTER ORIENTATION SIGNS	_____	_____	_____	_____	_____	_____
CLEAR CIRCULATION ROUTES	_____	_____	_____	_____	_____	_____
STORAGE FACILITIES	_____	_____	_____	_____	_____	_____
ADDITIONAL REST ROOMS	_____	_____	_____	_____	_____	_____
MAIL-TELEX SERVICES	_____	_____	_____	_____	_____	_____
ADDITIONAL PUSH CARTS	_____	_____	_____	_____	_____	_____
LARGER SPACE	_____	_____	_____	_____	_____	_____
ANY OTHER IMPROVEMENTS	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

22. Which of the following qualities do you think are missing in this area we're in?

- a) PLEASANT VIEWS \_\_\_\_\_
- b) CLEANLINESS \_\_\_\_\_
- c) GOOD SOUND SYSTEM \_\_\_\_\_
- d) COLOR \_\_\_\_\_
- e) LIGHT, WARMTH OF AMBIENCE \_\_\_\_\_
- f) CLEAR ORGANIZATION OF ACTIVITIES \_\_\_\_\_
- g) CLEAR ORIENTATION SIGNS \_\_\_\_\_
- h) CLEAR CIRCULATION ROUTES \_\_\_\_\_
- i) ANY OTHER (SPECIFY) \_\_\_\_\_

23. Which of these situations best describes your experience at airports in general?

- a) CAN'T UNDERSTAND LOUDSPEAKERS \_\_\_\_\_
- b) CAN NEVER FIND MY WAY \_\_\_\_\_
- c) I WANT TO GET OUT FAST \_\_\_\_\_
- d) MY KIDS DRIVE ME CRAZY \_\_\_\_\_
- e) STAIRS SEEM(OR ARE) AN IMPEDIMENT \_\_\_\_\_
- f) ALL SPACES LOOK ALIKE TO ME \_\_\_\_\_
- g) I ALWAYS GET SO BORED \_\_\_\_\_
- h) I HATE FLYING \_\_\_\_\_
- i) CROWDS MAKE ME NERVOUS \_\_\_\_\_
- j) NONE OF THE ABOVE \_\_\_\_\_

24. Have you ever been to an airport terminal that you have liked? Why?

C. SUMMARY OF OBSERVATIONS MIT SPRING, 1981

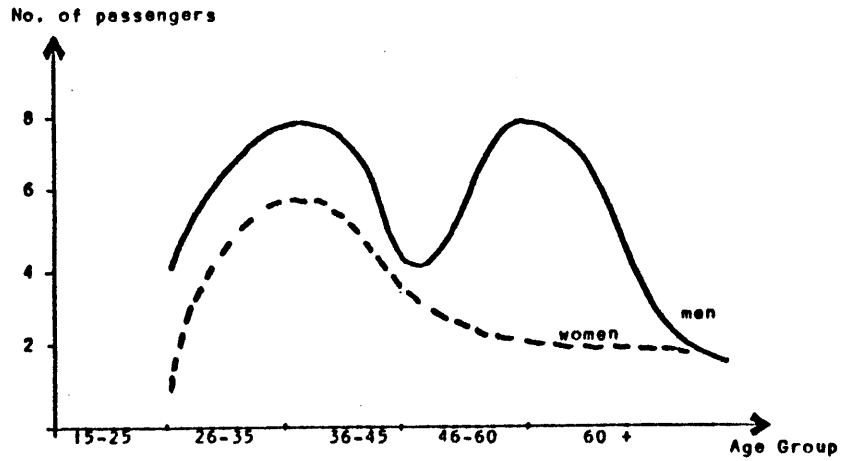
TRANSFERS

Time Between Terminals (minutes)

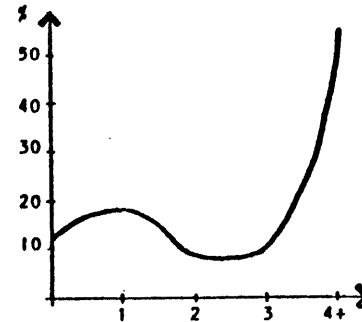
EA to AA	AA to TWA	TWA to Intl.	Errors
6	4		10 mins. to find AA to TWA passage! Got to Princeton Airways!
10	10	7	
13	8	7	Yes (EA to AA)
4	5	5	
6	7	8	
		5	EA to AA; yes (long way round; AA to TWA missed inside passage
8	11	8	AA to TWA; missed inside passage
8	7		AA to TWA; missed inside passage; EA to AA, missed bridge
8	8	6	AA to TWA missed inside passage
			AA to TWA?
8	8	7	over half missed AA to TWA error rate approx. 1/3

# D. SURVEY CENSUS DATA

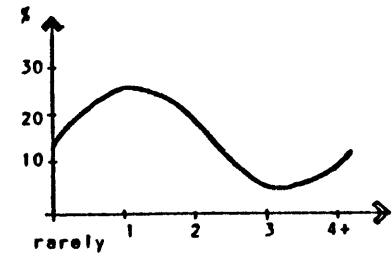
## D. SURVEY CENSUS DATA



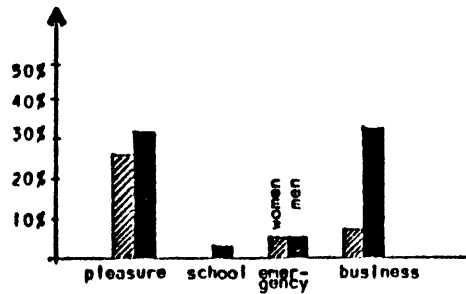
SEX AND AGES



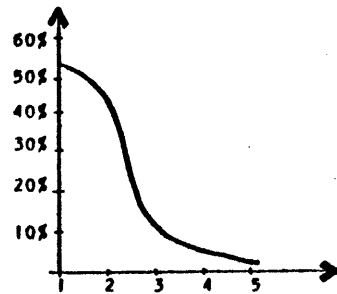
TRAVEL FREQUENCY/YEAR



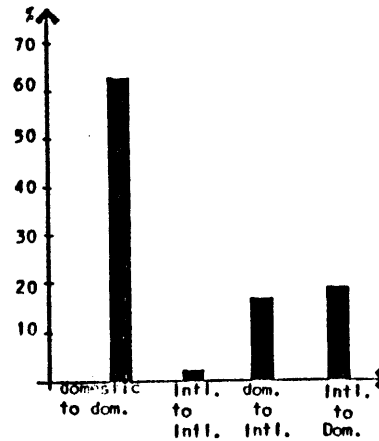
FREQUENCY OF LOGAN USE/USE



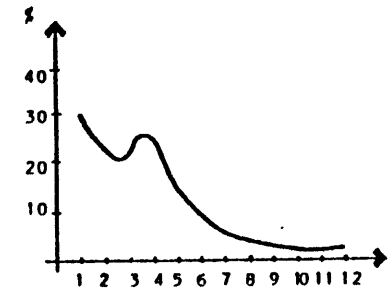
TRAVEL PURPOSE



TRAVEL GROUP



TRANSFER TYPE



LENGTH OF STAY AT TERMINALS



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