ROANOKE MUNICIPAL AIR TERMINAL BUILDING

by

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Also, gratitude is expressed to my very dear friends, and , for their help and support.

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Chapter I

INTRODUCTION

Airport and terminal facilities represent one of the most dynamic of recent architectural developments. In the seventy or so years since the airplane was introduced, aviation has developed into a highly sophisticated, world-wide, multibillion-dollar transportation activity. Although aircraft generally have a relatively long life span (they are seldom scrapped for obsolescence), new, larger, and better aircraft have been the rule rather than the exception. By contrast, the steam locomotive was in extensive use for probably 75 years before the diesel engine came into extensive service. The demand for air transport of people and goods has accelerated at a rate heretofore unheard of in society.

The study of various airports in the world shows that prediction of future changes is a prime issue in airport design. These changes can occur in airplane design, travel volume, economy, and so forth. The designer of an airport has to forecast these changes based on his own knowledge, and the predictions of other experts. Edward G. Blankenship, author of the book Airport, has cited the "initial smallness of the air transportation industry, coupled with the unforeseen changes in aircraft, which to a great extent obscured the problems that would multiply to plague major airports and airport environments." He continues:

> The air transportation story from World War II to the present day is one of phenomenal success coupled with fierce competition among the airlines. Dynamic growth consistently characterizes the history of air transport. Because aircraft and air routes change every year, most airports are inadequately planned to cope with increased air traffic in the air, or passenger traffic on the ground, or extraneous problems hindering physical airport growth. Much of the difficulty is technical and concerned with updating facilities, sometimes out-dated before they are in full use. However, the major problems can be traced to an inadequate or, in some cases, to a complete lack of long-range plan for the airport related to a comprehensive regional plan. It is also mandatory that forecasts and estimates concerning aircraft characteristics and passenger growth be consulted by planners.[1]

As pointed out above, one of the major problems in the planning of airports and service facilities since World War II has been the rapid increase in needs which were almost impossible to anticipate. New types of aircraft, baggage handling techniques, and passenger scheduling mechanisms have made recently-built facilities outdated and difficult to adapt. Arrangements for financing by local communities and cooperative regional ventures have complicated the organizational process almost beyond comprehension. The airport planner's greatest difficulty has been in developing workable plans that have sufficient flexibility to respond to future unpredictable needs.

On the other hand, there is evidence that the need and desire for major new conceptual developments have to some degree diminished. For example, the size of the present jumbo jet has been shown to be excessive except for certain prime routes. Thus we are unlikely to see any further development of larger and longer aircraft. Similarly,

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[1]Edward G. Blankenship. The Airport (New York: Praeger Publishers, 1974), p. 12.

developments in technology indicate that future aircraft probably will require less runway length than present aircraft require. The VTOL--vertical take-off and landing craft--is an example of such a specialized aircraft. Finally, a multitude of baggage concepts and techniques have been explored and all but a few discarded. Even if radically new techniques are developed, the need for rapid and convenient baggage handling has been recognized long enough to suggest that new techniques probably can be accommodated within recent well-designed structures. In other words, airport facilities have reached the point in size and concept that accommodating new developments (which will in all likelihood be minor developments) will not make entire airports obsolete.

PROBLEM STATEMENT

The interface between land and air transportation occurs at the airport. Airport design has gone through drastic changes in the past because of an amazing rate of increase in air travel and progress in industry in building airplanes with different speeds and sizes. These changes brought new requirements and demands for airport facilities. Airport designers have begun to realize that they are dealing with a problem which requires a great amount of prediction in light of future needs for flexibility and expansion. In addition, the problem is a complex one and involves various issues which again consist of numbers of components. This is true not only for design aspects, but also location. For example, it is important to locate an airport near a metropolitan area in order that it will be easily accessible by public and other modes of transportation. However, there are problems inherent in this. The closer the facility is located to the city, the harder it is to integrate it with the surroundings, in addition to the problem of finding a sufficiently large block of land to meet current needs, yet allow for expansion. Noise pollution and other factors must also be considered. There are also individualized problems: in one airport, speed in various operations is an important issue because a number of events are happening simultaneously or within a short period of time; while at another airport, speed is not an issue because of the low traffic volume. Due to this complexity, designers have been forced to set up a series of priorities of events. Once the priorities have been established, the functional and psychological aspects of the problem can be dealt with.

Once the physical technological problems have been overcome, planners can focus on the accommodation of passenger desires and needs. Air passengers are beginning to despair of long and tiresome waits in ugly and uncomfortable airport facilities with little opportunity for relaxation, study, or recreation other than that provided by the usual bookstand or curio shop. Communities are beginning to visualize airports as social-interaction centers as well as arrival and departure points. The problem for planners, then, is to determine just how a new airport facility will fit into the image of the community, meet the practical needs with new technology, and at the same time provide the kinds of amenities that travelers are beginning to demand.

The city of Roanoke, Virginia, is typical of those communities with an airport which has been rebuilt since World War II and which again faces obsolescence. Extensive studies by city-employed planners and by the Federal Aviation Administration (FAA) have provided estimates of the facility's needs by the year 2000 A.D. Certainly the planning of Roanoke's new airport will require careful and extensive study by firms of qualified architects, engineers, and consultants. In addition, considerable thought must be given to creating within Roanoke's new facility a sense of community place with ample amenities for travelers.

OBJECTIVE AND SCOPE

This thesis is intended to identify those problems in the design of an air terminal building which have been neglected or insufficiently considered in the past. Specifically, the results of a design study and exploration of a new terminal concept for the city of Roanoke are presented. In addition to increased efficiency and aesthetic qualities, the new facility will also incorporate amenities for travelers, and provide opportunity for community services and activities that may be developed in time. People often spend long hours waiting in a terminal building. To make this time a pleasant experience, the place must offer something more than just a waiting area. In addition, people may come to an airport just to watch the planes, to dine in the restaurant, to shop, or just to observe the activities. The terminal building must be an environment to enjoy, besides being a place to get on or off a plane.

This thesis provides airport planners, architects, and engineers, particularly those associated with the Roanoke facility, with an airport design that satisfies the needs of travelers and suggests some of the many concepts that they might want to consider. Included are a discussion of the study and considerations explored in the development of the design, a functional program for a new Roanoke Airport to accommodate needs in the year 2000 A.D., and finally, drawings, diagrams, and illustrations of the process involved. Not of particular relevance to the above purpose and, therefore, not included in this study are contract documents and cost estimates.

Chapter II

RELATED STUDIES

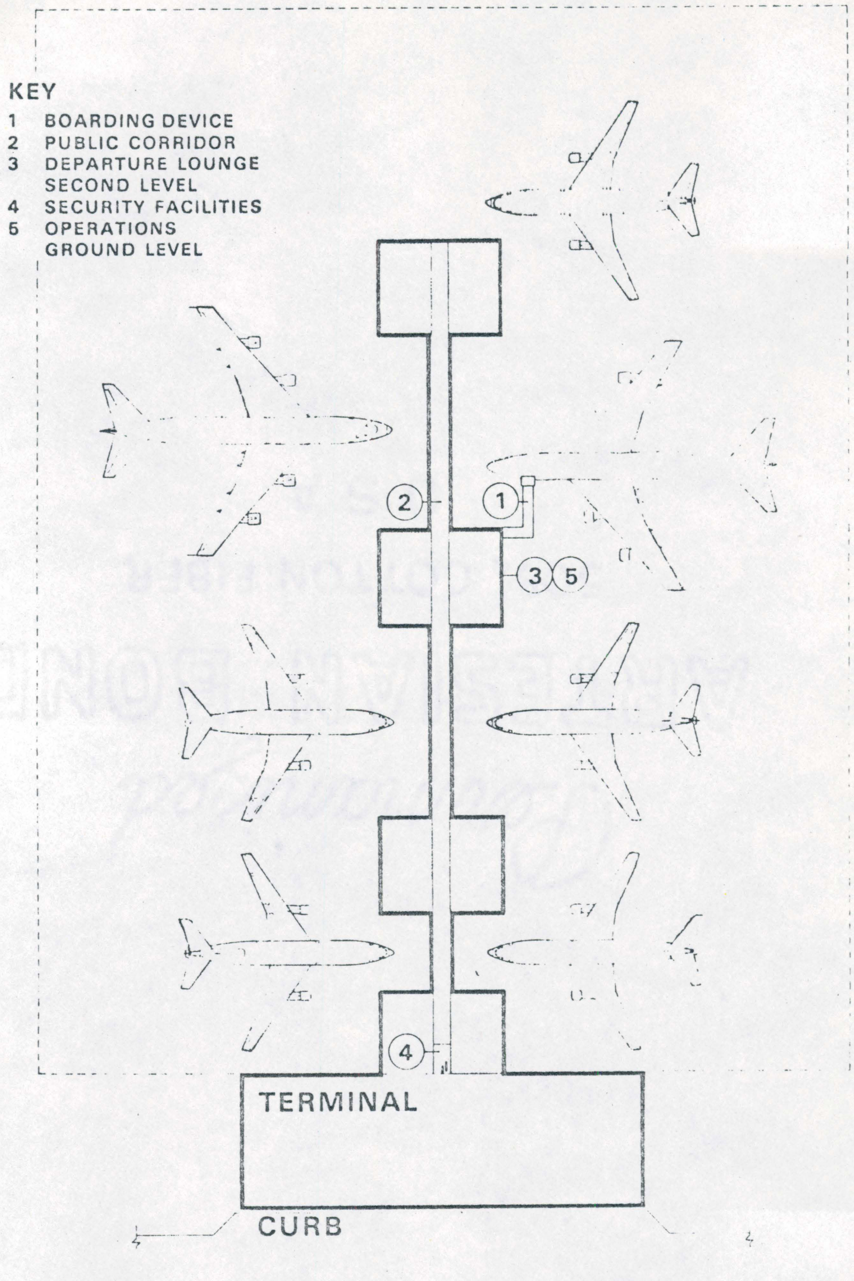
Terminal Configurations

All terminals are designed in one, or a combination, of the following configurations:

1. Pier Configuration
2. Satellite Configuration
3. Linear Configuration
4. Transporter Configuration

Pier Configuration

This concept was introduced in the 1950's and provides for separate holding areas for each flight. The passengers wait in the departure lounge and board a plane that is parked immediately adjacent to the lounge and along the pier. The system makes enplaning and deplaning safe because passenger circulation routes are totally separate from apron activities. (Figure 1) Disadvantages of this concept include the fixed size of the piers which limits the size of the aircraft using the facility, and the long walking distances unless people-moving devices are used. This difficulty has been experienced in major airports such as Atlanta Airport in Atlanta, Georgia, and O'Hare Airport in Chicago, Illinois.

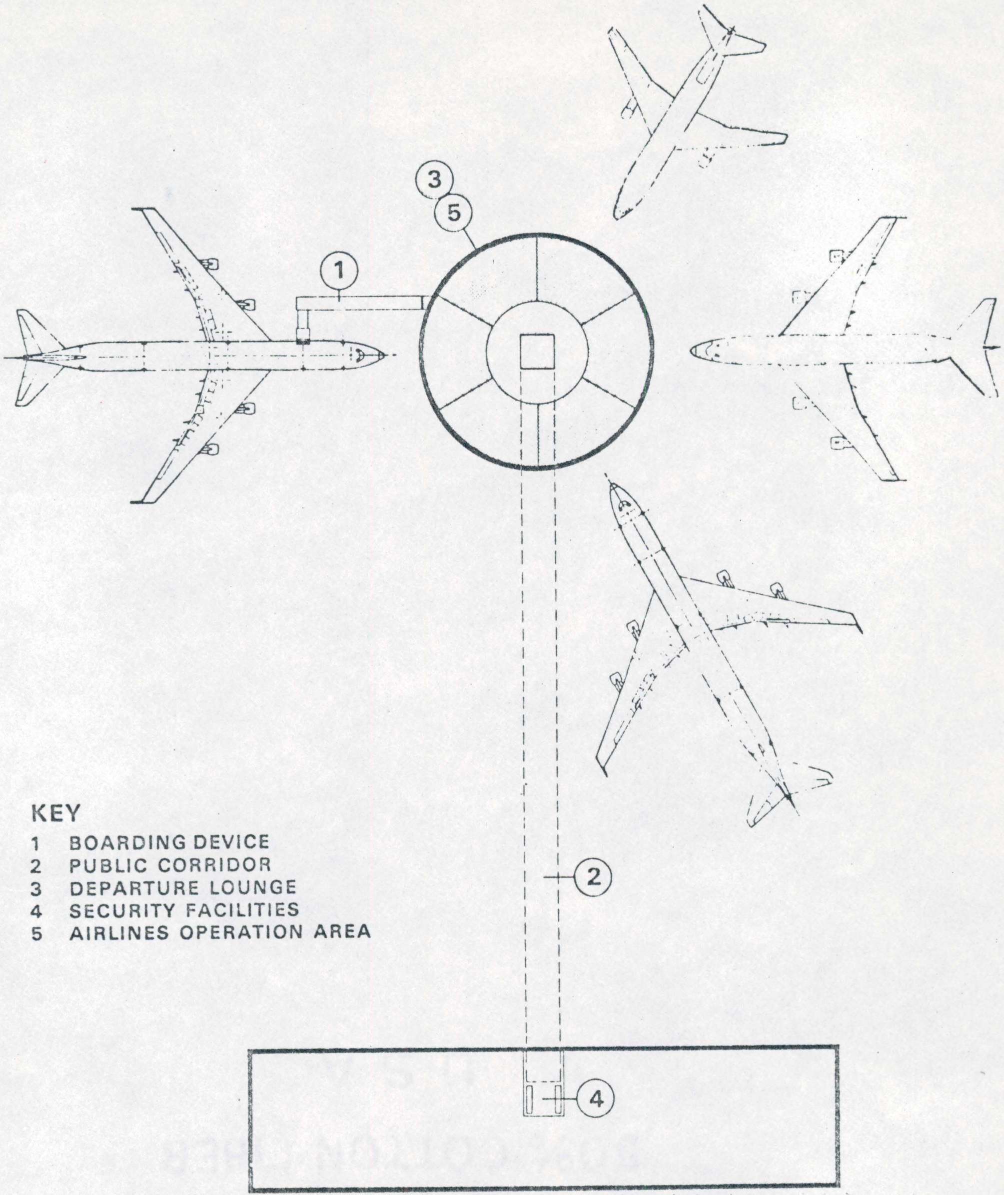


CONNECTOR — PIER CONCEPT
FIGURE 1

Source: The Apron and Terminal Building, Planning Manual, Prepared by the Ralph M. Parsons Co. for the U.S. Department of Transportation, July, 1975, p. 3-3.

Satellite Configuration

The satellite arrangement introduces the use of underground tunnels to the parked airplane. (Figure 2) This concept provides more flexibility for maneuvering planes and involves less limitation based on size of aircraft. Walking distances are maximized for all gates around the satellite unless the people-mover systems are used. In the satellite system, aircraft are parked about one point which makes it possible to share the equipment or service facilities but, at the same time, limits the number of aircraft accessible to parking and service. Houston International Airport and Roissey-en-France in Paris are examples of this type of configuration.

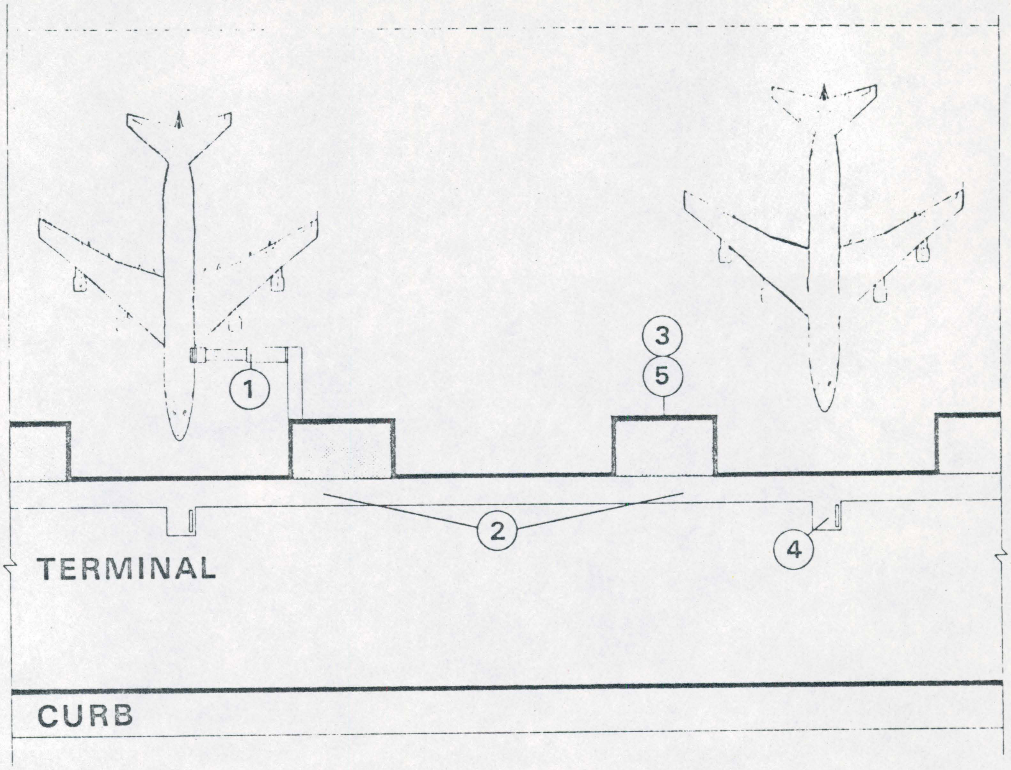


CONNECTOR — SATELLITE CONCEPT
FIGURE 2

Source: The Apron and Terminal Building, Planning Manual, Prepared by the Ralph M. Parsons Co. for the U.S. Department of Transportation, July, 1975, p. 3-5.

Linear Configuration

The linear configuration employs a single building providing all services with aircraft parked adjacent to it. (Figure 3) The system consists of several small terminals, each with a complete set of systems necessary to function as an isolated terminal. This prevents congestion as the passengers wait in small, individualized areas from which they directly board the plane. This plan provides a simple solution to future expansion problems, as additional small terminals can be built along the line. Toronto International Airport and Kansas City International Airport are examples of this type of configuration.



KEY
1 BOARDING DEVICE
2 PUBLIC CORRIDOR
3 DEPARTURE LOUNGE
SECOND LEVEL
4 SECURITY FACILITIES
5 OPERATIONS
GROUND LEVEL

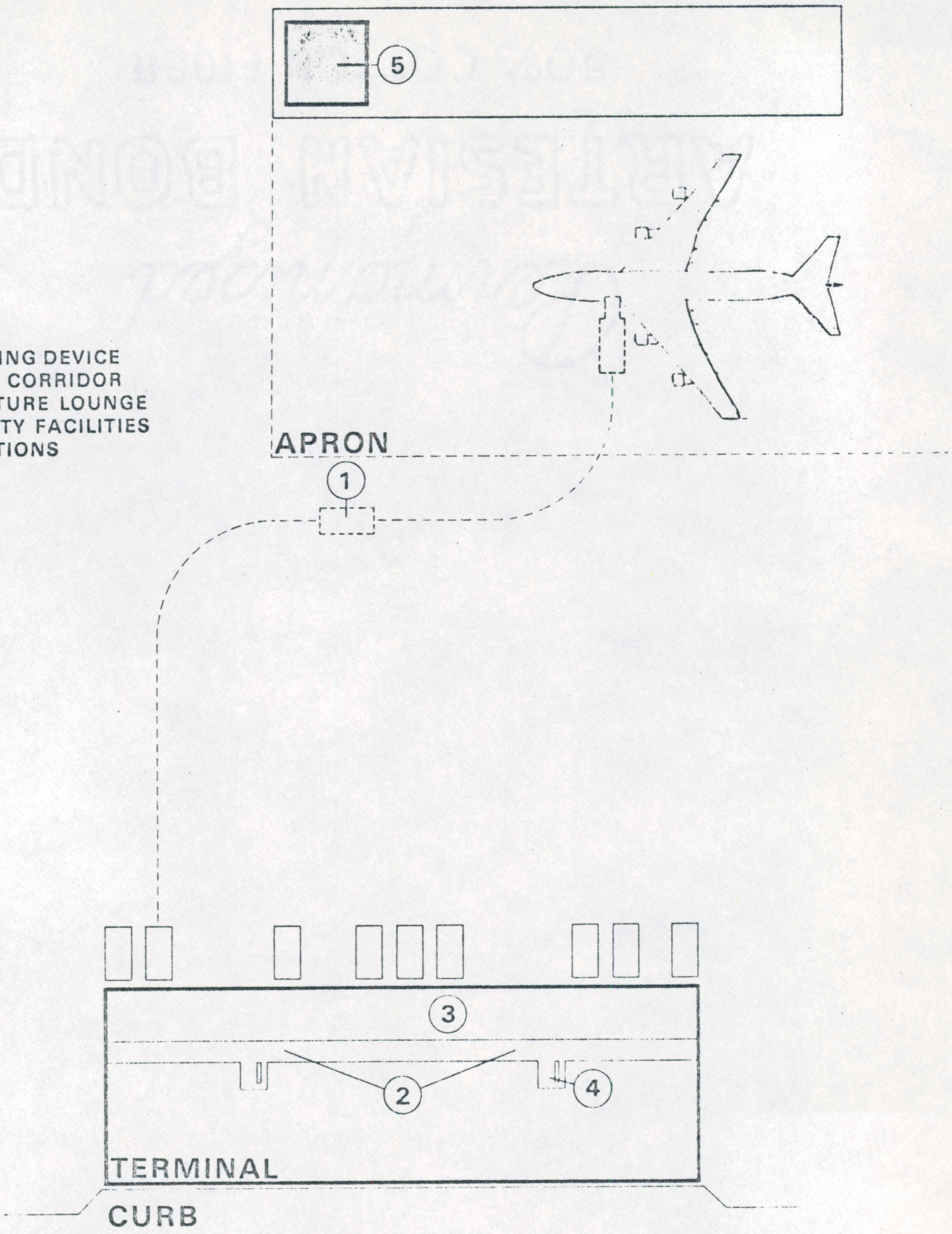
CONNECTOR — LINEAR CONCEPT
FIGURE 3

Source: The Apron and Terminal Building, Planning Manual, Prepared by the Ralph M. Parsons Co. for the U.S. Department of Transportation, July, 1975, p. 3-4.

Transporter Configuration

The idea in this concept is to transport the passengers to the plane from the terminal by the mobile lounge. In this way, the aircraft can be parked away from the terminal and taxi-in, taxi-out which eliminates expansive, time-consuming aircraft tugging or towing operations. (Figure 4) This also avoids congestion delays in terminal areas. Dulles International Airport is an example of this type of configuration.

KEY
1 BOARDING DEVICE
2 PUBLIC CORRIDOR
3 DEPARTURE LOUNGE
4 SECURITY FACILITIES
5 OPERATIONS



CONNECTOR — TRANSPORTER CONCEPT
FIGURE 4

Source: The Apron and Terminal Building, Planning Manual, Prepared by the Ralph M. Parsons Co. for the U.S. Department of Transportation, July, 1975, p. 3-6.

Evaluation

The four basic airport configurations discussed suggest various concepts from which to approach the design problem. Based on design priorities, one or a combination of these concepts can be incorporated to meet the needs of the individual airport. Trade-offs often must be made, as the configuration best suited for one aspect may hinder another. Some of the major considerations include:

1. Size of the airport and its potential for expansion. The number of aircraft currently accommodated governs the overall size of the facility which, in turn, affects passenger walking distances. Based on these, and other considerations, a design would be chosen keeping in mind its suitability for expansion.

2. Budget allocation. This issue governs the configuration choice due to the construction expenses and the technological facilities incorporated in the different designs.

3. Land availability. The size and shape of the available land may make one configuration more suitable than another. Expected expansion would also need to be considered in regard to this.

4. Types of operating aircraft. Some aircraft can maneuver better in certain configurations than in others because of their size.

However, there are some advantages and disadvantages in any selected configuration. According to the most important design priorities, the designer decides what to incorporate. It is important to note that the design priorities and choice of configuration will differ for various airports due to the individual constraints and problems.

Chapter III

RESEARCH PLAN

I. Literature Review

A thorough review of the relevant literature, along with in-depth studies of the design of various airports, will be conducted to establish the scope of the field. The Master Plan for Roanoke Municipal Airport, Roanoke, Virginia will be used to establish projections for the future.

II. Visit Airports and Observe Activities

Next, airports in the United States such as Dulles International Airport, Washington International Airport, and John F. Kennedy International Airport will be visited. During these visits the various activities of passengers, employees, etc. will be observed.

III. Interview Roanoke Municipal Airport Personnel

Various airport personnel will be interviewed, including the following persons:

Mr. Robert Poole, Roanoke Municipal Airport Manager

Mr. Richard Burrow, Project Manager for Expansion

Piedmont Airline Agents

Federal Aviation Administration Employees

Receptionist

Passengers

Engineers, Engineering Department of the City of Roanoke

IV. Synthesize Data

The information will then be used to determine the expected number of airlines operating in the airport, the volume of operations (that is, take-offs and landings), peak hours, and expansion by the year 2000 A.D. Finally, a program will be written for the new facility.

V. Problem Definition

According to the Master Plan for the Roanoke Municipal Airport:

> The use of turbo jets and other large aircraft is projected to increase both in absolute volume and as a percent of the total hourly operation at Roanoke airport. Present facilities cannot meet this increased demand. By the year 2000, over 200 aircraft are expected to be based on the airport. This is enough potential, using present FAA criteria, to require one and possibly two reliever airports. The present terminal is crowded and confined. By the year 1980 there could be a demand for at least 13 air carrier gates, and by the year 2000 as many as 18 positions. There is a need to construct a new air carrier terminal in an area capable of providing ultimate expansion capabilities of approximately 30 positions.[2]

This projection has several implications for future design. Specifically, the design should provide the following:

--Optimal utilization of the available land to provide for future expansion, including runway lengthening.

--Adequate space for current and projected aircraft volume, whether large or small planes.

--Ample room for the visitors, passengers, and employees to function comfortably within the terminal.

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[2]The Master Plan for Roanoke Municipal Airport (Woodrum Field), Roanoke, Virginia, prepared for the City of Roanoke by Talbert, Cox, & Associates, September 1970, pp. 60, 71, 72.

--Easy access to and from the airport and sufficient parking space.

VI. Design Criteria

In addition to those specific criteria for the Roanoke facility cited above, the following needs should be considered in the design of any airport:

--A convenient environment for the arrival and departure of passengers.

--A conducive atmosphere for the work of airline and airport employees.

--Interesting surroundings for waiting for arrivals and departures.

--Accessibility and usability by the handicapped.

--Efficient location of service facilities.

VII. Design Phase

Once the important issues and problems have been identified, they must be incorporated into the physical design. This stepwise process includes:

--Evaluation of the activity patterns. The individual activity paths will be studied, in addition to relationships between paths and especially any possible overlapping.

--Identification of the traffic flow caused by these activities. The intention here is to separate these traffic paths as much as possible. This will help to ease and speed the various types of circulation, and to prevent confusion.

--Allocation of spaces. This must be done with careful consideration of the different spaces, their functions, sizes, psychological effect on users, relationship to one another, and relationship to the circulation paths.

--Selection of structural system. After generating several structural alternative systems, one is chosen which best suits the designed space. In addition, the selection should relate to the cost, aesthetic qualities, and availability of different types of materials and skilled labor.

--Design of mechanical and electrical systems. The design of these systems must be considered while choosing the structural system, and then integrated into it.

Chapter IV

PROGRAM FOR THE NEW AIR TERMINAL BUILDING AT THE ROANOKE MUNICIPAL AIRPORT

Introduction

This study is partially based on observations of people, their activities, and the effect of the airport's physical environment on them. It is important to see how people respond to their physical environment. Through these studies certain questions can be developed which help in understanding the nature of this response and in identifying the design inadequacies. Observing users' behavior at a particular space reveals valuable information. These questions can be considered:

--How often is the space utilized and for what length of time?

--What is the function of the space, and what kind of activity will the users be engaged in while there?

--What is experienced, physically and psychologically, while using the space?

--How can changes in physical design achieve maximum space utilization?

This study is intended to provide a basic understanding of how an air terminal building can be designed to be pleasant and interesting while, at the same time, functioning to provide excellent service to the airlines and their passengers. These ideas will be incorporated into the real-life problem of designing a new terminal building for the Roanoke Municipal Airport.

Allocation of Area

The following projections for aviation-related land needs for 1990 are cited in the Master Plan for the Roanoke Airport:

Terminal Building Area	14 acres
Apron	43 acres
Public and Employee Parking	23 acres[3]

The 14 acres allotted for the terminal building must be subdivided to determine the space requirements for the areas within it. Figure 5 shows a general plan for how this breakdown occurs. Based on this plan, the following area allocations would be made:

Gross Terminal Building Area: 14 acres or 609,840 sq. ft.

Rentable Area: 55% or 335,412 sq. ft.

Airline Needs: 38% or 231,739 sq. ft.

--Airline ticket counter/offices
--Administration
--Operations
--Baggage
--Holdrooms

Other: 17% or 103,672 sq. ft.

--Concessions
--Food and Beverages
--Airport Administration
--Miscellaneous

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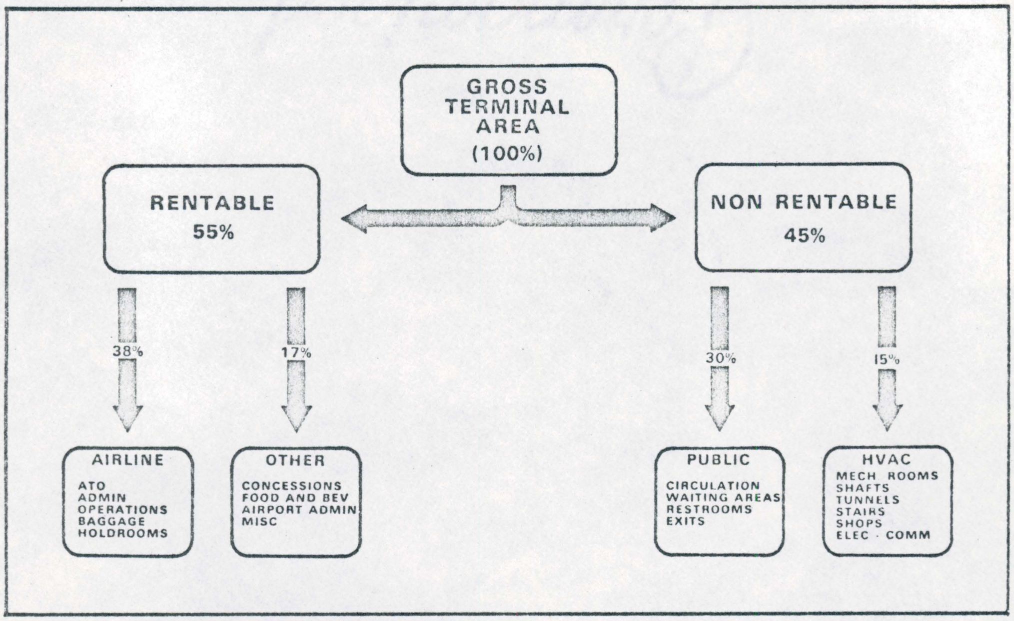
[3]Ibid., p. 85.



INCLUDES CONNECTOR AND TERMINAL AREAS COMBINED
STRUCTURE SPACE IS INCLUDED IN EACH AREA

SPACE DISTRIBUTION
FIGURE 5

Source: <u>The Apron and Terminal Building, Planning Manual</u>, Prepared by the Ralph M. Parsons Co. for the U.S. Department of Transportation, July, 1975, p. 6-9.

Non-rentable Area: 45% or 274,428 sq. ft.

Public Uses: 30% or 182,952 sq. ft.

--Circulation
--Waiting area
--Restrooms
--Exits

Heating, Ventilation, Air Conditioning and Circulation: 15% or 91,476 sq. ft.

--Mechanical rooms
--Shafts
--Tunnels
--Stairs
--Shops
--Electrical-Communications

The following section explains the specific needs and functions of the various areas of the terminal. The amount of square footage given here is based on the preceding information and the evaluation of other airports. It is important to note that this is only an estimation and can be changed during the design process if necessary. These allocations are intended to provide an overall understanding of the size of the various areas.

Enplaning Road to the Terminal Building

Easy access should be provided to the terminal building, with parking available for vehicles approaching. This access road should be wide enough to unload the people and baggage without slowing the traffic passing by. A sidewalk should be provided next to the terminal.

Deplaning Road

A separate road for vehicles leaving the terminal would ease the traffic flow. Also, an area for loading passengers and baggage, providing a sidewalk and easy access from the parking area to this road must be considered.

Parking

Enough parking spaces should be provided for a total of 3000 cars, to be shared by the public, employees, and car rental companies. Access to these parking spaces must be provided from both enplaning and deplaning roads. Exit from parking to the deplaning road is necessary. Walking distance from parking to the terminal must be minimized as much as possible. An area of 1,001,880 sq. ft. was allocated for this purpose.

Entrances and Exits

These elements must be well located to ease enplaning and deplaning activities, such as loading and unloading passengers and baggage.

Ramps, Elevators, and Escalators

Vertical circulation must be designed in such a way that handicapped users feel comfortable and need not depend on another's help. The use of a series of ramps, elevators, and escalators would be encouraged for this purpose.

Front Service Desks

Front service desks for information, car rental, and hotel reservations must be located near the entrance where they will be easily visible and accessible to the public. Total area: 180 sq. ft.

Public Washrooms

Public washrooms should be located near the entrance, waiting, and concession areas. They should be easy to find and easy to reach for passengers, visitors, airport employees, and airline personnel. Total area: 3,500 sq. ft.

Lockers

Various sizes of lockers for deplaning passengers should be located near baggage claim area and deplaning gates. Total area: 100 sq. ft.

Ticket Counters

This facility must be located close to the enplaning entrance. Enough space must be provided for the airline personnel to handle tickets and baggage. Space in front of these counters must be adequate to accommodate a number of passengers and visitors for peak hours. Total area: 22,500 sq. ft.

Enplaning Waiting Area

This space must be designed to be close to

a) ticketing counters;

b) enplaning gates, shops, and restaurant;

c) observation deck;

d) public washrooms.

In addition, this area should offer various options to amuse passengers and visitors who may have to wait long hours. For example, by means of providing visual connection to a number of other spaces, the activities of the airport personnel and passengers can be observed. Providing shopping facilities is another idea.

Total area: 58,400 sq. ft.

Shops

A variety of specialty shops could be provided to attract local residents to shop there in addition to serving the passengers. These shops must be located in the waiting areas to maximize their sales. Providing service care to these shops is an important consideration. Total area: 32,900 sq. ft.

Baggage Claim Area

It is convenient to locate this space near the deplaning gates and deplaning waiting area for visitors, so as the passengers reach the terminal they may pick up their baggage and see their friends and relatives. Therefore, a good connection channel should exist between the baggage claim area and deplaning visitor waiting area. Also, public washrooms, storage space, and lockers must be provided close to this space. Total area: 6,000 sq. ft.

Baggage Truck Circulation Tunnel

This tunnel must be wide enough so that the driver of the truck may stop the vehicle, unload or load the truck without stopping over moving trucks. The tunnel also must be designed for two-way traffic flow and must be connected to the apron area and the enplaning and deplaning baggage sorting area.

Deplaning Waiting Area for Visitors

This place should have similar characteristics to the enplaning waiting area to offer various things to do, such as shopping, eating, watching planes, etc. Total area: 45,272 sq. ft.

Holdrooms

These are the areas from which enplaning passengers board their planes. These areas should be designed to help airline personnel carry out their normal tasks--checking the tickets and seeing that all the passengers are present at boarding time. These areas should provide physical separation but visual connection between passengers and visitors. The areas should be connected properly to the enplaning waiting area, with minimal walking distance between them. Total area: 36,000 sq. ft.

Deplaning Gates

These gates should allow arriving passengers to get into the terminal building without walking a long distance, and get them to the baggage claim area, lockers, public washrooms, waiting area for visitors, and finally, to the doorways to the deplaning road.

Baggage Sorting Area

This area is used to sort all baggage, with outgoing baggage being put on trucks for transport to the planes, and incoming baggage being placed on conveyor belts to the baggage claim area. Total area: 4000 sq. ft.

Storage

Storage must be provided for outgoing baggage that cannot yet be loaded, for incoming baggage that has not been claimed, and for other baggage-handling equipment. Total area: 22,000 sq. ft.

Employees' Lounge

It is very important for people who work in an airport (airport employees, FAA employees, or airline personnel) to have a place of their own to relax when they take a break. Sometimes these people have to work a double shift and need an area in which to get a few hours sleep. These lounges must be very close to their working area. Total area: 5,000 sq. ft.

Restaurant

This restaurant must serve passengers, visitors, and employees, providing enjoyable meals and a view of the planes. There should be easy access for service trucks to deliver supplies to the restaurant and to move food from the restaurant to the planes. Total area: 30,000 sq. ft.

Airline and Government Offices

These offices must be designed to provide a suitable environment for the airline and government personnel. Desirable properties include natural light, a nice view to the outside, a lounge for the personnel to relax, a business meeting room, and enough space for filing cabinets. These offices must be easily accessible to restaurant, washrooms, apron, employees' parking lot, and other offices. Moreover, the airline offices must be close to ticketing areas, gates, and baggage-handling areas. Total area: 38,000 sq. ft. with 20,000 sq. ft. for the airlines and 18,000 sq. ft. for government offices.

Chapter V

DESIGN PROCESS

Introduction

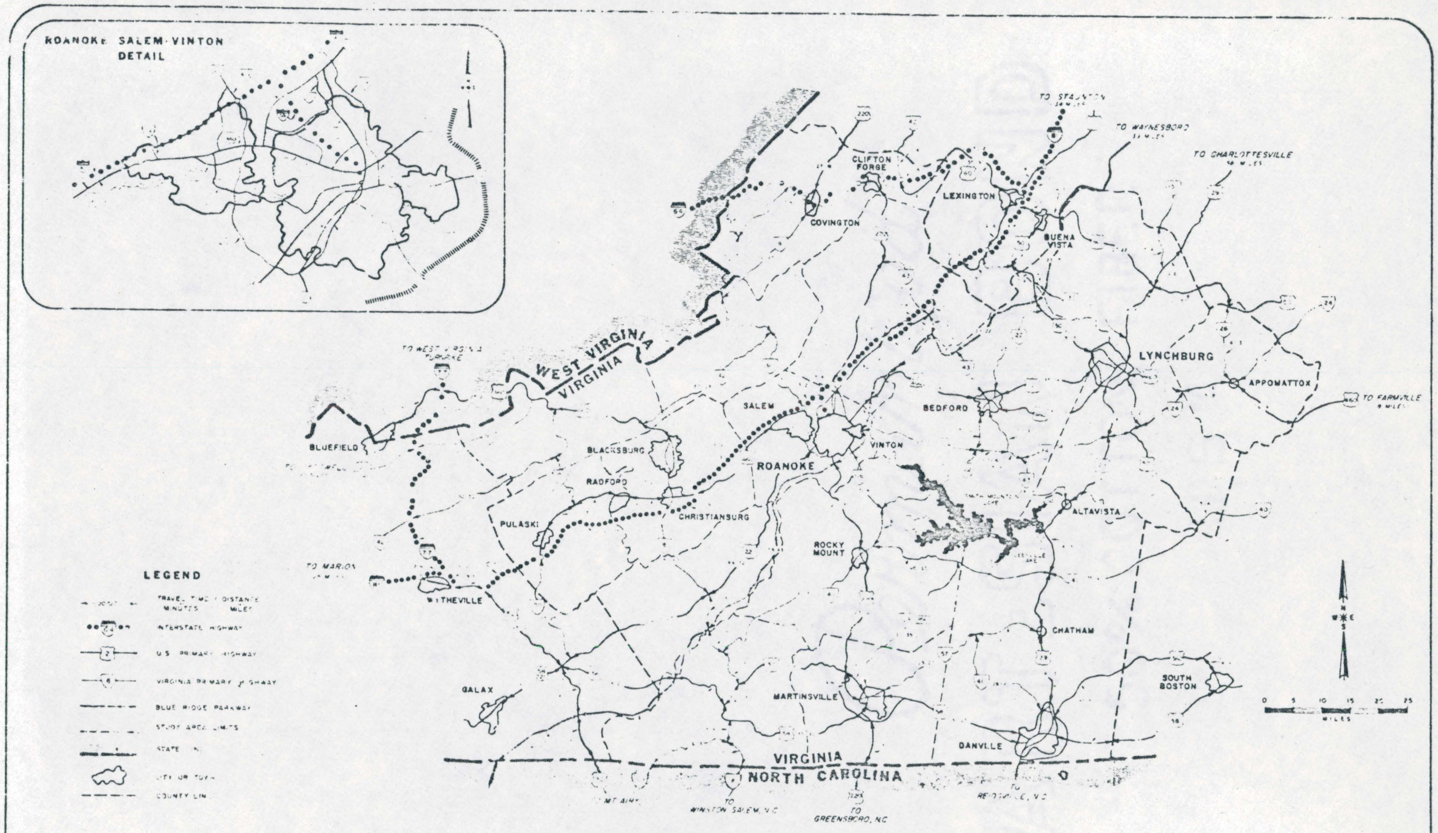
The Roanoke Municipal Airport is located north of the city of Roanoke, five miles away from the downtown area. Roanoke is located in the southwestern part of the state of Virginia. The Municipal Airport functions as a regional airport for the area shown in Figure 6.

Schematic Design

The present terminal building and tower are located at the end of runway 33. (See site plan, page 57.) The tower facilities can be used as they are now functioning. Since a new terminal building is needed, the present terminal can be utilized as the cargo building.

In locating the new terminal building and parking facilities, one of the prime considerations is to choose an area which would allow for further expansion. The best location for this purpose on present airport property is on the west of runway 33, indicated on the site plan. The new terminal will be adjacent to Interstate 581 which is one of the main access roads into the city. Minor changes in the course of some of the access roads are necessary. These changes are indicated on the site plan.

FIGURE 6



SPATIAL RELATIONSHIPS

Source: Blue Ridge Airtransportation System Study, Phase Three--Data Base. New River Valley, Fifth, Central Virginia, and West Piedmont Planning District Commissions, September, 1975, Revised January, 1976, p. 32.

According to the Master Plan, "in 1990 air carrier activities will approach 40 operations per hour during the peak hours. Total peak hourly operations, including military and general aviation activity, could range upwards of 230 operations per hour. This would produce a significant level of ground traffic requiring the addition of a dual parallel taxiway to the main runway."[4] In addition, an extension of 900 feet for runway 23 is needed due to the operation of larger aircraft and the nonstop scheduling of flights.

Design of the Terminal Building

All the information that has been gathered must be reviewed at this time. This helps to keep the designer aware of all important issues and problems identified, and prevents any later conflict and confusion. Specific design process steps that need review at this time include:

--Studying the activity patterns. This includes the individual activities, their relationships to each other, and any possible overlapping.

--Identifying the traffic flow of these activities. The intention here is to separate these traffic paths as much as possible. This will help to ease and speed the various types of circulation and prevents confusion.

Photographs on pages 35 and 36 show the model that was built of plexiglass. Its purpose is to study the circulation paths of employees,

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[4] Ibid., p. 90.

passengers, visitors, baggage, cars, service vehicles and planes. Various types of circulation are identified by different colors of tape. The modes of transportation are shown by different types of lines.

Spatial allocations must be made with careful consideration of the different spaces, their functions, sizes, psychological effect on users and their relationship to one another. Photographs on pages 37 and 38 show a few space diagrams that have been considered.

After the preceding studies of traffic flow and space allocation, the terminal design must be studied with consideration given to both circulation and spaces. All the elements of the design must be organized based on their relationship to one another. Circulation paths and activity sequences can be very helpful to see these relationships. Photographs on pages 39 through 44 show the different layers of the model that was built for this purpose. As the color key indicates, different colors have been used to designate the various spaces.

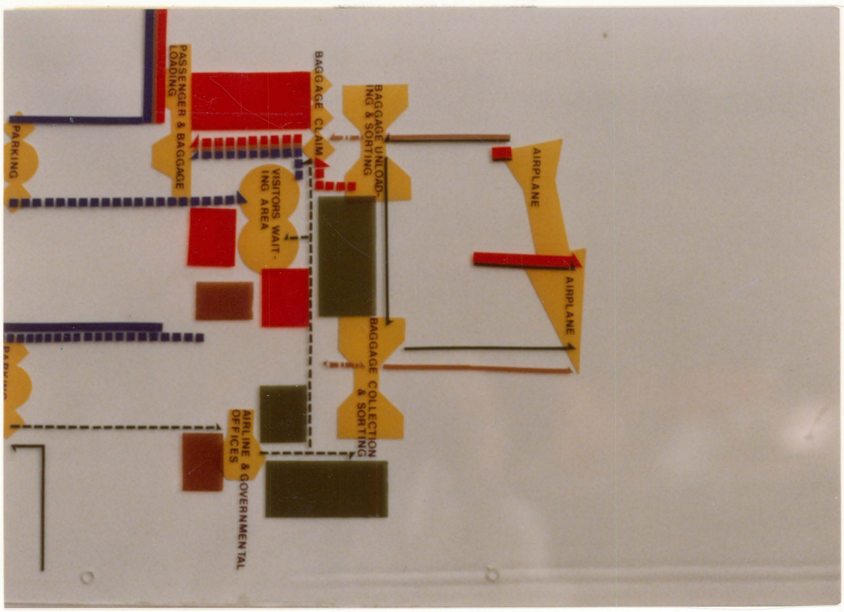
After designing the various spaces within the terminal building, structural alternatives must be considered (see page 45 through 49). The structure consists of a main terminal building which is linked to the holdroom areas by second level pedestrian walkways. Models have been used to study the structural elements (beams, columns, etc.) of a typical bay. The use of models can help to analyze the problem in a three-dimensional way. The structural system chosen is shown on page 50 through 53. The structural model shown on page 54 through 56 depicts the overall structural system. It is important to note that the structural system was designed with the thought of integrating this system with the mechanical and electrical systems. This will be illustrated in the following section.

Drawings

This section consists of drawings of the different levels of the terminal building, the section, the elevation, the structural plan and grid, and the mechanical systems.

Circulation Diagram

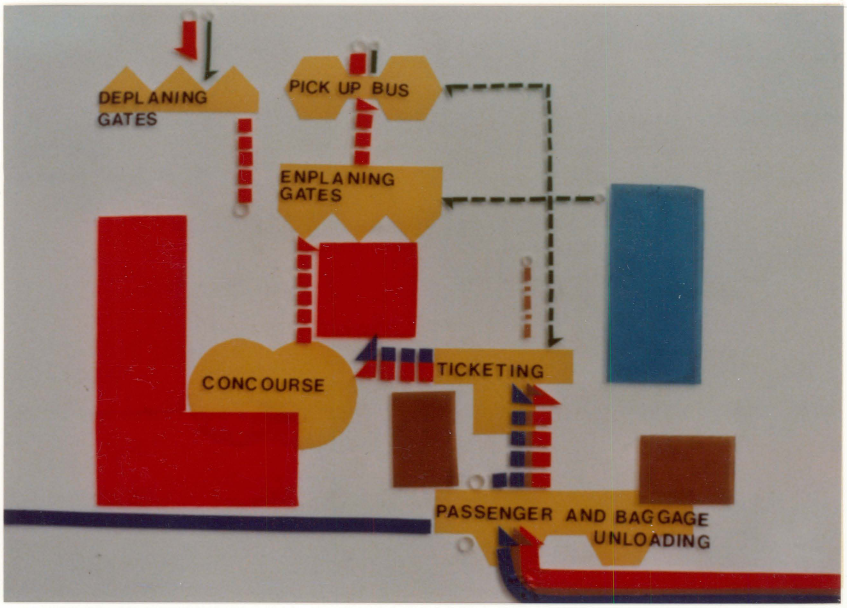
(1)



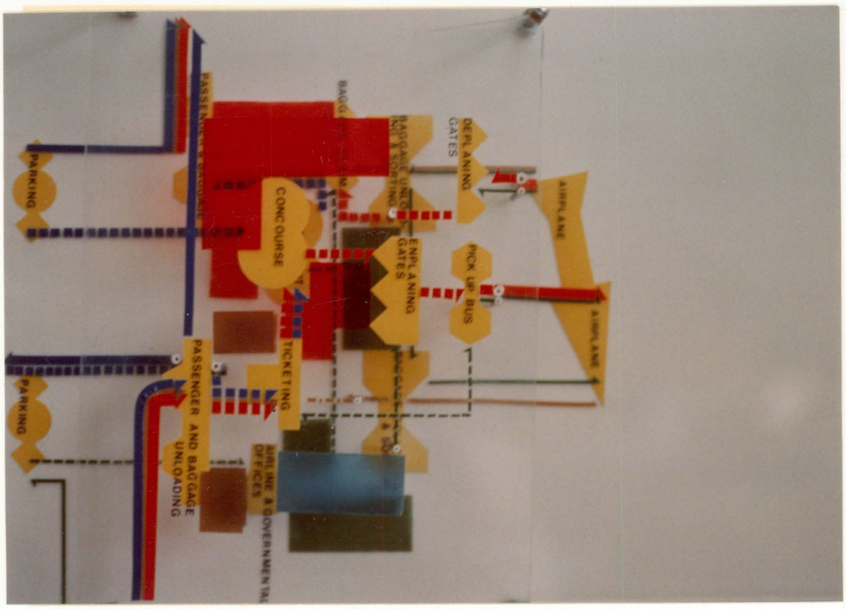
(2)

(1) Key to the Circulation Diagram

(2) Deplaning Diagram



(3)

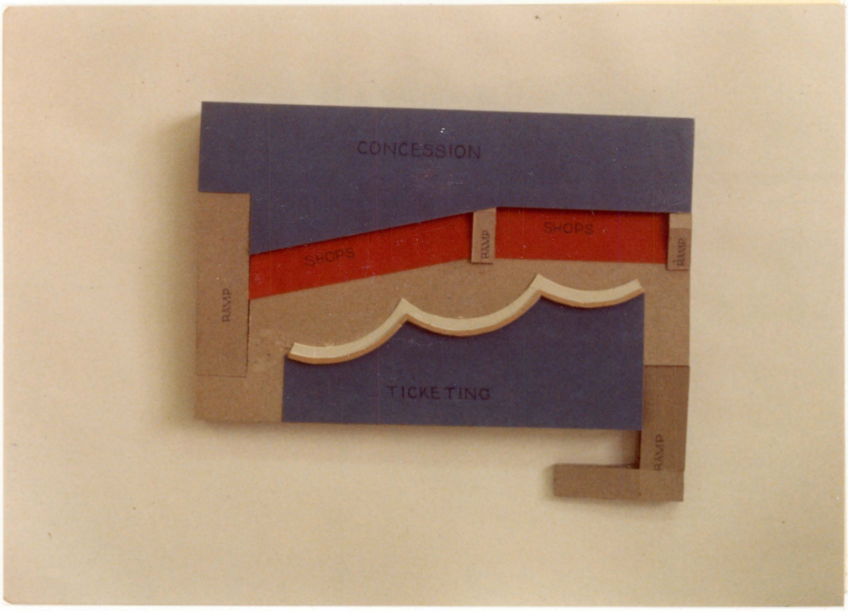


(4)

(3) Enplaning Diagram

(4) Overall Circulation Diagram

Space Diagram

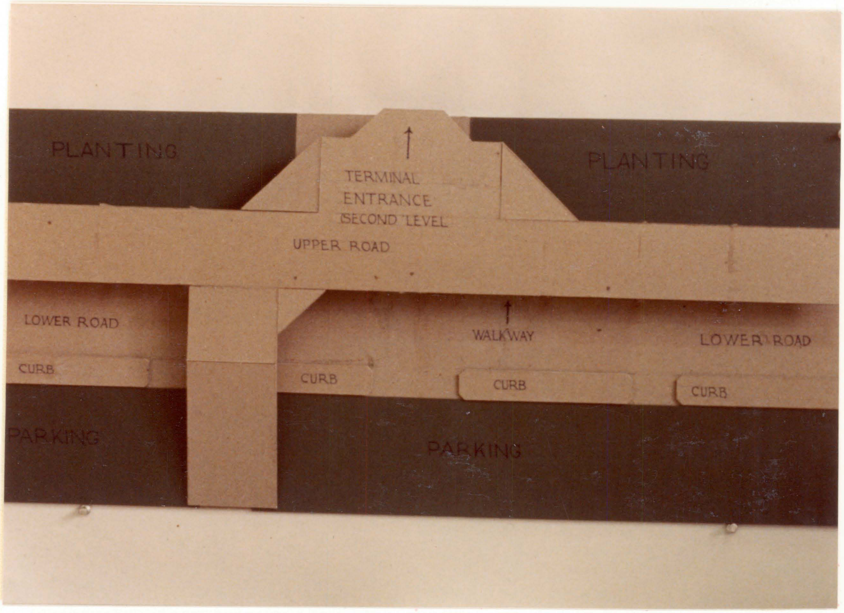


(5)

(6)

(5) Ticketing Area

(6) Baggage Claim and Waiting Area



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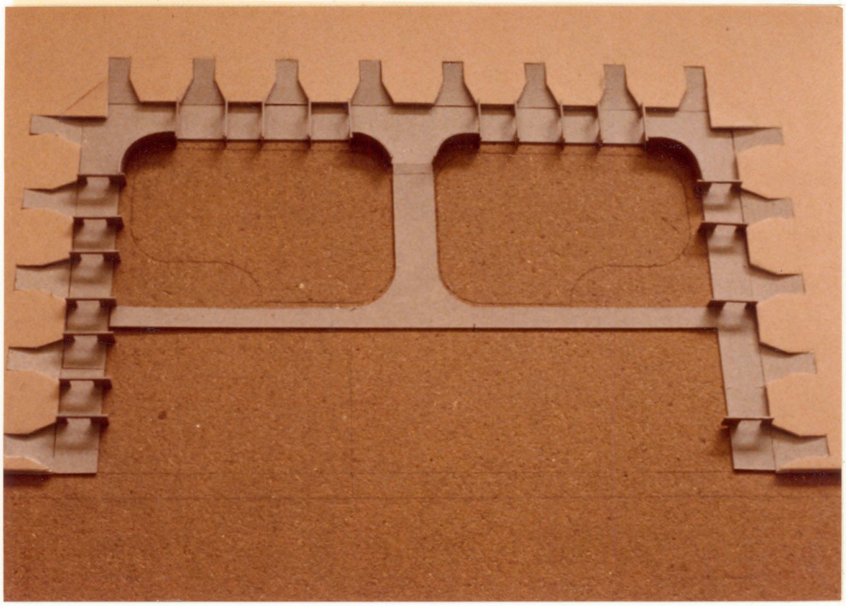
(7) Access Road to Terminal



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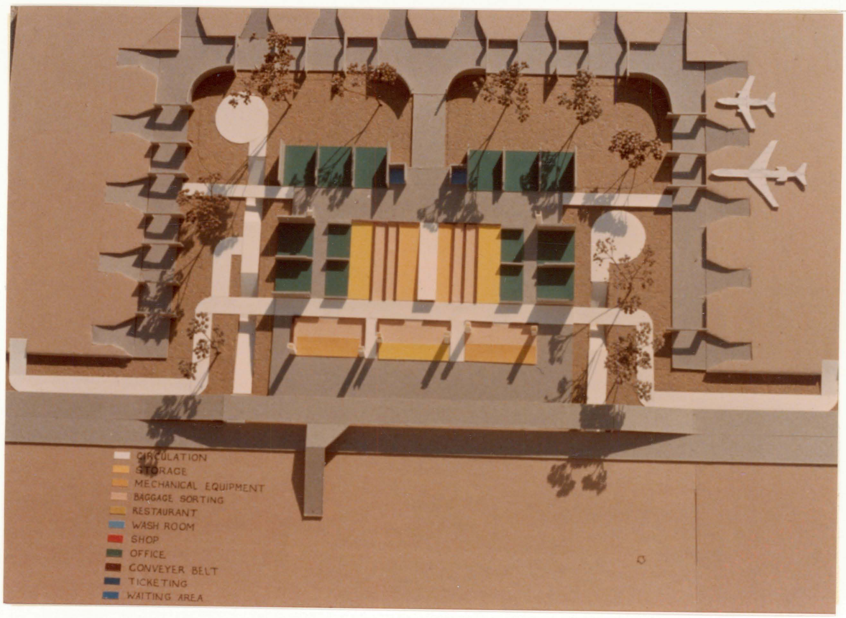

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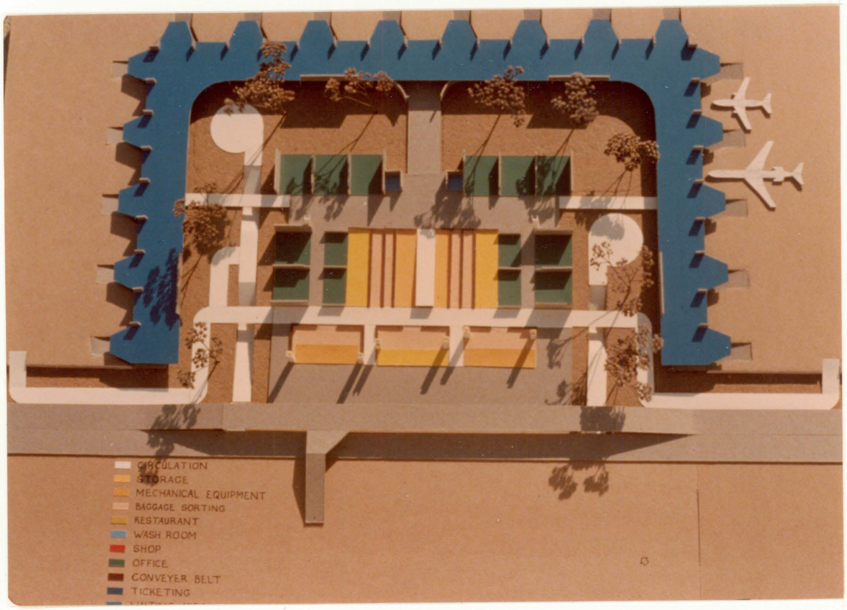
(8) Apron Area and Site for Terminal Area

(9) First Floor



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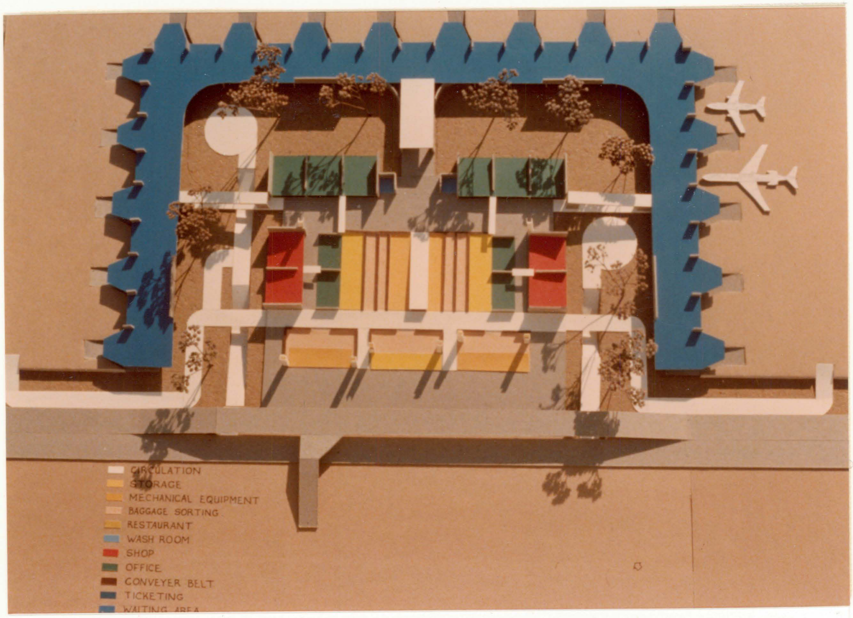

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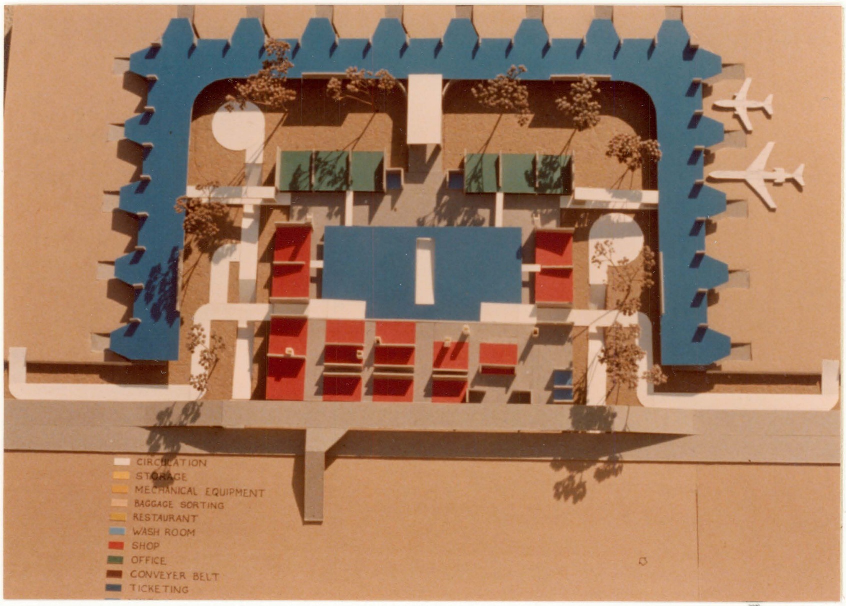
(10) First Floor and Holdroom Area

(11) Second Floor, Holdrooms, and Connecting Bridges



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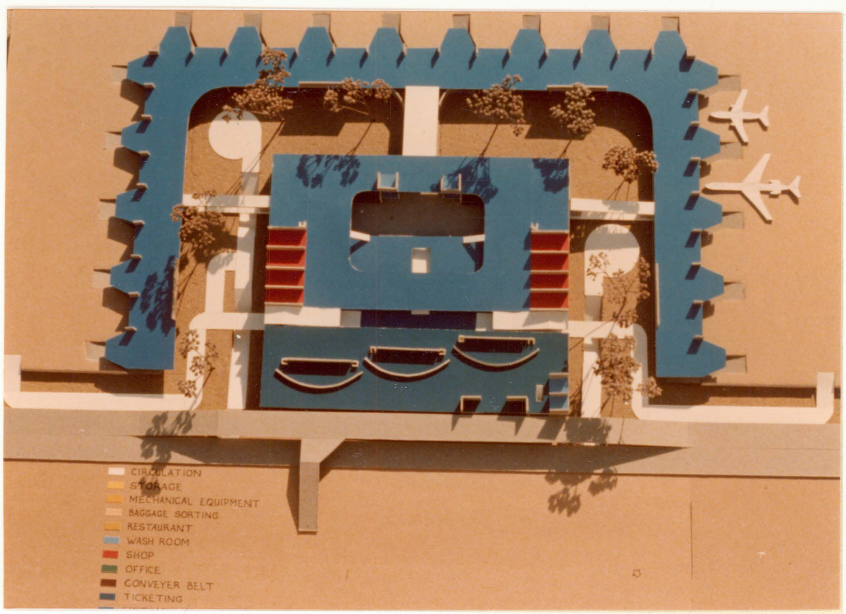

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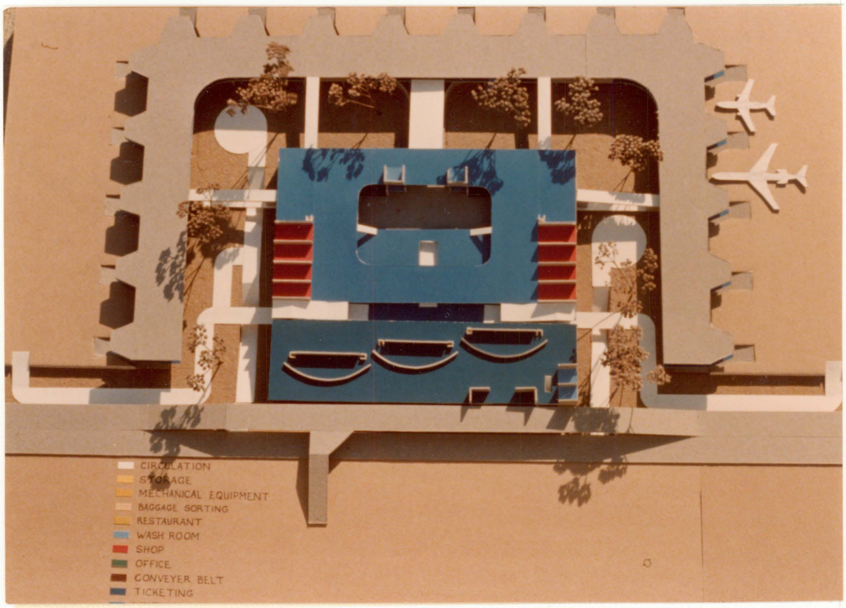
(12) Second Floor

(13) Third Floor



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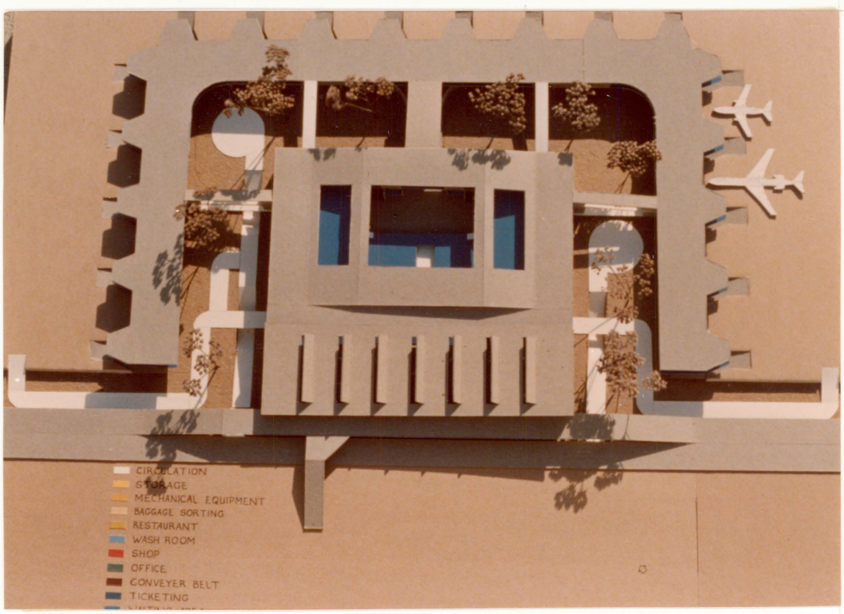

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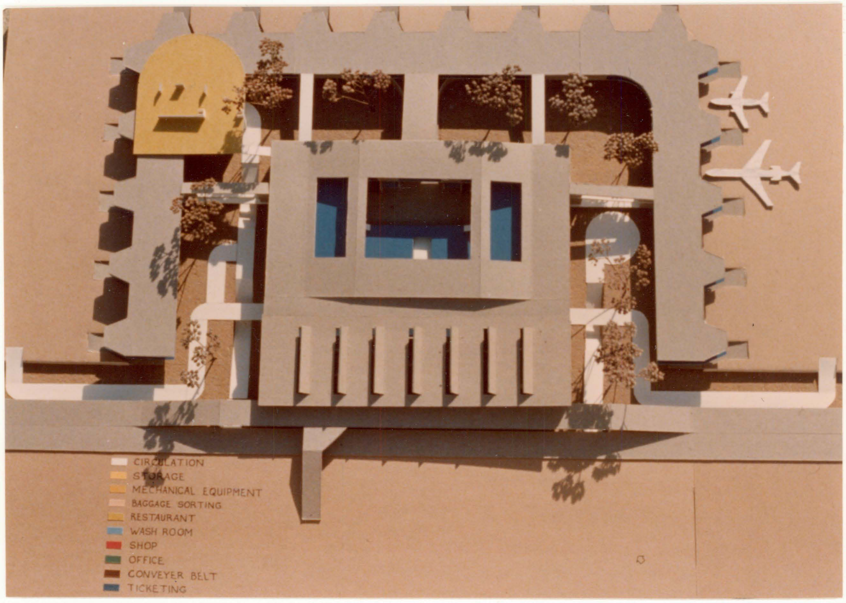
(14) Third Floor and Roof on Holdrooms

(15) Roof on Main Building and Holdrooms



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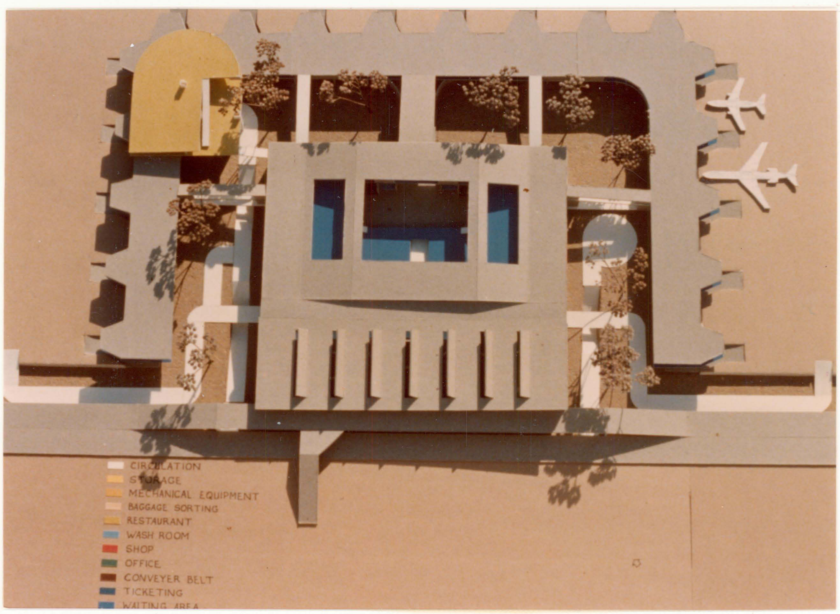

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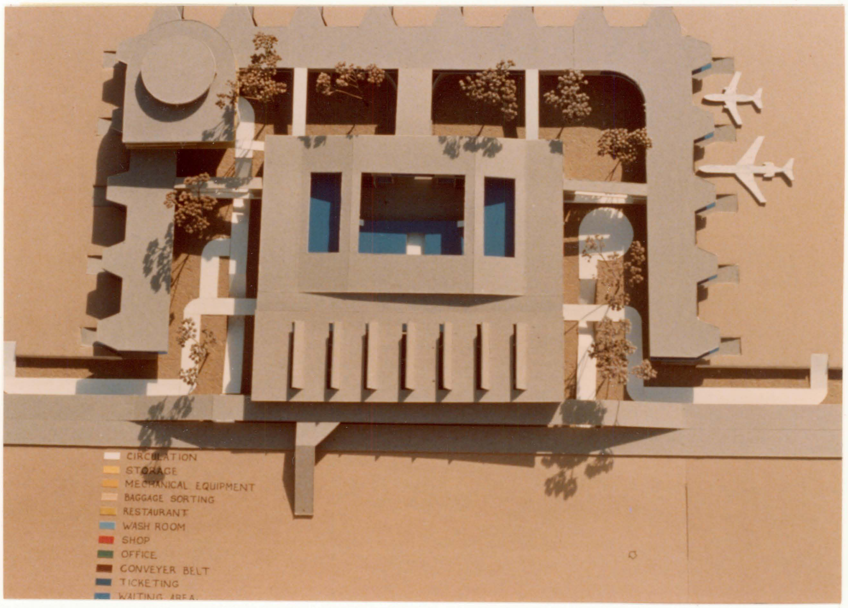
(16) First Floor of Restaurant

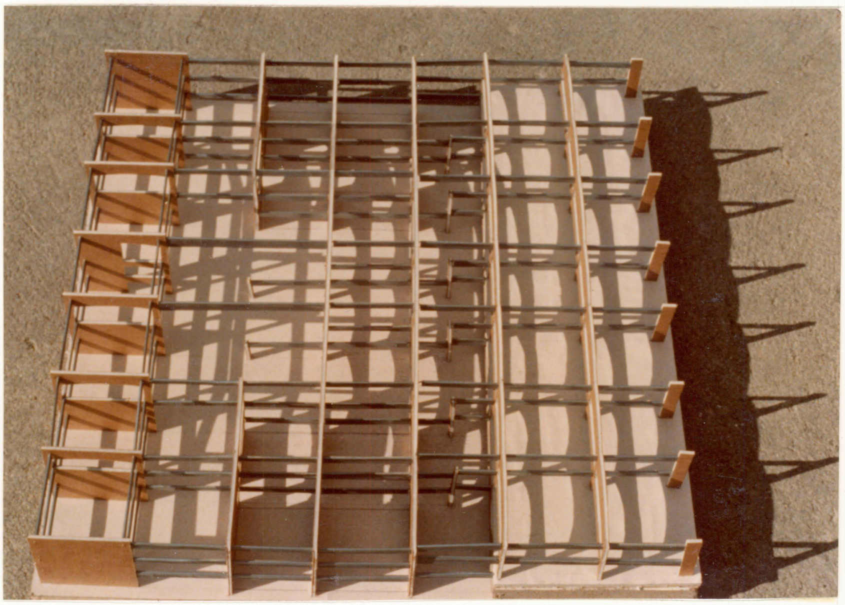
(17) Second Floor of Restaurant


CIRCULATION
STORAGE
MECHANICAL EQUIPMENT
BAGGAGE SORTING
RESTAURANT
WASH ROOM
SHOP
OFFICE
CONVEYER BELT
TICKETING

(18)

(18) Roof

Structural Alternatives



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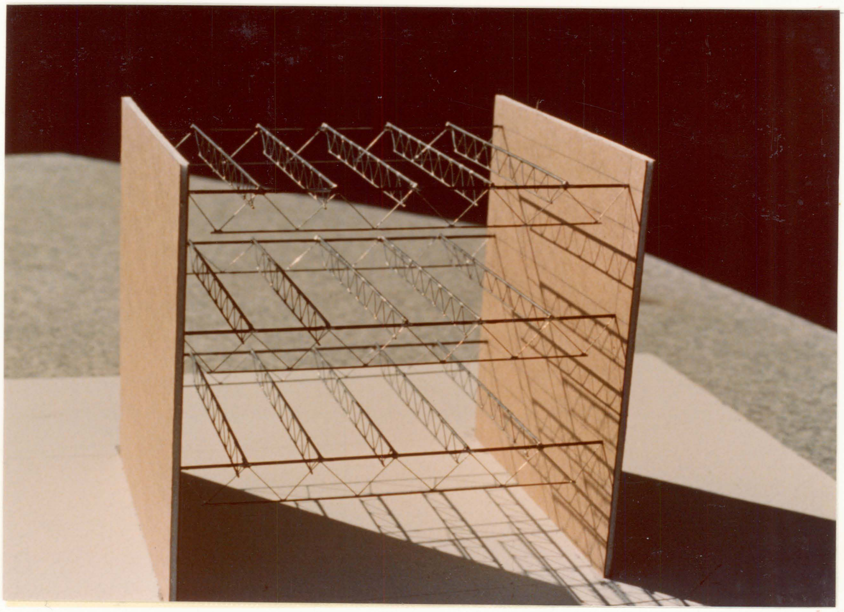
(19) Structural Alternative for Main Building



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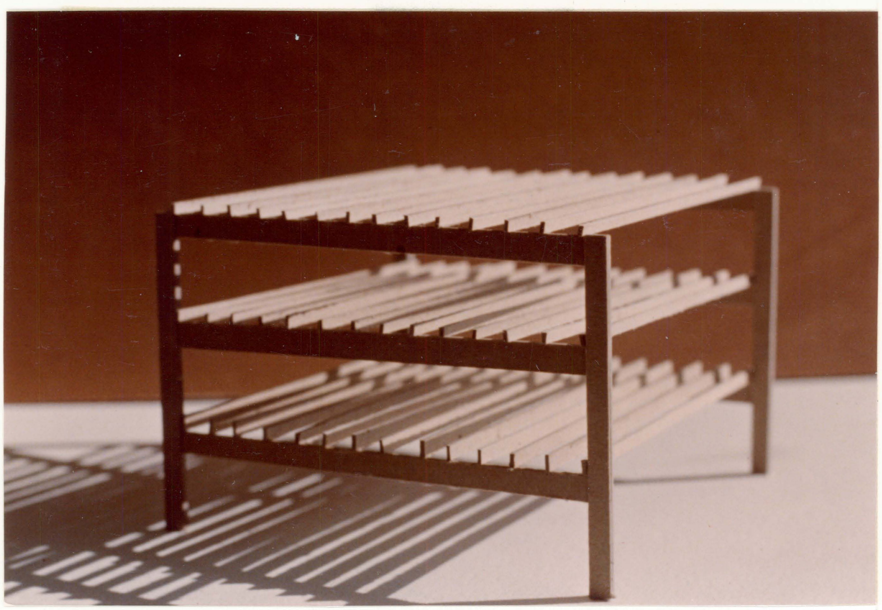
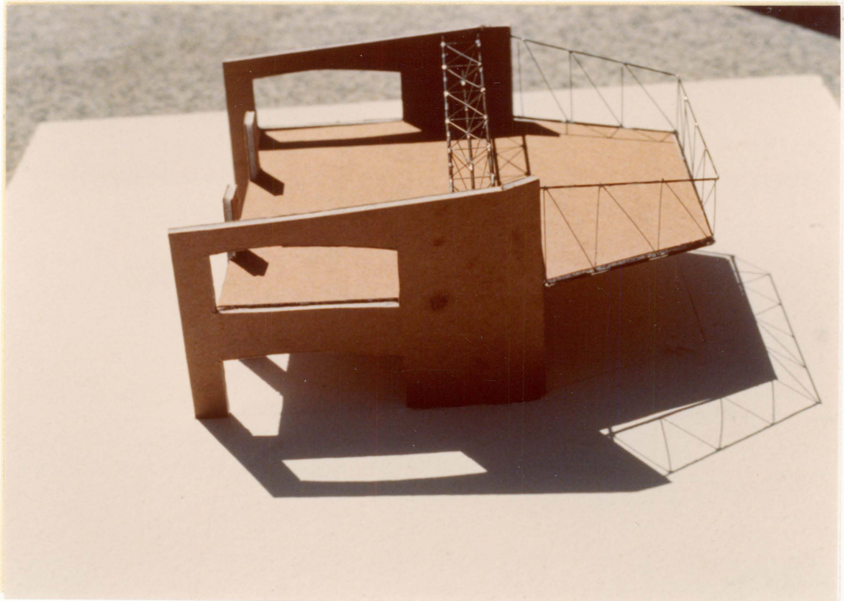


(21)

(20) Typical Bay of Main Building

(21) Typical Bay of Main Building



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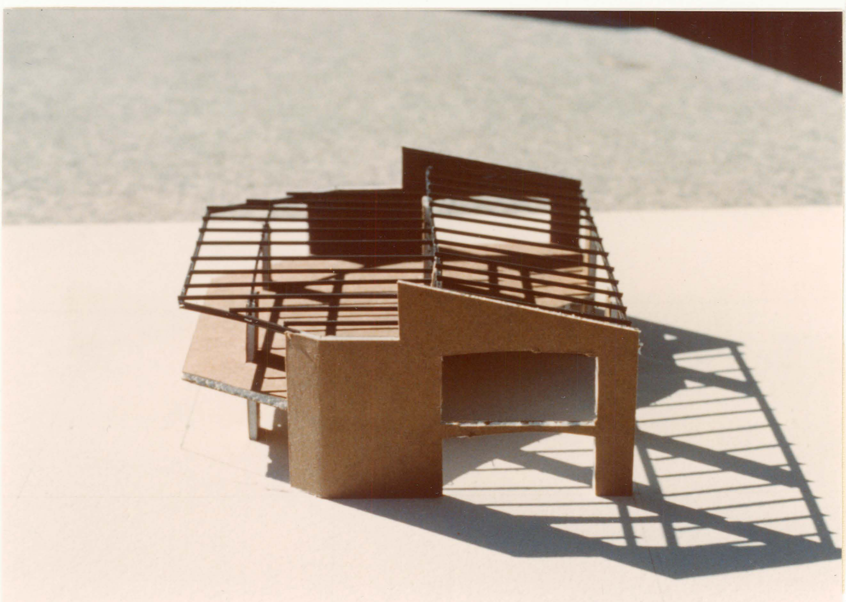
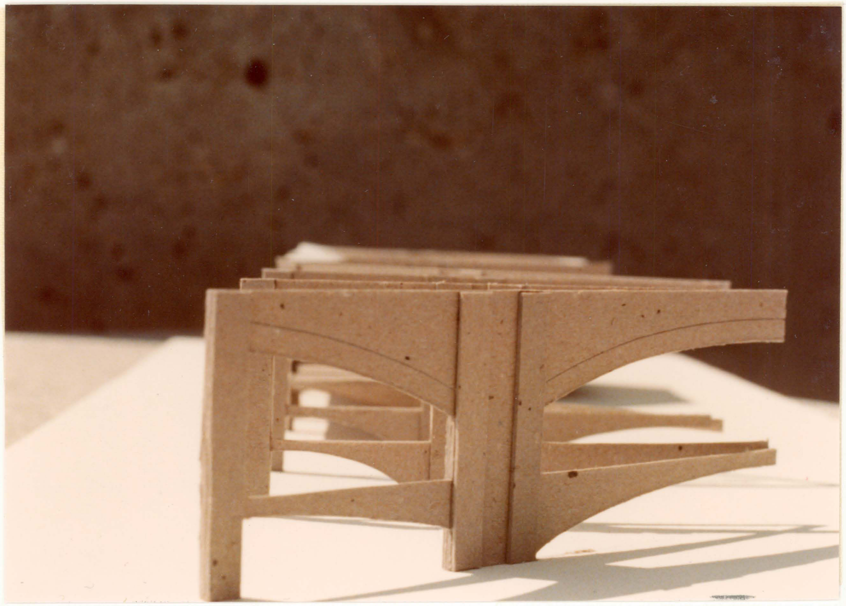


(23)

(22) Typical Bay of Periphery Building

(23) Typical Bay of Periphery Building



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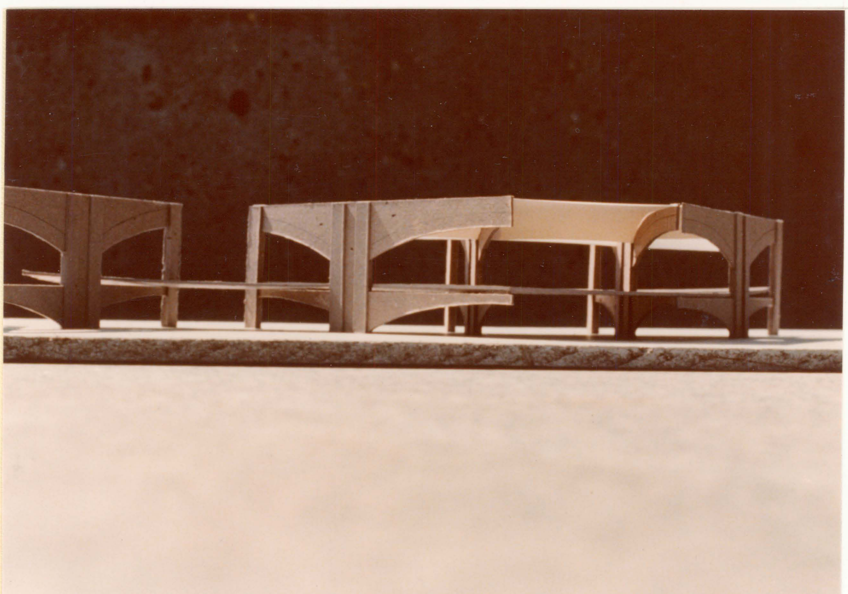

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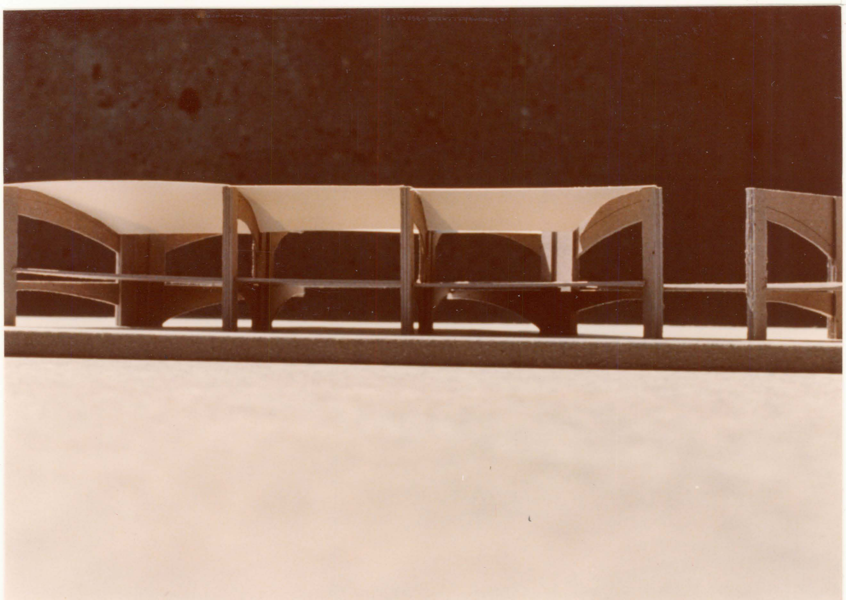
(24) Side View of Periphery Structure

(25) Side View of Periphery Structure



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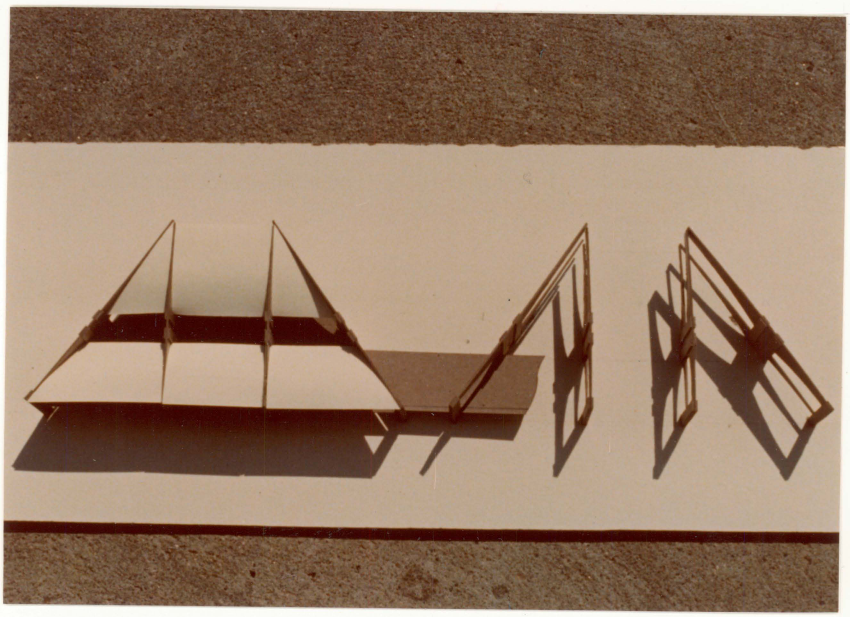

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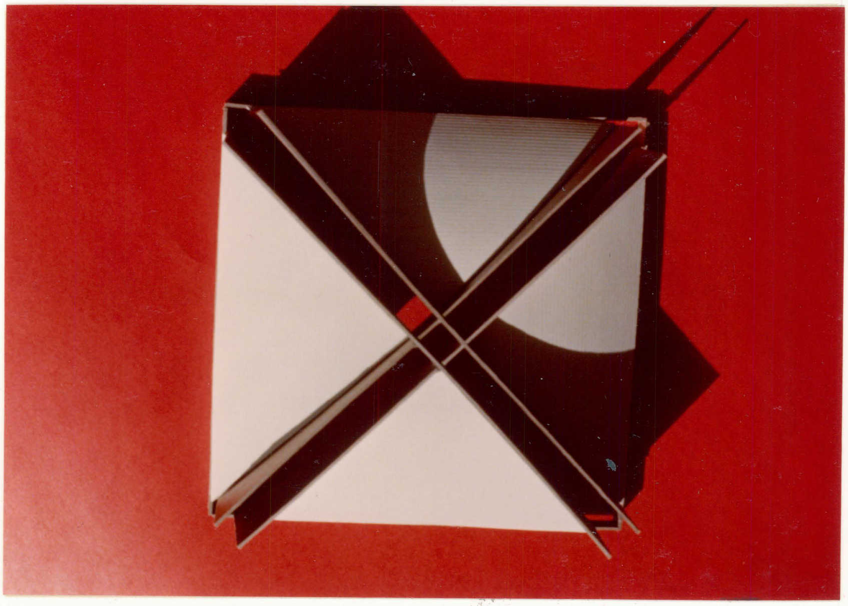
(26) Side View of Periphery Structure

(27) Roof View of Periphery Structure



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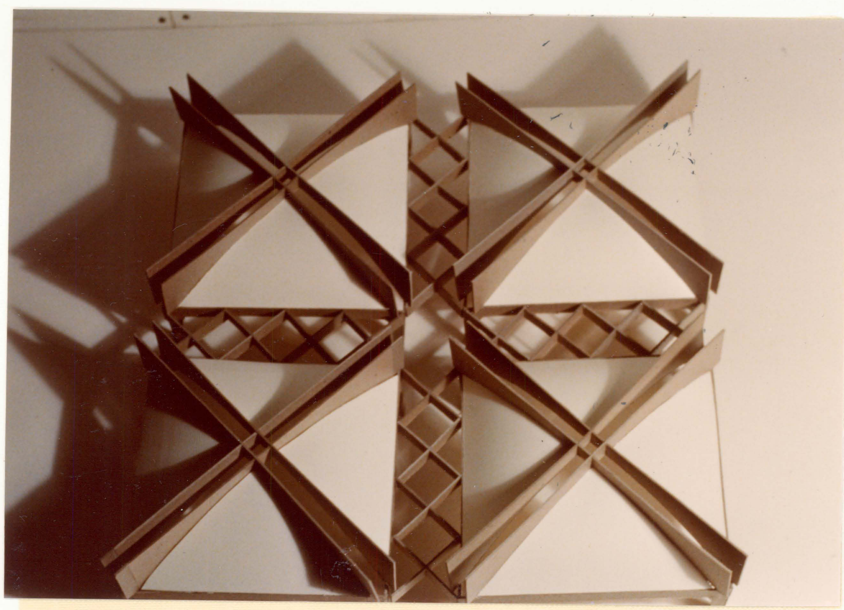

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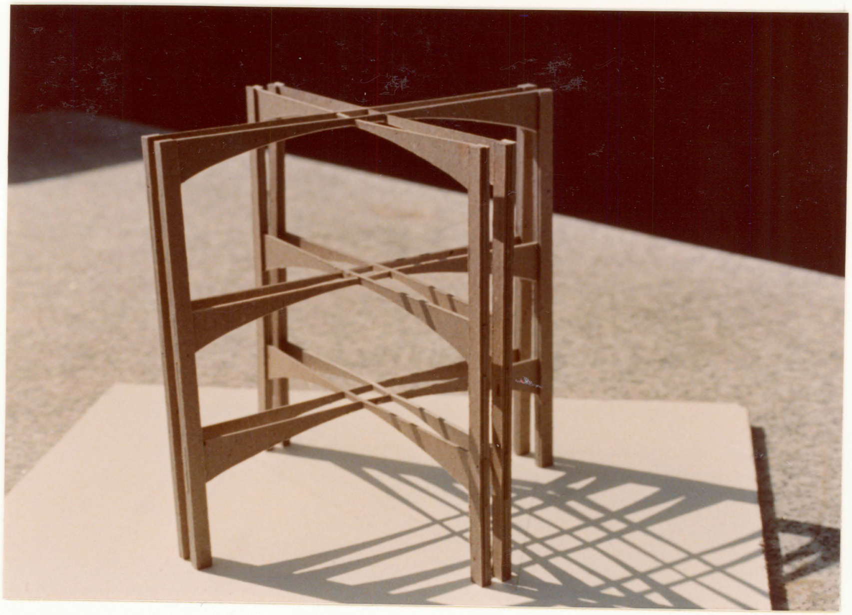
(28) Roof Configuration of a Bay (Main Building)

(29) Roof Configuration of Four Bays (Main Building)



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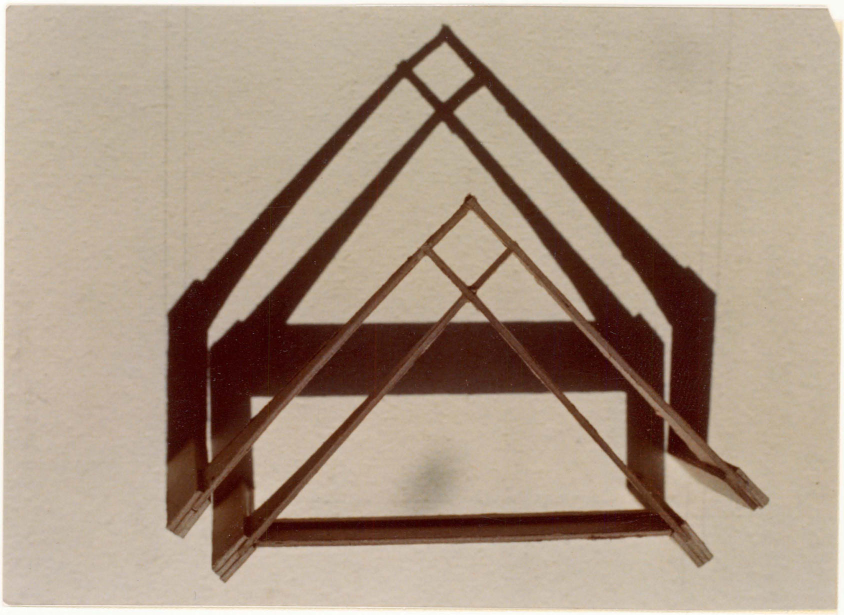
(30) Modified Structure



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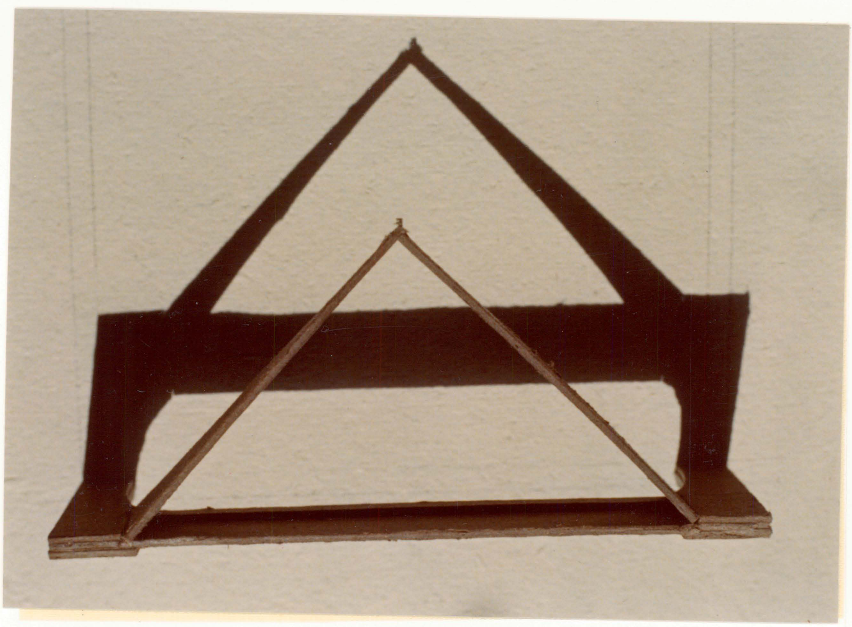
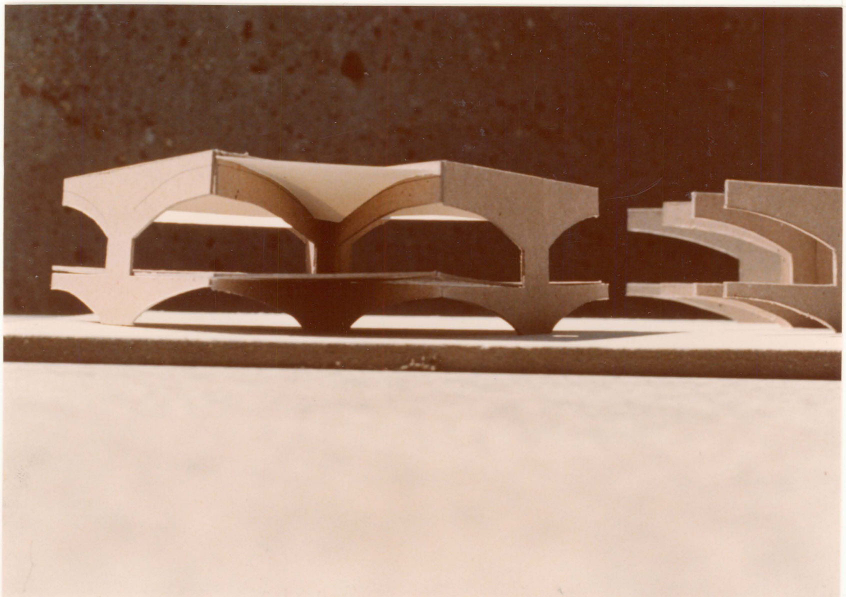


(32)

(31) Structural Detail

(32) Structural Detail



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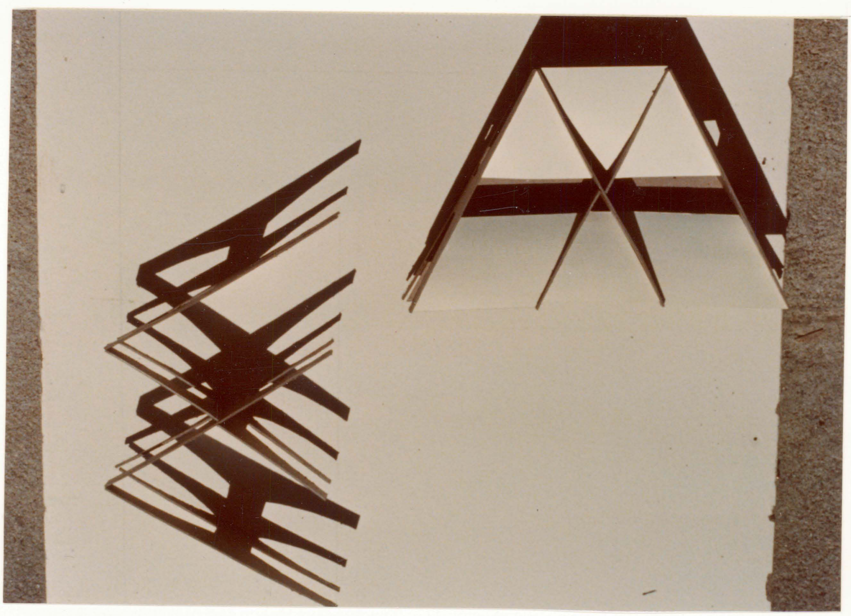
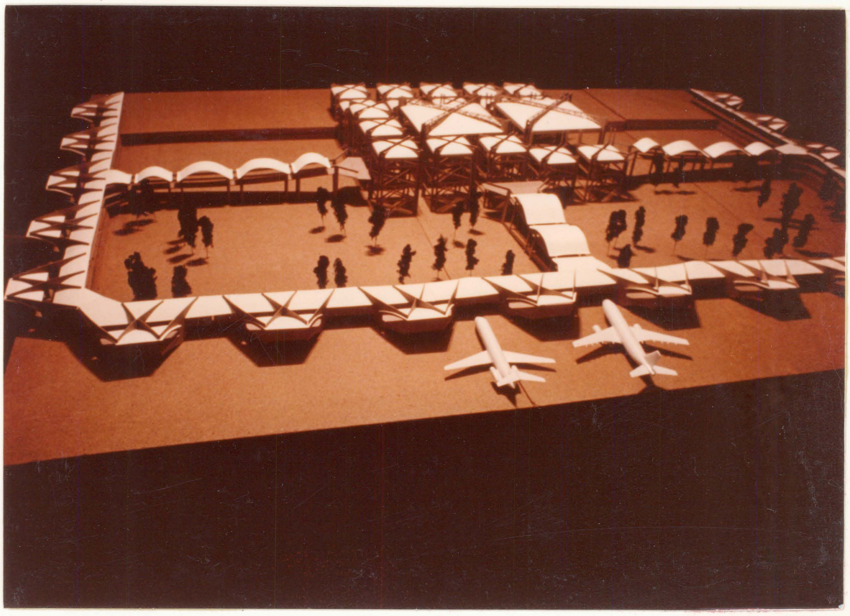


(34)

(33) Side View of Holdroom Structure

(34) Roof View of Holdroom Structure



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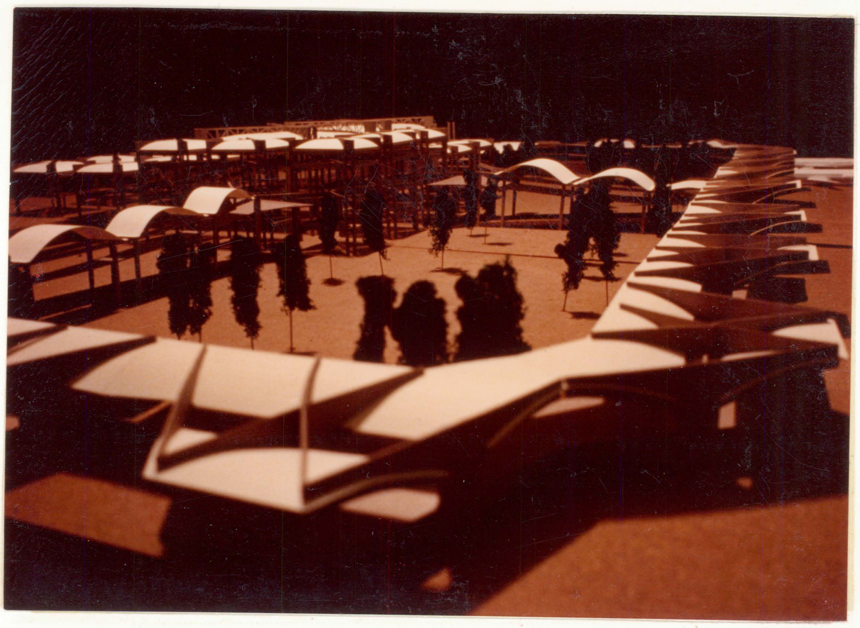
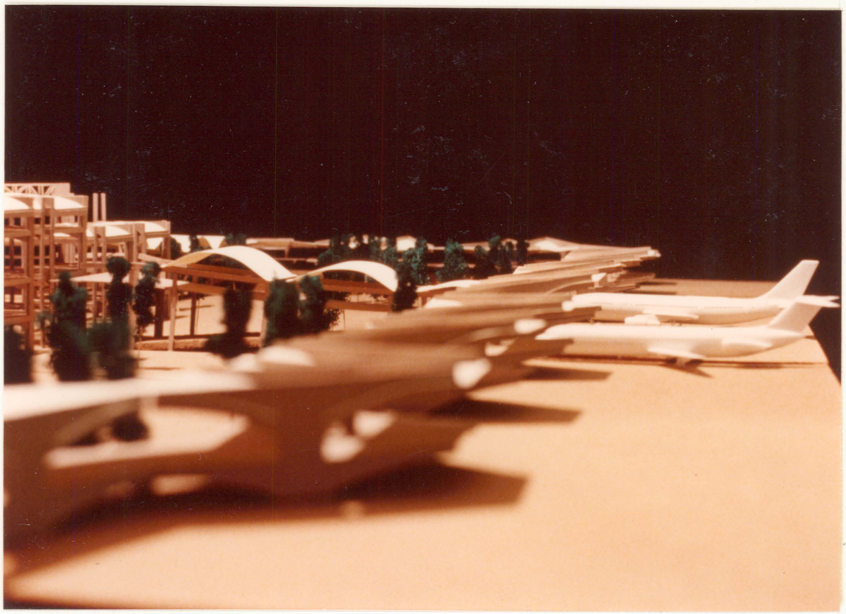


(36)

(35) Top View of Terminal Building

(36) Side View of Terminal Building

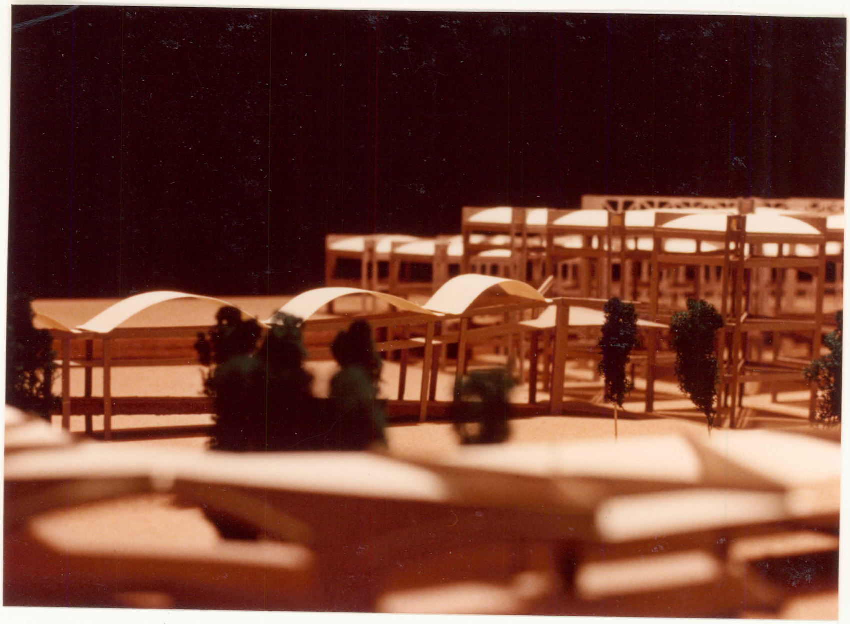


(37)

(38)

(37) Side View of Terminal Building

(38) Side View of Terminal Building



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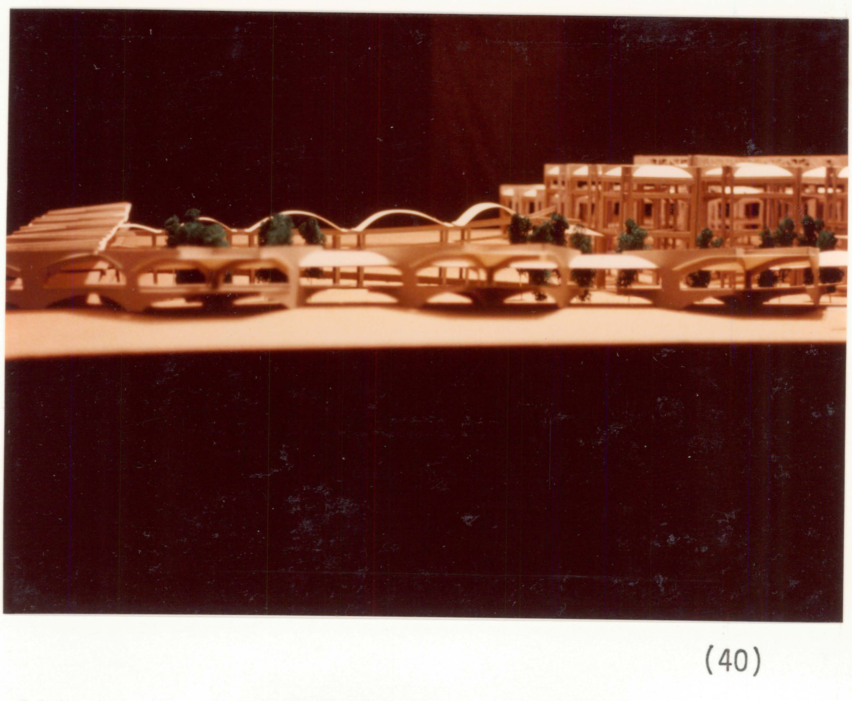
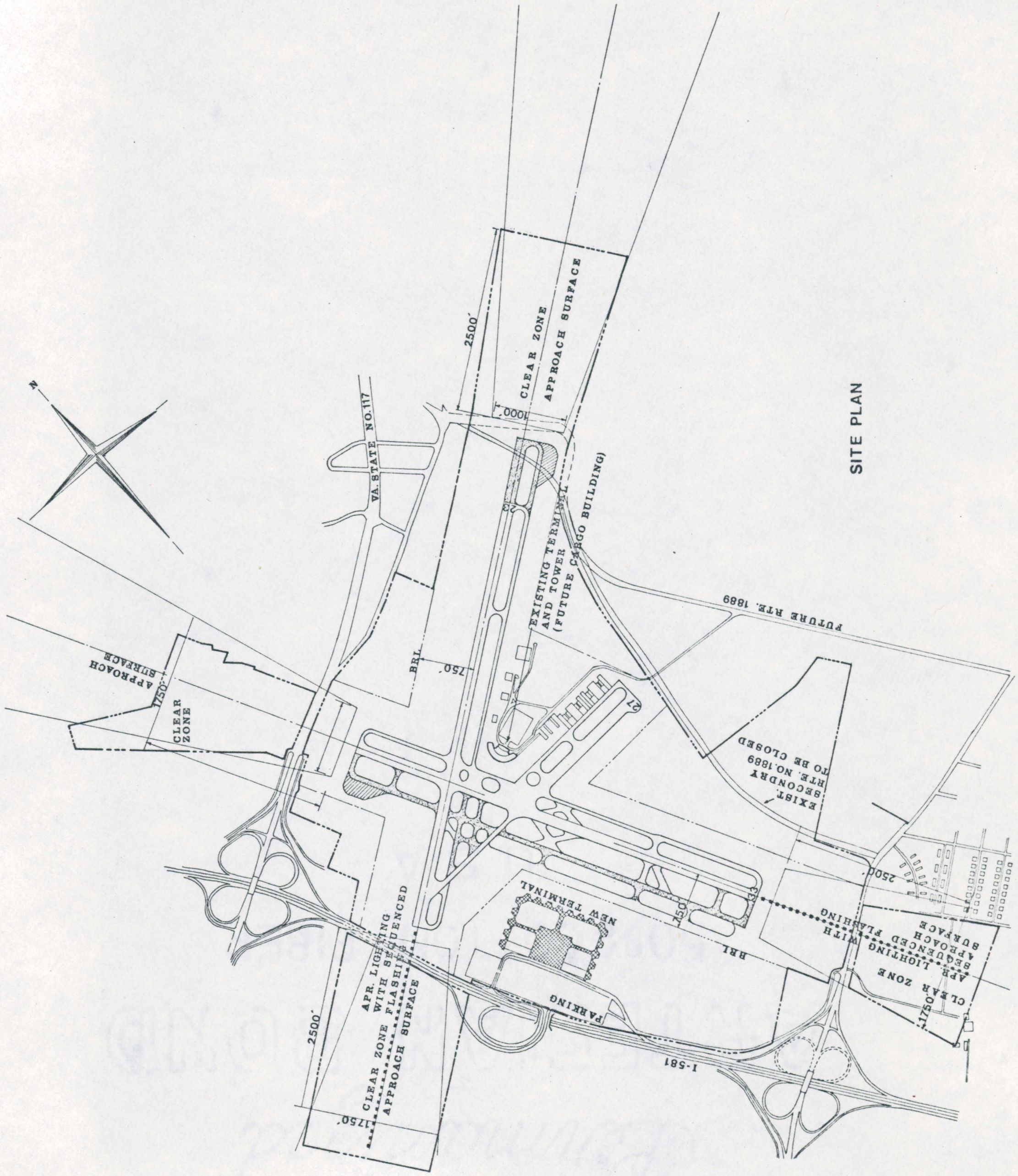


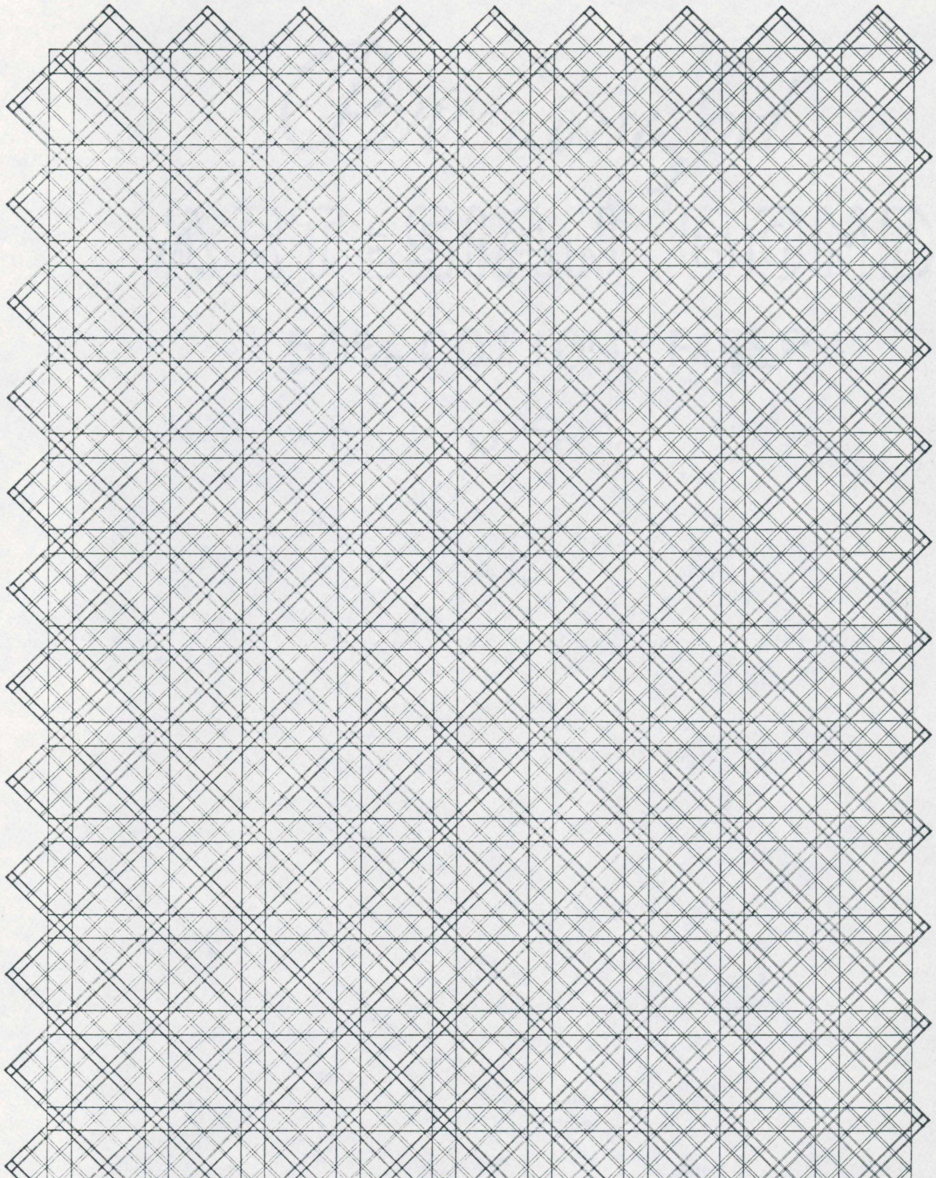
(40)

(39) Side View of Terminal Building

(40) Side View of Terminal Building

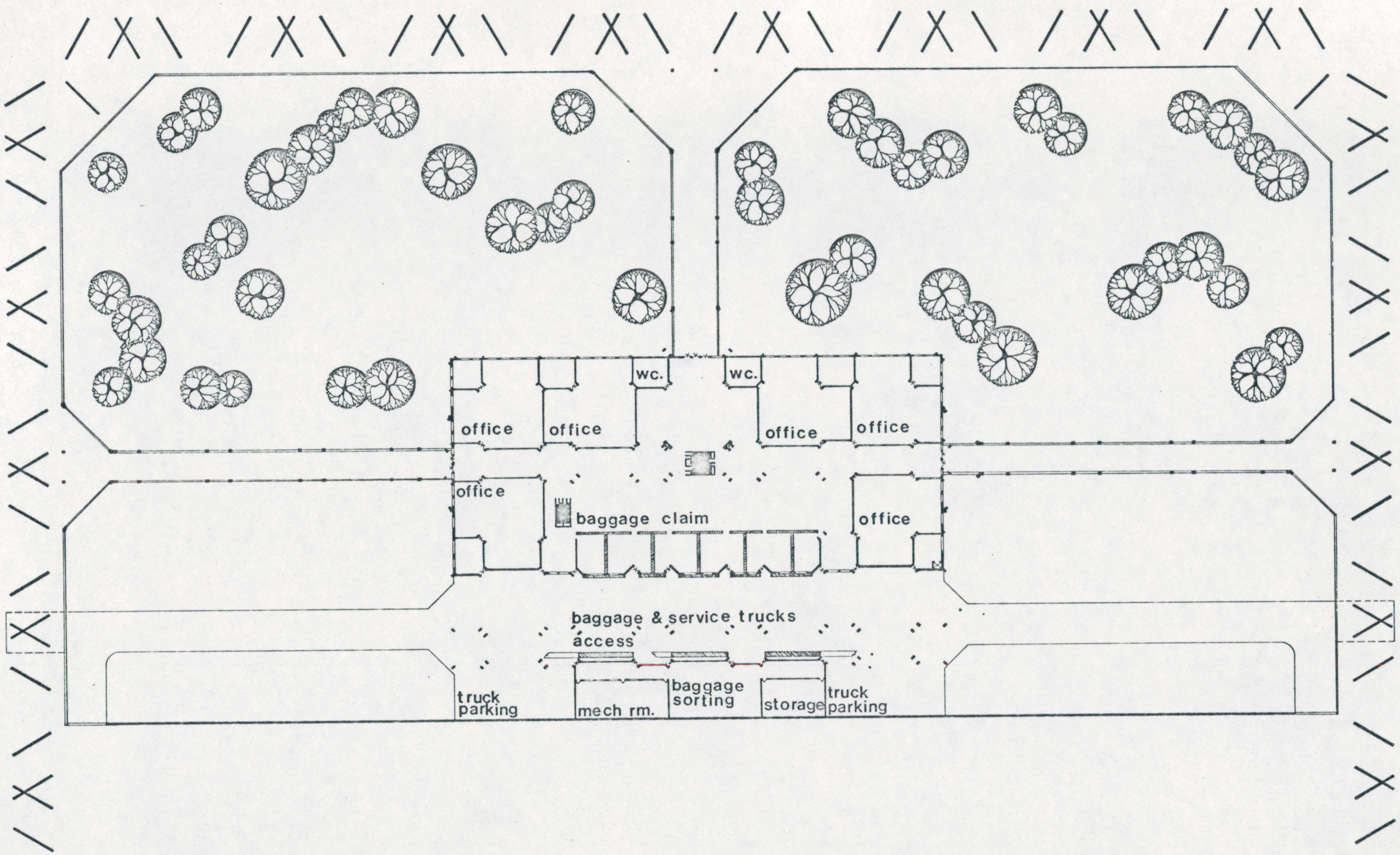


ROANOKE AIRPORT SCALE: 1"=600'



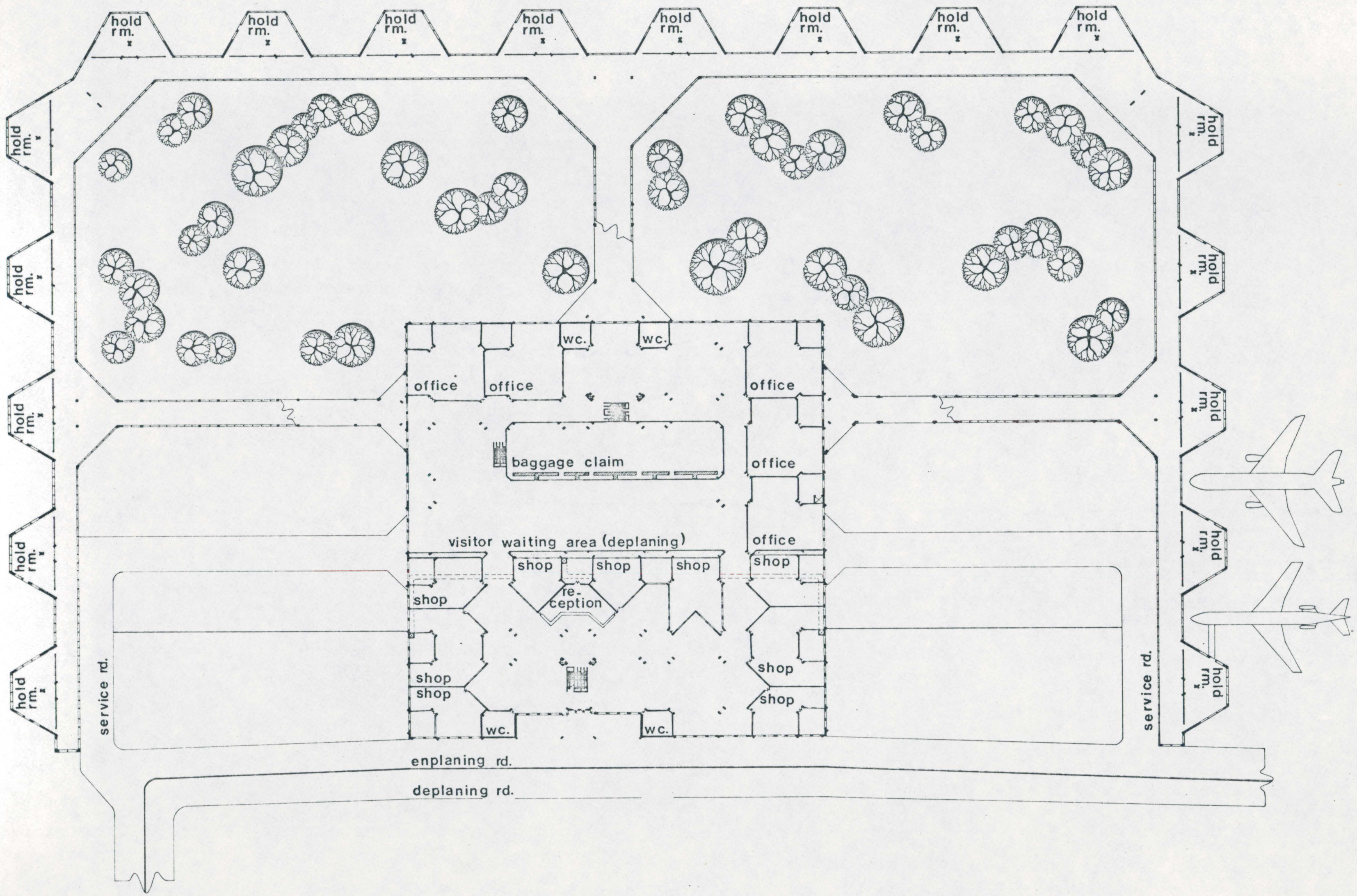
STRUCTURAL GRID

ROANOKE AIRPORT SCALE: 1"=40'



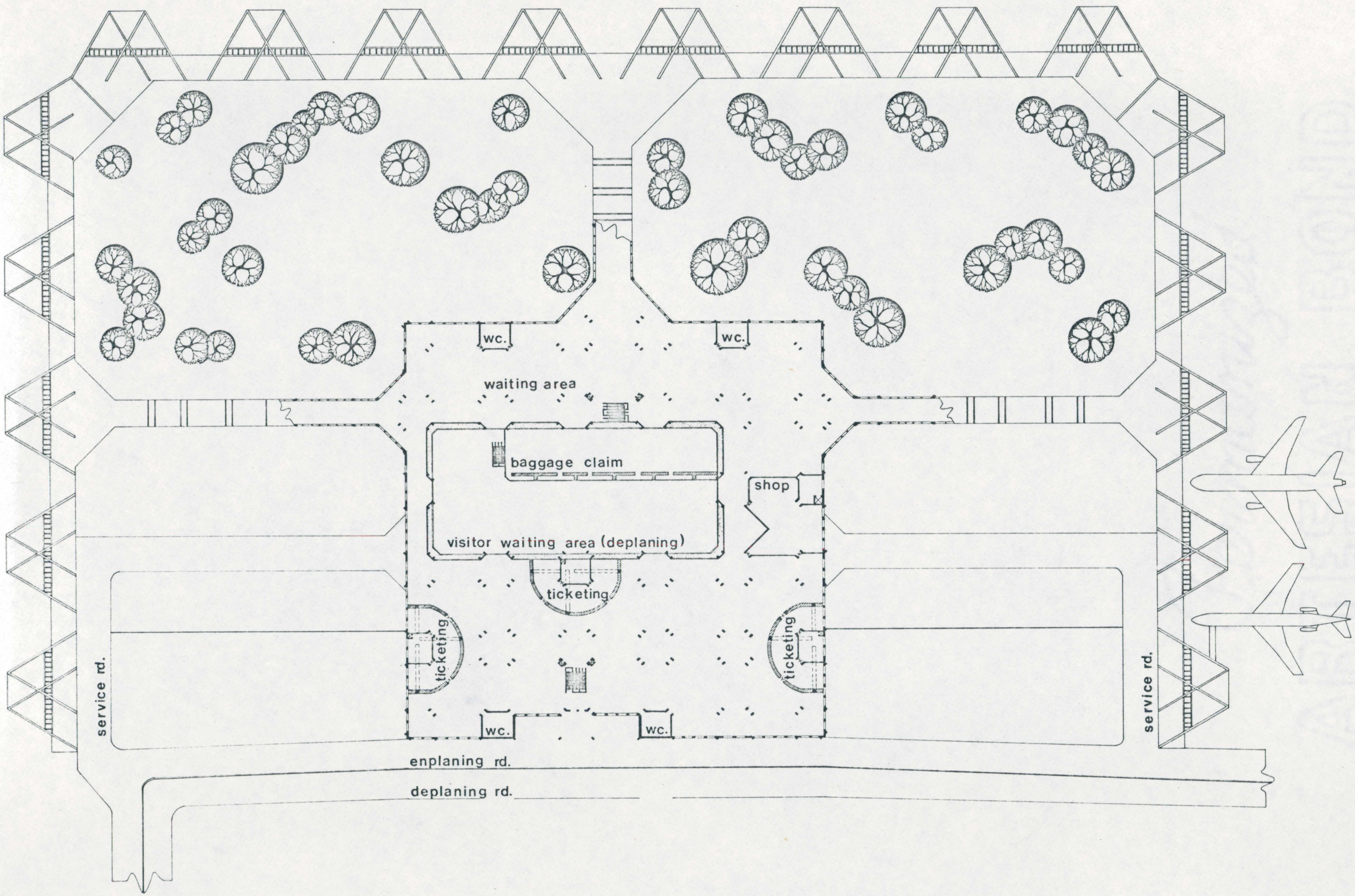
PLAN OF FIRST FLOOR

ROANOKE AIRPORT SCALE: 1"=40'



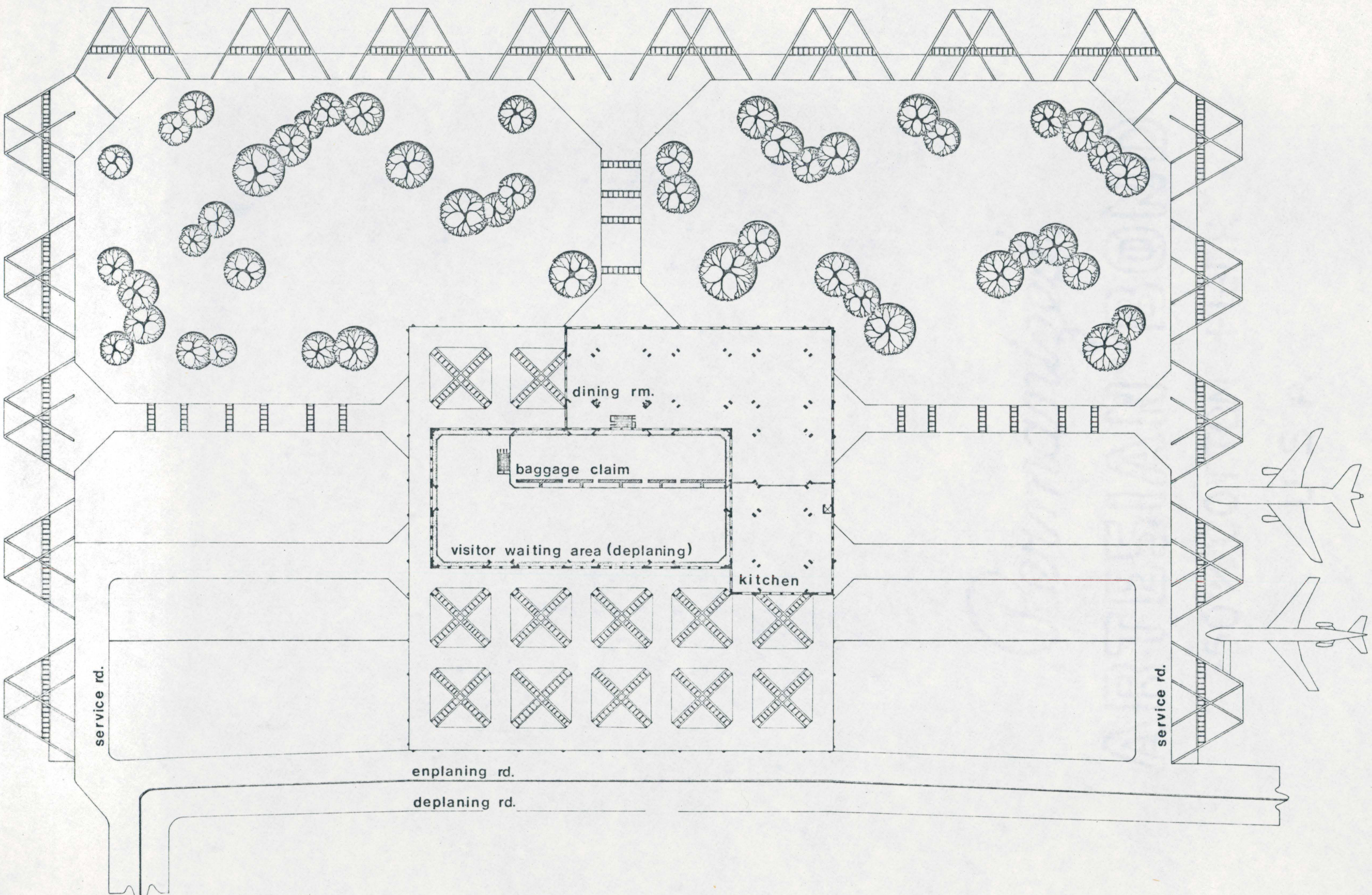
PLAN OF SECOND FLOOR

ROANOKE AIRPORT SCALE: 1"=40'



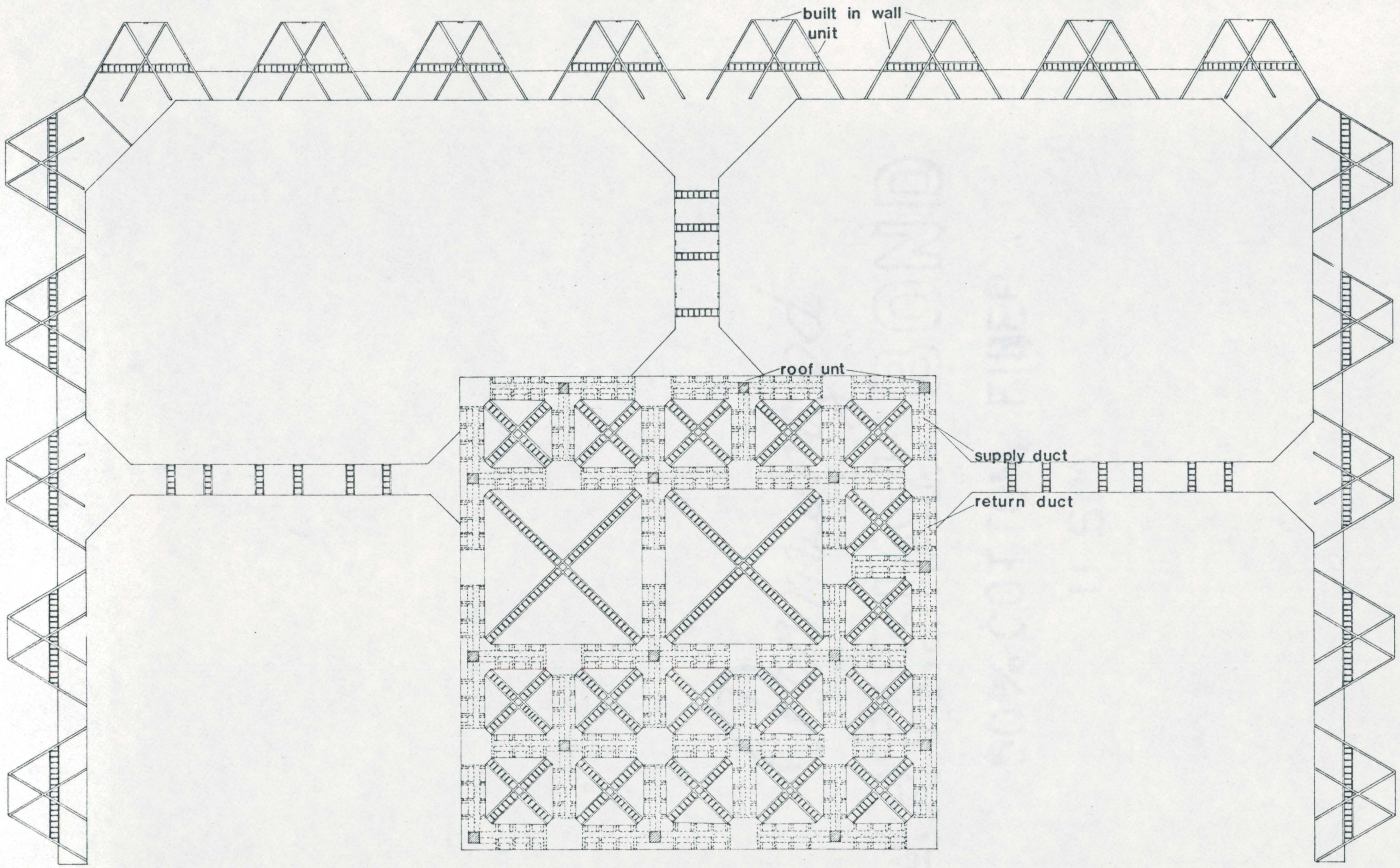
PLAN OF THIRD FLOOR

ROANOKE AIRPORT SCALE: 1"=40'



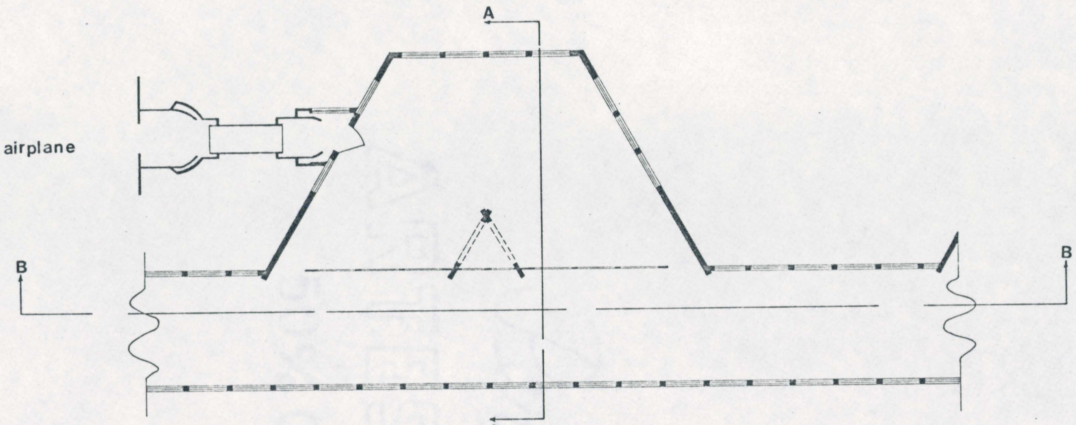
PLAN OF FOURTH FLOOR

ROANOKE AIRPORT SCALE: 1″=40′

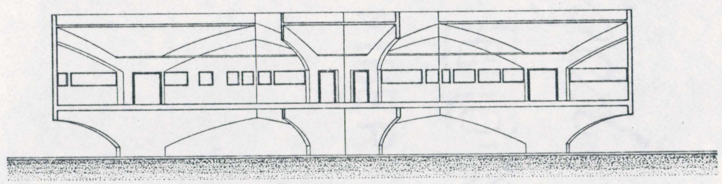


PLAN OF ROOF AND DUCTS

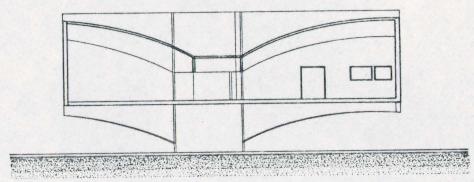
ROANOKE AIRPORT SCALE: 1"=40'



PLAN OF HOLD RM.

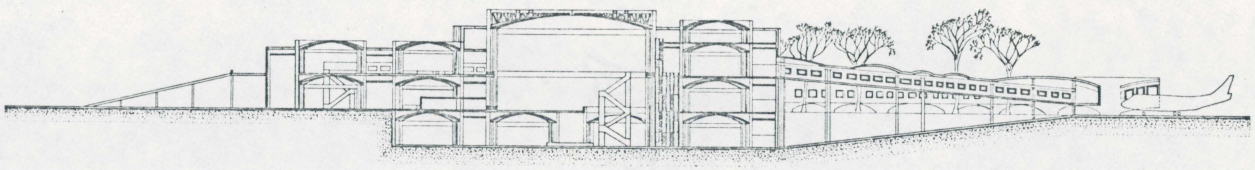


SECTION BB

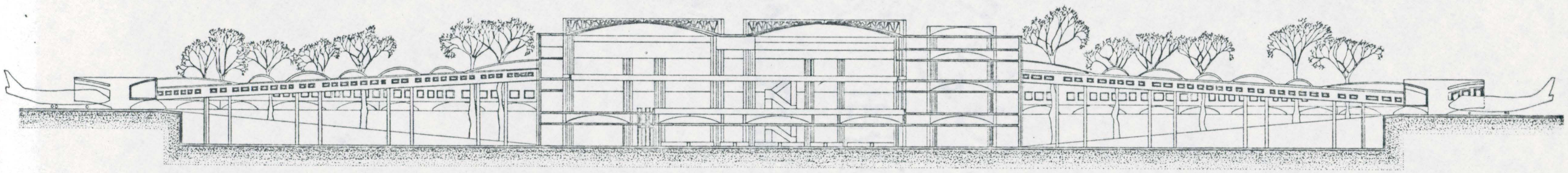


SECTION AA

ROANOKE AIRPORT SCALE: 1"=10'



SECTION AA



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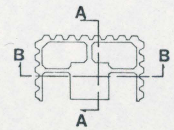
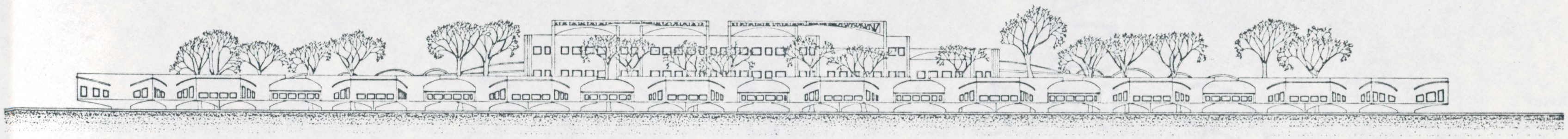
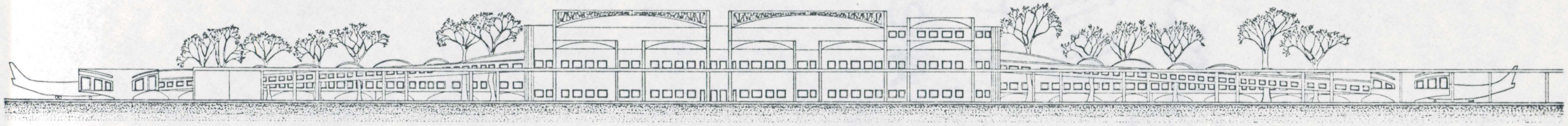


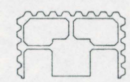
ROANOKE AIRPORT SCALE: 1"=40'



ELEVATION A



ELEVATION B



ROANOKE AIRPORT SCALE:1"=40'

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ROANOKE MUNICIPAL AIR TERMINAL BUILDING

by

Seyed A. Hadisadegh

(ABSTRACT)

This thesis investigates the main issues to be considered in designing an airport for the present and the future. Points for consideration include a review of the:

--Changes in airport design and their effect on airport planning and air transportation

--Effects of the airline industry on a community; for example, noise effects, potential for future growth, etc.

--Additional services that should be provided by airport facilities other than passenger handling

--Complex nature of the facility, in addition to the need for design flexibility

--Basic airport configurations and their characteristics

In addition, Roanoke Municipal Airport was selected as a design exercise. The new facility was planned as a regional airport for the year 2000. This part of the study includes the plan, which is a description of the design process, the program which discusses in detail the requirements for the airport facilities, and the actual design which is illustrated by models and drawings.