PROPOSAL FOR PRIVATE AIRLINES TERMINAL BUILDING MURTALA MOHAMMED AIRPORT LAGOS

BY

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FACULTY OF ENVIRONMENTAL DESIGN

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DECLARATION:-

I Aliyu Iyal, hereby declare that this is my authentic work under the guidance of Dr. Mrs. B.P. OGUNSOTE, and the chronological sequence of texts in the computation and edition of this write-up remains solely the achievement of the author. No part of this work may be produced, stored in a retrieval system, as transmitted in any form or by any means except in the case of quotations without the prior permission of the Department of Architecture, Ahmadu Bello University, Zaria Nigeria.



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Date

CERTIFICATION:-

This thesis entitled Proposal for Private Airlines Terminal Building Murtala Mohammed Airport Lagos, by ALIYU IYAL meets the regulations governing the award of the degree of Master of Science (Architecture) of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This work is dedicated to my Grandmother Hajiya Hadiza Sume Iyal and to my brother Captain Shehu Usman Iyal to whom I owe all reasoning and to God who made that possible.

ACKNOWLEDGEMENT

In the name of Allah the most beneficent, the most merciful, through whose power and almighty grace that I have been able to undertake this research project. In the cause of the programme and indeed carrying out of the research project, assistance was rendered to me by many people that I found it necessary to acknowledge.

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I thank my parents, brothers and sisters for what they have been able to give.

I wish all my numerous friends success in all their endeavours.

Finally, I am thankful to God for giving me life abundantly.

ABSTRACT

Architecture is that field of human endeavour that concerns itself with man’s essence of being, in a comfortable environment.Architecture can only foster enjoyable experience and consequent appreciation if its commitment is total. Man has failed to recognise the fact that the architectural vocation of any particular place should be governed by the culture of the inhabitants and the nature of the place. by recognising human and social needs, and by applications of suitable strategies and exchanges of design, all the complex requirements of architecture can be reconciled and integrated into structures which re both humane and efficient.

The effectiveness of a transportation system is commonly measured in terms of its ability to efficiently process the transported unit and the performance of an airport system in dependent upon the individual components which comprises it.

The aviation industry is highly technological due to its dynamism but as with all spheres of life aviation demands for growth, that growth promises dynamism.

Airplanes have never stopped to fascinate me, such large objects flying gracefully up in the air and gliding down unto the thermal to taxi to a halt. Most of the people that get to know the organisational input that would have to be a ground before such a flight would have to take place.

The airport is where these activities that make such flight possible, occurs. The airport a multi faceted yet correlated activity area may be viewed or a centripetally acting organised system that has the actual take off, flight and the landing of the aircraft at the centre of all these activities.

Murtala Mohammed Airport Lagos requires sequential utilisation several facilities and as such its overall efficiency had been limited by the characteristic of the least efficiency component which is the passenger and baggage handling facility.

Proposal for Private airlines terminal building is an attempt at providing an ideal passengers terminal system that responds to passenger comfort and convenience requirements; that provides a favourable atmosphere for airline operators and airport management: that satisfies the peculiar nature of Murtala Mohammed Airport as regards domestic and occasional international flight operations; and that will accommodate possible organisational, economic or technological changes.

Proposal for Private airlines terminal building is the acts

of growing, increasing, becoming more complete and thus paving way for economic possibilities. Essential facilities that are required for the technical competency of Murtala Mohammed Airport Lagos are available in serviceable condition. But lack of a proper passenger terminal system hinders its commercial viability. Thus, the end product of this research is a contribution to the Proposal for private airlines terminal building Murtala Mohammed Airport Lagos.

"For me aviation has value only to the extent that it contributes to quality of the human life it serves".

Charles A. LINDBERGH, 1972

New concepts in airport planning aerodrome and terminal *design has to replace obsolescence in airport thinking* and new independent growth and design philosophy should be fostered in total airport design.

New concept in airport terminal design such as variable geometric, flexible modular extensions, both an airside and landside airport airport design as well as renewed thinking in vertical extension is overdue...

William F. SHEA 1970

Whatever space and time mean, place and occasion mean more. For space in the image of man means place, and time in the image of man means occasion...

Provide that place, articulate the inbetween... Get close to the shifting centre of human reality and build its counter form - for each man and all men.

Van Eyck. 1964.

Has the absence of a tool made the spirit of Man any poorer?

It does not seem so, for the parthenon and the Indian temples, the cathedrals, and all the refinements of recent human achievement, the incredible triumphs of the last hundreds years, are there to mark man's progress along the path of time.

le CORBUSIER

Paris, the 8th October., 1951.

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GLOSSARIES AND ABBREVIATION

GLOSSARIES AND ABBREVIATION:

(Source Time Saver Standards for building Types De Cliaria, John Calendar).

AMENITIES: That part of terminal building housing convenience, service, and diversion facilities for the passengers, tenants and public.

AVERAGE PEAK HOURS:

The peak hour of the average peak day. The peak hour is the one hour period of any peak day during which the highest percentage of the day traffic for passengers.

BAGGAGE DIVERTER:-

A mechanical means of transferring baggage from a moving conveys belt to a baggage claim counter in such a manner that the baggage is every distributed along the baggage counter.

BOARDING CONTROL POINT:-

The point at which a passenger credentials are inspected to assure that is authorised to board a particular flight normally this point is located at the vicinity of the gate from which the flight will depart.

BOARDING PASSENGER:-

Any originating or connecting passenger authorised to board a flight.

CONNECTING PASSENGER:-

A passenger who arrivers on one flight only for the purpose of transferring to another flight to reach his destination. these passengers are broken into two interline and intraline passengers.

CUSTOMS:-

This is an area under the federal jurisdiction through which passengers arriving from foreign countries are required by law to pass in order to make a declaration related to baggage which is accompanying them upon entry to the United States (or the country). This area is used for receipt of a declaration and/or examination of baggage, if duty is required the customs agents will receive same in the customs areas special attention must be paid to the design of this area because of changing techniques of operation.

DEPARTURE ROOM:-

An assembly area including the boarding control point; located at a gate position(s) for passengers pending availability of aircraft for boarding.

DEPLANING:-

Any passenger, cargo, baggage visitors etc which is related to the unloading from an arriving flight.

DOMESTIC PASSENGER:-

All passengers travelling in the country or its territories are considered as domestic. Foreign nationale within the country and territory require no special checking and operate as domestics.

ENPLANING:-

Any passenger, cargo, baggage, visitors etc which is related to the boarding of a departing flight.

F. I. S. :-

FIS is an abbreviation for federal inspection service. It is utilized as an all inclusive term for the United States public health, immigration and Naturalization service. The department of Agriculture, and United States customs.

GATE:-

A location to which aircrafts are brought for the purpose of discharging and loading of passengers and their baggage.

GATE CONCOURSE:-

An extension from the main terminal building primarily intended to provide protected access for passengers between the main terminal building and the gates. In addition to the passenger carried on the concourse may include airline functional areas and minimum consumer services.

GROUND TRANSPORTATION:-

The independently operated transportation vehicles schedules for passengers use between airports and the area served thereby is called ground transportation.

IMMIGRATION:-

This area is devoted to the examination of passports for nationals and aliens seeking to enter the country. Consideration for design and functional of this area must be corttlated with federal authorities.

INTERLINE CONNECTING (ION):-

A term used to describe passengers and baggage which arrive on the flights of one airline and depart on the flight of another.

INTOWNS TERMINAL:-

A facility located apart from the airport usually in the down town area of the city at which passengers may be processed; baggage is checked to passengers distinction and from which ground transportation is provided.

INTRALINE CONNECTING (ION):-

A term used to described passenger passengers and baggage which arrive on the flight of one airline and depart on another flight of the same airline.

INTRANSIT PASSENGER:-

If an internationally bound aircraft stops at an airport for the fueling or discharge of passengers and a remaining number of passengers to be destined in the aircraft for another destination the convenience of providing a totally segregated lounge facility may be warranted for the continuing passengers. This facility may be referred to as an intransit area. No FIS inspection is required but security of the area is important.

LONG HAULT:

A term used to define flights or traffic which travel over a relatively long distances as opposed to those which travel over a shorter distances. *Normally, long haul passengers arrives at their* originating airport earlier than short haul passengers, carry more baggage than short - haul passengers and are accompanied to or are met at the airport by mere persons than short haul passengers.

ORIGINATING PASSENGER:-

A passenger who is starting his trip.

OUTBOUND BAGGAGE ROOM:-

The area to which checked baggage of originating *passenger is delivered for sorting by flights prior* to it being dispatched to the aircraft for loading.

PUBLIC HEALTH SERVICES:-

The function of the public heath services is to *determine whether an arriving passenger will* present a heath hazard to the general population. this may require inoculation special examination and possible quarantine. Design requires correlation with federal authorities.

READY ROOM:-

An area adjacent to the normal worth areas in which personnel whose duties are performed out of doors are performed out of doors may assemble be protected and from which they may receive their work assignments.

These rooms should be concealed from public view.

SELF CLAIM BAGGAGE:-

A method under which passengers have direct access to terminating baggage in a controlled areas. As passengers leave the area, an attendant retrieves baggage claim checks and marches them to strip checks to assure that passengers have selected only baggage to which they are entitled.

SHORT HAUL:-

A term used to define flights or traffic which travel over a relatively short distances as supposed to those who travel over a long distances. Normally short haul passengers arrive the airport of origin latter than long haul passengers carry less baggage than long haul passengers and are accompanies to or met at the airport by few persons than haul passengers.

STAND BY PASSENGERS:-

A passenger not holding confirmed space but who is on hand at departure time for space that might become available.

TERMINATING PASSENGERS:-

A passenger who has arrived at his destination.

THROUGH PASSENGERS:-

A passenger who arrives and deplanes on the same flights.

TRANSFER BAGGAGE ROOM:-

The area to which checked baggage of connecting passengers is delivered for sorting by flights prior to it being despatched to the aircraft for loading. This may be combined with the outbound baggage room at some locations.

UNIT TERMINAL:-

One of several functionally complete terminal area (which may be in the same or several buildings) each of which houses the activities of one or more airlines.

CHAPTER ONE

INTRODUCTION

An airport is a quasi-city devoted to dynamic movement. It comprises of varied structures that facilitate passenger and cargo movement, maintenance and aircraft control, and structures that provide auxiliary support services.

Architects who regard airport as opportunity are correct in that surmise but often they are unaware of its full implications. there has never been a field where the basic skills of architecture had been, more necessary or have met more negative constraints.

Air travellers must have encountered the consequence of those constraint, bleak and confusing terminals; exhausting delays on ticket lines; more likes on foot with heavy luggage, traversing unreasonable distances mandated by convenience and configuration of machines demands upon traveller's time and person, serving no purpose but the proprietary image of airlines, shrinkage and withering of the quality of life, subservient to the economy of the machines and to the monstrous conditions they create. But here and there, there had been fragmentary victory by architects on behalf of people - so logical and so expensive.

Foxhall (1973) said "But the airlines, not the travellers, are the essential clients of architects in this arena. So terminal design are for airlines, not travellers. Architects, whatever their social consciences must either deal with the goals of the client or pass along to those who will".

In the 1960s, a discussion on airport terminals would invariably lead to the question, is it big enough? The growth of the aviation industry was turbulent then: the rise in consumerism, a devastating airline recession, an awakening to our responsibility to the environment, all had their effects. Airplanes too have become larger. airline growth skilled many cities. Noise which remained a problem now seems solvable.

One element that effect terminal planning which has remained constant is the passenger. Passengers still want to use terminal easily, without confusion and with a sense of dignity.

Why Lagos?

In the Murtala Mohammed airport Lagos, the input in the domestic carries sector is largely ruled by a private airlines. these private airlines operators contribute. More than 75% of the total haulage of passenger which may be averagely put 2.5 million every year 1. The private airline operators are still using facilities created and put in place by government which relegates these facilities to a seasonal class rating as these have been an introduction of competition due to upsurge of air travellers. Sharing the same facilities

in most of the local airports can controlled due to the lower number of air travellers passing through the terminal as compared to the Lagos airport.

The proposal for private airlines terminal building Murtala Mohammed Airport Lagos is in the current development plan. the master plan has been completed accepted by the FAAN (Federal Airport Authority of Nigeria).

1.1 PROBLEM STATEMENT:

1. As at present over 8 Airlines operators are crammed into a ticketing and departure hall not up to 250m^2 of floor space, this gives rise to shearing of facilities causing congestion and delay.
2. Despite the fact that Murtala Mohammed Airport has its average Annual Passenger volume put over 2.5 million a proper private airlines passenger terminal system is lacking.

1.1.1 SUGGESTIONS

It is important to relocate the facility to be able to maximize the economic gains of the dynamic in the development. It would be best to move all the facilities into a nuclear environment sharing the same roof, this is to minimize the hardship caused.

1.1.2 VALUES

It is important to note that air transportation has moved from a realms of a service reserved for the rich to a necessity. A system that has evolved all round the world is that of perfection in performance. Efficiency is the watch word of such a system that is rooted in performance and such existing standard lack any aspect of efficiency at the General Aviation Terminal. This may blamed on the temporary nature of the structure and lack of control.

1.2 AIMS AND OBJECTIVES:-

1. an attempt at providing an ideal private airline passenger terminal building by designing a passenger terminal complex within a context of Murtala Mohammed airport Lagos master-plan being the concepts of its ultimate development.

2. To increase passenger capacity per hour to meet already anticipated growth by the year 200 AD.

3. To improve Baggage handling facilities to meet modern operational standards.

4. Provide an identity for the terminal and the airport as a whole.

5. Raise Aesthetic quality of general Aviation terminal designs in the country.

1.3 RESEARCH METHODOLOGY:

The methodology adopted in this study research are as follows:

1. Interview with the practicing Architects especially those who handled similar projects.
   i) Their basic design approach.
   ii) Basic designs space provide and their inter-relationships.
   iii) Choice of materials and finishes for the design.
   iv) Site selection criteria and
   v) Implementation mode.
2. Interview with the staffs of the existing Airport terminal building to find out the followings.
   i) The type of function necessary for an international/domestic Terminal.
   ii) Space Provided
   iii) The adequacy and short comings of the space and their functions.
   iv) Facilities and their sizes that will be provided.

3. Visual survey by personal visits to the site and some existing airport terminal building as follows:
   i) General Planning
   ii) Layout
   iii) Massing
   iv) Presentation

4. Visiting appropriates ministries for bye-law statistics and history.

5. Library research of published Text Books periodicals, Articles, and unpublished Text or thesis in other institutions.

6. Always study of some existing air terminal building to determine space standards.

7. Foreign and local case studies compared and contracted emphasizing success and failure of local cases.

1.4 MOTIVATION:

The effectiveness of a transportation system is commonly measured in terms of its ability to efficiently process the transported unit, aid the performance of an airport system is dependent upon the individual airports where the use of the whole system is requires the sequential utilization of a group of facilities the overall efficiency had been limited by the characteristic of the least efficient component - passenger and baggage handling facility.

1.5 CONSTRAINTS:-

Certain access to information as possible areas of airport design and day to day running were not made available due to claims by officials that the information was classified also photographs of the airports visited could not be taken due to the same reason. the recent in hijack of a domestic plane increased the security of the airports.

1.6 SCOPE AND LIMITATION:

The passengers Air Terminal building complex shall comprise of the following:

i) The passengers and baggage handling facility

ii) The Federal Airport Authority of Nigeria Accommodation.

1.7 ARCHITECTURAL SIGNIFICANCE:-

1. Designing a building that will respond positively to the personal requirements of individual within each user group.
2. Designing a building in which the Architectural expresses the specialness of air travel and relates the human scale to that of the aircraft. and thus architecture that will reveal the terminal, not as static enclosure of space, but a place of movement and of transition.

1.8 TARGET USERS:-

As an Airport is actually a point of interaction user detention should be carefully planned as to reduce confusion during interaction.

The users are divided into three (3) main groups for this exercise, these are as follows:

i) The passengers

ii) The Airlines Operators and

iii) Federal Airport Authority of Nigeria (FAAN).

1.8.1 THE PASSENGERS:-

The generality of passengers do not fall into any age bracket but includes all age groups. The main bulk of air passengers are made up of business men and women. the most important factor affecting explaining and deplaning passengers is the baggage handling. this when not well considered faults the dynamism of air transportation.

Route planning is of importance when dealing with the passenger especially with the baggage involved. The enplaning passengers should be clearly and actively separated from the deplaning passengers. Areas should be clearly earmarked with directions that are in consonance with present day graphical representations for the gradual but strict direction of the passenger. This helps to improve operational efficiency and improves passenger security.

Comfort of the passenger is very important as it may effect the overall efficiency of the operators. As the terminal is a building in direct contact with an important percentage of the populace, it is of importance to place emphasis on terminal comfort and the facilities that enhance it.

1.8.2 THE AIRLINE OPERATORS:-

These are various private airline operators using the existing structure, as their number increased by the day it is important to consider for expansion where possible. Usually these operators are involved in the ticketing of passengers the collection and safe keeping of baggage from these passengers, the haulage of the passengers to their destination and the retrieval and onward distribution of the baggage to the owners at the end of the Journey. All these services are intended to be provided with maximum comfort in relation to the passenger due to competition between the various operators. Also in a highly secure atmosphere.

Most of the airlines operators use the 727 or 737 for the haulage of the passengers to their various destinations. This came about due to the low priced nature of the airplane in the airline market but as with the policy of the Federal Government for the slow phasing out of the 727 by 1997 due to the nature of the controversy surrounding its safety rating and for a gradual introduction of the boeing 747 as the airplane for domestic haulage. The terminal design calls for an introduction of a larger area for passengers due to the larger passenger capacity of the intended airplane. The security of the airline man power and the installed facility is also very important and as the terminal building becomes a tourist attraction to visitors, it is also important to make

for easy maintenance to make sure that the airport is kept at a relatively high standard.

1.8.3 THE FEDERAL AIRPORT AUTHORITY OF NIGERIA: (FAAN)

The authority generally looks after the day to day running of the airport and it does this through subsidiaries. As is indicated as the designing and building of this terminal should be partly done by the private Airline operators who would be using it, but as with what obtains now, the FAAN would have to be involved.

The FAAN usually maintains existing terminals, the runway system, access systems and other facilities even during the construction stage. They also provide facilities which generates maximum revenues and security of the airport.

CHAPTER TWO

LITERATURE REVIEW

THE DEVELOP OF AIR TRANSPORTATION IN NIG

2.1 MAN'S QUEST FOR BETTER TRANSPORTATION

The history of man's progress through the ages is linked among others, with the development and improvement of transportation. It is vital not to underestimate the importance of man's being able to develop social, economic and political relationships, with his neighbours. No community in isolation can develop to the full extent otherwise possible. History is filled with records of races and nation that flourished briefly and then, because of lack of exchange of ideas and essence of external competition quickly faded and vanished from the scene.

Technology is the life blood of transportation which is the medium of infusing new breadth into the individual and into the nation. Before man discovered the wheel, he used sledges. The steam age, beginning in the early 19th century, freed man from dependence upon human and animal transport power, the vastly increased his movement capability over land and sea. In the last years of the 19th century, the invention of the Internal combustion engine and the automobile provided

man with flexible rapid transport over kind, free fixed routes required by rail rights-of-way and water channels.

Greater speed meant fuller life-the sensation of speed itself had always had a great attraction. By travelling faster, man could see more of the world, could exchange ideas and goods with people far away and could develop a higher culture. Man watches the flight of birds with great admiration and dreamt of vehicles capable of carrying him through the air smoothly. His first efforts were in lighter-than-air balloons. He kept trying, and eventually succeeded in accomplishing a powered flight of heavier-than-air machines.

On December 17, 1903, in the Sand dunes of kitty Hawk, North Carolina, two bicycle mechanics, Wilbur and Orville Wright achieved the first sustained flight of an airplane powered with an internal combustion engine. It lasted 12 seconds and travelled a ground distance of 40 metre. This epochal historical event that ushered in the air age was witnessed by only five (5) people.

Following the Wright brothers' flight, development of aircraft and power plants was quite rapid. However, it is noteworthy that the greatest force behind the development of the aviation industry has been. The two world was and fear of a third one. As early as January, 1914, the first rudimentary scheduled airline service in the United State started over 32 kilometer route linking Tampa and St. Petersburg in Florida. It did not last for long. Between 1914 and 1918, world war 1 accelerated the development of aircraft engines in terms of dependability and load-carrying capability. After the war, between 1919 and 1920, scheduled airline services started in Europe linking Paris and London. In recent times, man has been able to move faster than even the boldest scientist would have dared to predict. Now in use are supersonic jets like jumbo jet, Boeing 747, which is the heaviest commercial jet liner in history having a payload as high as 490 passengers at speeds well over 960 kilometer per hour.

2.2 THE HISTORY OF AIR TRANSPORTATION IN NIGERIA

In the 1920's several flights were made to Nigeria by the British Air Force squadron based in Sudan. The first Civil aircraft to land in Kano was a light aeroplane of De Havilland (DH) 'Moth" variety, privately owned, which was flown from Lagos to Kano in 1930.

No commercial flying took place until six years when the imperial Airways inaugurated the first international airline service to Nigeria. The airline operated flight in Four-engine DH 86 biplanes through Khartoum in Sudan connecting Cairo-Kisume route. The Lagos airport, as at then, could best be classified a landing strip on the force shore of Lagos-Island. During world war 2, The American Airforce captioned "Allied Nations" operating under the West African Frontier force built the airport at Ikeja for their use. At the end of the war, it was phased into civil use.

Similarly, there was no airport facility in Kano for the first airline services to Nigeria. The imperial Airways was using the Polo ground in the North of the walled city, which had a maximum length of 400m. Later, the public works Department constructed two runways, - the main one running 1000m though extensible to 1500m in the direction of the prevailing wind, and the secondary one 800m long for use when cross winds were experienced on the main one. The runways were later improved during the second world war. Taxiway were also constructed to build up the speed of military aircraft.

In 1946, the west Africa Airways Corporation (W.A.A.C) was established to operate in the British West African Territories. the airline had its headquarters in Lagos and, operate regular domestic air services in both Nigeria and Ghana (the Gold Coast) and internationally to Dakar (in Senegal) and Khartoum (in Sudan) He fleet of aircraft

comprised of De Havilland Doves (DH 104). Bristol way fares and freighters (B 170). Accra (in Ghana) was the actual base of the way fares and freighters while the Doves were handled in Lagos. There were very few private operators and one foreign owned general aviation aircraft which specialised in carrying out aerial photography and surveys. As at 1950, ten DH Doves and Bristol 170's belong to W.A.A.C, one piper belonging to Sudan inferior mission and one Tiger Moth belonging to Mr Malcolm Brown were on the Nigeria register.

In 1960, Nigeria Airways was incomperated following the break-up of W.A.A.C. Most co-owners had to relinquish their partnership after their independence. The Nigeria Airways is a national airlines charged with the responsibility of operating commercial flight service both domestically and internationally.

2.3 THE ROLE OF THE GOVERNMENT IN THE DEVELOPMENT OF AIR TRANSPORTATION.

The oil boom of the early 70's sparked a boast in several of the country's industries, the aviation industry inclusive. The enhanced level of socio-economic development, resulting from oil boom, led to a rapid increase in the quest for air travel among the citizenry. Consequently, available airport structures and facilities became overstretched by an unprecedented upsurge in passenger and cargo traffics. The

Federal Military Government saw a massive aerodrome development project as the solution to this problematic situation and subsequently conceived the idea of setting up an autonomous body, the Nigerian Airports Authority (N.A.A) to implement the envisaged solution. this body was charged with the responsibility of developing and subsequently managing airport and necessary supporting facilities through out the country.

In 1976, the Federal Military Government Promulgated Decree 45 designated Nigerian Airports Authority Decree formally establishing the authority as a corporate and statutory body. However, it was not until July 11, 1977 that N.A.A. Came into effective existence with the inauguration of a 10-man board of directors, to manage the affairs of the authority. Before then, the responsibility of developing and managing airports was under the direct jurisdiction of the then federal ministry of Civil Aviation. The N.A.A. has been endeavouring to achieve their purpose of establishment by ensuring the substance of and a steady improvement of airport facilities, some of which were designed to serve long haul intercontinental Jets for international services and medium haul jets for domestic services as the case may be. A good number of airports including Ibadan, Port-Harcout, Yola, Sokoto, Calabar, Jos and Akure Airports have been commissioned since then. Presently, there are fifteen (15) commissioned airports in Nigeria. Others include Lagos, Kano, Kaduna,

Abuja, Enugu, Benin, Ilorin and Maiduguri.

At the inception, the Nigeria Airports Authority Inherited a total 2,0000 workers from the then ministry of Civil Aviation in Areas of engineering, administration, accounting, and fire services. At that time, the authority did not have a clear cut organisational structure. There were five principal divisions namely technical development, personnel, internal audit and training departments were later incorporated into the set-up. After sometime, the organisation was reguaranteed for greater administrative convenience and to reflected the commercial orientation of the authority.

The principal functions of the authority as laid down in the Decree 49 of 1976 are as follows:

1. To develop and maintain at airports all service and facilities necessary for the safe operation of aircraft excluding navigational aids.

2. To provide accommodation and other facilities necessary for the effective handling of the passengers and cargo.

3. To provide and develop facilities for surface transportation.

4. To carry out at airports, either directly on in partnership with either person or groups, such economic activities that are relevant to air transportation.

5. To formulate regulatory modalities for the development of air transport and supporting services in the most economic and efficient manner.

The authority has since inception, established certain 'commercial subsidiaries purposely for revenue generation and operation rationalisation in the airports. They include:

1. Nigeria Aviation Handling Company (NAHCO) this is a Joint Venture between the N.A.A. and some foreign airlines in which the N.A.A owns 60 percent equity shares. This company is one of the two empowered by the government to undertake aircraft handling operation at Nigeria airports.

2. Nigerian Airports commercial ventures (N.A.C.V.). This is solely owned by the N.A.A. and its activities spread from smack bars to restaurant services.

3. International Airport consultancy (I.A.C). This offers consultancy service in Aviation and transport related issues. It enjoys patronage of some African countries.

At this juncture, it would be necessary to mention other organisations that are connected with air transportation in Nigeria. The civil Aviation Department of ministry of Aviation is responsible for providing navigation aids and air traffic control services, while the meteorological Department of the same ministry provides weather forecast required for effective fight operation.

2.4 COMMERCIAL FLIGHT OPERATIONS IN NIGERIA:

For the past three (3) decades, the local air transportation industry has focussed primarily on the movement of people. Air cargo has been given a secondary role, only employed to fill available space on the passenger flights as belly cargo. Therefore, only the relevant aspects of civil aviation being operated by companies and individuals who own and use their aircraft for transporting people and properly in normal business operations. So large companies and well meaning Nigerians own and operate multi-engine and well - equipped aircraft. These are business flying and air taxi service. At one time the question. "Why the business aircraft" was often asked. Why should airlines not serve companies? Today, the trial period has ended; and the answers to those questions are ready and sound. It has ben said that "having the right men' the right tools and the right equipment at the right place at the right time plays a vital role in the economic of modern business". This saying explains why the

aeroplane has become a logistical tool in modern business.

Air-taxi service concerns with transportation for hire by qualities individuals and companies who supply service on a contract on charter basis. There are quite a good number of air-taxi operators in Nigeria. The scheduled airline among them are the national airline, Nigeria airways and other privately established ones like Chanchangi, Kabo and Afri-Air and Gas Airlines. Others like Skypower Express, Flash Airways, Imani Aviation and so on are non-scheduled carriers.

As at the time of writing this paper, the fleet of a serviceable aircraft belonging to the National Airline comprises of 8 Boeing 737, 3 Boeing 707, I Boeing 747, one DC. 10 and 4 A310 Air buses. Totalling 17 in all. the Boeing 737 aircraft have the smallest passenger seating capacity which varies from 103 - 130 seaters. Two among the three Boeing 707 are cargo aircraft, while the only Boeing 747 is half cargo and half passenger seater. the national airline operates domestically in twelve out of the fifteen commissioned airports in the country.

There are several International Airports. Lagos, Kano, and Port-Harcout International airport actually originate International flights. Other Internal airports are Calabar for originating non-frequent flights to the west coast;

Kaduna, Sokoto, Maiduguri and Ilorin for originating flights of Hajj Pilgrims.

Besides, Kaduna, Ilorin and Enugu are serving as alternate International airports for Kano, Lagos and Port-Harcourt respectively. An alternate airport is a reliever airport that should be established near an international airport to provide an alternative lading facility in case of any difficulty should arise, and must be of similar standard in terms of facilities. Abuja International airport is peculiar in the sense that it rarely originates International flight but is located in the Federal Capital Territory.

The remaining airports are meant solely for domestic flights operations. They include Benin, Jos, Yola, Ibadan and Akure.

TABLE 1:

DISTRIBUTION OF DOMESTIC PASSENGER TRAFFIC IN NIGERIA AIRPORT 1999.

AIRPORT	% OF PASSENGERS	RANK
Abuja	17.5	2
Benin	8.5	3
Calabar	1.9	9
Enugu	6.0	7
Ibadan	0.8	12
Ilorin	0.9	11
Jos	1.4	10
Kaduna	6.9	6
Kano	7.5	4
Lagos	37.8	1
Maidurugi	2.5	8
Port-Harcout	7.5	5
Sokoto	0.6	14
Yola	0.8	13
TOTAL	100%	

SOURCE:- Nigeria Airways as reported in the statistical and Economic Abstract of the Nigeria Airport Authority.

2.5 AN APPRAISAL OF AIR CARGO:

In Nigeria, the opportunity that is being offered by the air-cargo sub-industry is not being fully exploited. This might have been a result of non-awareness. With so many forms of transport, such as road, rail and water available, persons engaged in the movement of goods from place to place might ask 'why use air cargo?

There are several good reasons for using aircraft to carry goods; there are also reasons which can preclude the use of aircraft under certain circumstances from the carriage of certain commodities, the decision whether or not use air-cargo would depend upon all the factors involved, particularly the 'unit value' and the over all cost.

The unit value is based on a comparison of the value of articles to be despatched with their weight. For example, a carton of watchpiece of N4,000.00 worth and having a gross weight when packed for dispatch of two kilograms, is a cargo of higher unit value conversely, a bag of cement at a value of N10.00 is a cargo of low unit value.

All goods which travel from the point of manufacture to a point of sale for consumption must include in the selling price the cost of transport. Therefore, the basic value of N4,000.00 would be increased by the amount of the freight paid for carriage to destination.

Assuming that both specimen consignments are flown from the same point of origins to the same destination, over the same route. Taking the freight rate to be N4,000.00 at two kilogram gross weight will incure a total freight of N8.00. The selling price will therefore be N4,000.00 plus the freight charges of N8.00, a total of N4,008.00. The freight equals 0.02 percent of the basic value of the watches and such an increase would be acceptable. In this case, air cargo should be an obvious method of dispatch. The cement value at N10.00 and weighing 50kg will include a total freight of 50x4.00 - N200.00. In this instance, the selling price would be N210.00. the freight charge of N200.00 represents 200 percent or 20 times the basic value of the cement. such an increase in the cost of an article could never be accepted under normal circumstances. Therefore air cargo would not be an acceptable method of dispatch.

The above examples show that gods with a high unit value are more suitable as air-cargo that goods that has low unit value. The same applies to perishable agricultural produce that could be in high demand in their destination. For example, in Nigeria there is a relative potential in the production of certain agricultural goods. Vegetables likes tomatoes grow better in the north while fruits like oranges grow better in the south.

Some advantage that could be enjoyed by sending goods by air are discussed below.

1. SPEED: The speed of the conveyance, that is the aircraft is obvious. The aircraft convey from one place to another more rapidly than any other forms of transport. The speed of handling, the air-craft convey less cargo the ships and consequently can load and discharge more quickly because of the speed of aircraft, they can return for further loads more frequently.

2. LESS COSTLY PACKING:- As cargo carried in aircraft is handled and stored in different manner from that of ship it is possible to use less robust materials, and methods of packing. These light - weight materials usually cost less. Some countries even impose custom duties on gross weight of a consignment in that sense, this could result in some savings.
3. LOWER INSURANCE PREMIUM:- With greater speed of transit, the reduced handling and the more rapid movement through the transit shedis, the goods are subject to less loss, damage or pilferage. For a greatly reduced period of time, this reduction in risk has resulted in lower insurance premium.

However, the fact that aircargo can offer certain advantages to many shippers does not mean that can replace other forms of transport. Air cargo is a useful and very necessary supplement to those means of transport which has existed for long, and as such, certain demerits that disqualify air-cargo from replacing other forms of transport are discussed below.

1. High Freight Rates in Relation to Value (Low-Unit-Commodities).

This is basically the main disadvantage. The variation between air-cargo rates and surface transport rates is less critical when goods are to be conveyed between town and cities which are not a great distance apart. The greater the distance, the less favourable is the rate of air-cargo.

2. Restriction on the Size of Indivisible Load:

The limitation of the lifting equipment is closely associated with the type of location in which the airport is situated. If an airport is mainly used for handling passengers with only small "Federal" type of aircraft, it is not likely to have equipment that can handle heavy single pieces of cargo. The very type of aircraft normally using the airport governs the average pieces of cargo which can handled.

3. Severe Restriction Imposed on Certain Cargoes which are of Harzadous Nature.

Manufacturers of some commodities may agree that their products are of sufficiently high unit value to lose aircargo economically. They may be able to gear up their marketing program to rapid delivery by air instead of bulk stocks held at depots overseas. Unfortunately they may be deprived of such benefit as are available to others, by the very nature of or content of the product. Certain goods of harzadous nature

are restricted, and others prohibited from being carried by air. Similar cargoes may be subjected to special conditions when they are conveyed by other forms of transport, but none is likely to be as strict as those imposed for carriage by aim.

2.6 PROBLEMS AND OPPORTUNITIES:-

It is not the intention here to make predictions for the future. There is, however, some purpose in looking into possible ways in which the expansion of air cargo may ease the transportation of goods in Nigeria. The aeroplane has been said to make the world a smaller place, it has certainly enabled many of the ordinary people of the world to meet their opposite numbers in other countries. A great understanding of the world is becoming possible by more people through air travel.

Nonetheless, certain problems and opportunities that re existent in the present staff of the air transport system are highlighted below.

CAPACITY CONSTRAINTS:-

Only a few of Nigerian airports are equipped for night or instrument operations. This make it more difficult for domestic airports to achieve satisfactory aircraft utilization rate, as they must terminate operations on many routes by early evening. In order to avoid night time operations.

ECONOMIC PROBLEMS:-

In spite of booming demand, domestic aviation in Nigeria is not viable in economic terms. the industry appears to be a net drain in Nigeria's national resources and unnecessarily so. In particular, the industry is subsidized by public funds. The fact that aviation required costly imports makes this drain of resources a serious concern.

(i) - The operating costs of aviation infrastructure are not covered by user charges. In fact, most of the operating costs of the airports, terminals, navigation and communication system are out of general government revenues. Of these costs the navigation, meteorological and communications services are not susceptible to imposition of user charges, and consequently are usually considered a legitimate government express.

(ii) - Air transport service is furnished primarily by a government financed parastal, Nigeria Airways. The public company looses money in a market that should be generating substantial economic and financial profits.

(iii) - Pricing is another serious problem of Nigeria domestic airtransport. In the past, domestic air fares have been held down. Even, if private competitors had been allowed in the market in the past, uneconomically low air fares would

have hammer free market mobilization of capital holding down net operating revenues. Higher air fares would both reduce a drain on public resources and encourage air increase in aviation service by better enabling the private sector market entrance to earn money on their operations.

AIR FLEET CONSIDERATIONS:-

The need to expand the private domestic service on certain routes is evident. Three options exist: purchase of the new aircraft which best serves the needs of the routes; purchase of the best available used aircraft taking advantage of its reduced price; or wet lease from other operations if the decision is to purchase new equipment, current production models should be considered to forestall obsolences and rapid depreciation. The current model of the Boeing 737 should be preferred to the new model which is being modified with sophisticated and expensive equipment, unnecessary under Nigeria domestic operating conditions.

Other aircraft worthy of consideration are the B-757, B-767 and A-310 Airlines. In spite of high initial costs these aircraft may provide advantages in the short to medium haul domestic service.

Smaller aircraft of the air commuter type may prove advantageous in two ways. By collecting small passenger emplacements at remote or lightly used airports and transporting them to regional airports, the cost per passenger

kilometer would be reduced, or expanded service could be provided without increasing total operating cost. Secondly, if the larger aircraft did not lose time in servicing these small airports it would be possible to change schedules so as to better utilize every daylight hour.

REFERENCES:

1. Wiley, J.R. (1981) Airport Administration, Ero Foundation for Trasportation Inc West Port, Connectient, U.S.A.
2. Deru J.I. (1980) The Aviation Industry in Nigeria, A Paper presented at the Nigerian College of Aviation Technology, Zaria.
3. Ibid
4. Supplement on Aviation and Tourism, Nigerian Airports Authority. Vanguard December 1, 1998.
5. Wallac C. Turberille (Travel and Tourism Column) Vanguard Newspaper Vol. 10, No 2828, 14 January, 1999.

2.7 THE TERMINAL ISSUES

DEFINITION:

Terminal adjective of Terminus, forming, or marking an end, boundary, or terminus: final: of a term occurring every term, an end: an ending, a rail, air or other terminus: a free end in an open electric circuit.

The terminal in air transportation can be said to be a passage through a period. Of transportation from land to air and all activities carried out in or within it during the period as from the passengers point of view should be seen to be necessary and comfortable. This building contain all the necessary procedure for the processing of passengers ticketing, baggage air cargo. In some circles the terminal is refereed to as the airport interface and this interface may include lobbies, holding room, a main or sub-concourse, baggage areas, office space, restaurants bars, executive lounges, airport management facilities and in some cases the airport car part and aircraft maintenance and services. The terminal boosts the image of the airport as without it the airport becomes a mere airstrip and looses all its dignity and noise.

During the evolving years on airport design by airport planners safely and convenience has always been a focusing point. As usually it was he safety and convenience of the passenger that has been paramount. The main design and arrangement of the terminal building was developed around methods of passenger processing and this had to deal directly with the walking distances, parking and access mode relations. Many of the final configuration emerged when monumentally had been relegated as the function f the design was of more importance.

Design performance in terminal design may be rated with the synchronization of all systems i.e where they perform perfectly under the existing safety standards. In most cases the systems that are directly involved with delays usually cause or indirectly result in confection, these delays might occur due to minor aircraft repairs or delayed cause due to baggage loading or reclaim or that caused due to air traffic patterns and weather. But these problems can be addressed when the designer goes to tackle the problem from behind the scene, but overcrowding and inconvenience in passenger areas occur when flaws in the total system appear which makes it very important to integrate the running terminal with the overall running of the airport and then bring both to harmony.

As stated previously the basic configuration of the terminal then developed around the passenger considers the access to the terminal, the walking distance from vehicular access areas and the directional mode: Placing a cover over the functional flow diagram to be direct.

It is a fact that an interaction between the element within the system and the land environment exists on the land side and the air environment on the air side. This inadequately produces a resultant system of interaction which should never be neglected as it is interrelated into the fabric of the need for a terminal. Through a comparism of effects which are produced as a result of system interaction the value of basic terminal configuration is determined and may be defined therefore.

Where terminal configuration is being considered their comes into play the twin f, equation that is the function + flexibility = form

Function + flexibility = form

funct + flex = form

Accepted, the function of the terminal between transportation modes requires a set of system that form participants, these systems are all closely related in the transportation industry. A broad overview devideds them into inter and intra function. They include the intra city access, intra line frasters interline systems and as in most cases sitting a top these would be the managerial control systems.

Primarily related through their function and less closely related through the space the occupy.

The flexibility may relate to the idea of existing systems being able to adopts to the systems of change. One of the factors that may be considered stable during the design is adaptation to change i.e change in respect to aircraft size, speed, service requirements and capacity and this becomes mere evident when the speed of technological invention becomes 'supersonic'. An example is that concord jet, a supersonic jet that has surpassed all barrier jet placed in air travel. A terminal must be able to adopt to the increase in passenger number through the years as this is very important to its existence.

On the land side flexibility plays great role as to the adaptation of the present design to greater use as the changing demand in number and general size of cars and other modes of access.

In most cases all of these incompatibilities may be resolved through technological innovations which may come about through automation and decentralization.

2.8 AIRPORT OPERATION:

It is worthy to note that movement and function of the passengers, the cargo, and the airline employees to and from an airport are regulated by a printed schedule. That is the action that each discipline will follow is begun on the basis

of this schedule, and the passengers actions are based also on the printed time table of the airline he has chosen to fly.

The employees working hours are predicated upon the functions of each discipline as it relates to the schedule. Therefore all major elements of movement to land from the airport tend to take place upon a pre-established, programmed basis. However the technology of the aviation industry changes so rapidly that a secondary but most important consideration arises. The technology can over night; change the pre-established schedule, thereby changing all relationships and movement to and from the airport. This may occur in three (3) ways:

1) The aircraft manufacturer has demonstrated his ability to produce new aircraft with greater speeds, capable of carrying a gross loads comparable to that of existing aircraft. Therefore with the faster air craft, time zones that had one relationship now have another. This then effects the predetermined schedule and all the related discipline.

2) The ability to change and increase the pay load of the aircraft for both passenger and cargo creates a new condition. This requires a review of function and all disciplines in order to accept greater number of passengers and increased cargo movement within a short period of time. It also creates voids during the others periods of the day.

3) This condition results from both increased pay load and increased speed. This will totally change the predetermined schedule.

Therefore a constant program factor in the development and design of all function and discipline is the fact that flexibility for future growth and expansion must be incorporated.

There is another factor to be incorporated within the design programme and this is the on-time record aircraft as related to the printed schedule. The actual arrival and departure time are subject to weather conditions, mechanical difficulties, and other special consideration that will arise from time to time.

The extent of on-time arrival or departure by aircraft and the extent of deviation from the schedule must be carefully evaluation. The airlines themselves afford the best source of information related to this problem. Although the scheduling and on-time record is good a 10 - 15% deviation can raise havoc at the airport; therefore, consideration must be directed towards the capability of handling the peak condition plus and overload factor for deviation from the schedule. No two airports function in the sum manner. The overload factor must be evaluated separately. However, the designer must use caution and be aware of the fact that peak capacity may be reached only 2 or may be four hours a day, depending upon the airport and for the remainder of a 24 hours a day (12 hours a

day in Nigerian airports) selected elements of the airports at very low efficiency. Restraint must be exercised to carefully control the amount of structure that is designed so as to provide economically correct solution. An airport functions as to a transfer point between air vehicles and ground vehicles. There are numerous types of air vehicles which are designed for various functions.

Ground vehicles at an airport can take many forms. They are motor vehicles utilized as passenger. Cars trucks etc; rapid transit systems of many descriptions; and special loading vehicles which can be utilized for supplementary transfer within the airport proper. The transfer point (passenger terminal) is generally a building structure or structures and its to it's activities that we usually primarily address ourselves.

2.9 CONFIGURATION CHRONICLE:

The early thirties saw the beginning of an evolutionary process that was the scheduled flights to destinated area and this called for the establishment of areas for waiting due to delays. Also of importance was ticketing which meant that air travellers had to ticket as same as rail travellers.

Terminal designs at the inception were just ordinary buildings placed near air strips to sieve the purpose mentioned above. The basic terminal configuration came about due to an evolutionary process that may be divided into three

(3) broad and distinct generation.

1930 - 1950 - simple building that permitted a direct exchange between airport access mode and the aircraft.

1950 - 1970 ~ This occurred as a result of the increase in air traffic and the demand for more aircraft position and gates. These gates were attached to existing simple terminals, usually through concourses which also added a walk between airport access/egress modes and the air craft. This terminal form is the most common in USA and Europe and Nigeria.

1970 and after: This third generation of airport terminals have now evolved as a result of demand for gates which cannot be efficiently solved. Through the addition of more concourses. Terminal may be identified through the systems by which passengers move to aircraft and by which baggage is processed. In many means mechanical may have been preferred to manual but due to the initial input as to economical design the manual system is being used.

Due to great distances, simple mechanical means have come to replace the manual means and these refereed to as the simple mechanical means may include the push trolley or push cart, which more often than not is used in Nigerian airports (domestic) to move baggage and cargo to conveyor belts where applicable or to arrival points for onward distribution to passengers.

It is the intention of this design to centralise passenger processing and this means that all facilities of the system are housed in one building and are used for processing all the passengers in the same building.

On the other hand decentralised processing means that passenger processing facilities are arranged in modular units and repeated in one or more buildings. Each units is arranged around one or more aircraft gate positions and serves the passengers using those gates positions.

2.9.1 CONCEPTS FOR HORIZONTAL DISTRIBUTIONS:-

Four basic concepts for the horizontal distribution of the terminal exists, although some others which may be formed from a combination of two or more or aspects from all may present it is suffice to say that hybrids are also entertained during design considerations. It is important to note that each can be used with varying degrees of centralisation which is one of the important consideration. The concepts are as follows:-

1. PEIR OF FINGER CONCEPT:-

First appeared in the 1950 and ushered in a new method of passenger processing. This became a solution to the result of changes in airline procedures for a reliance on a common passenger holding facility to separate holding facilities for each flights.

This concept has an interface with aircraft along fingers extending from the main terminal area. Aircraft are usually arranged around the axis of the pair in a parallel or nose in parking alignment. Each pair has a row of aircraft gate positions at both sides, with a passenger concourse along the axis which serves as the departure lounge and circulation space for both enplaning and deplaning passengers. This concept usually allows for the extension of the pair to provide additional aircraft parking position without the expansion of the central passenger and baggage processing facility.

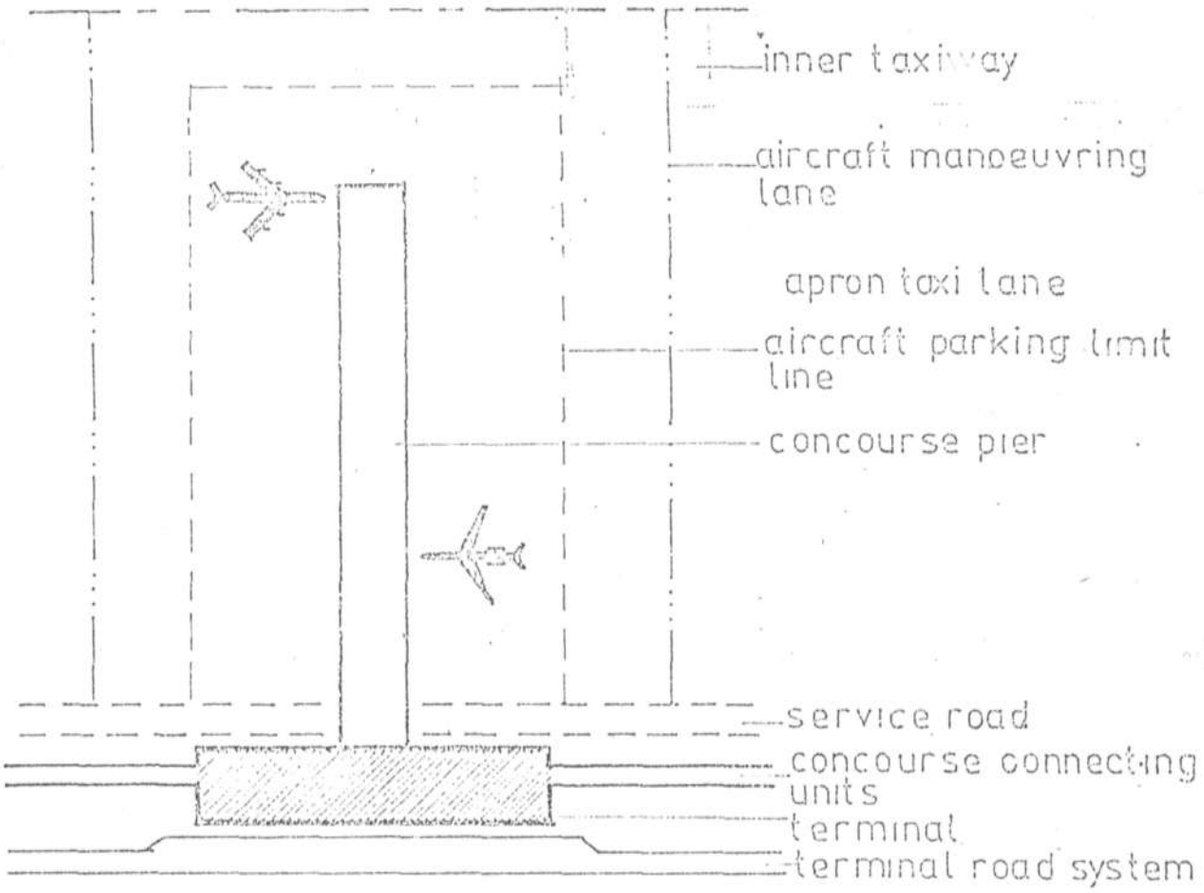


Fig 2·1 PEIR SYSTEM

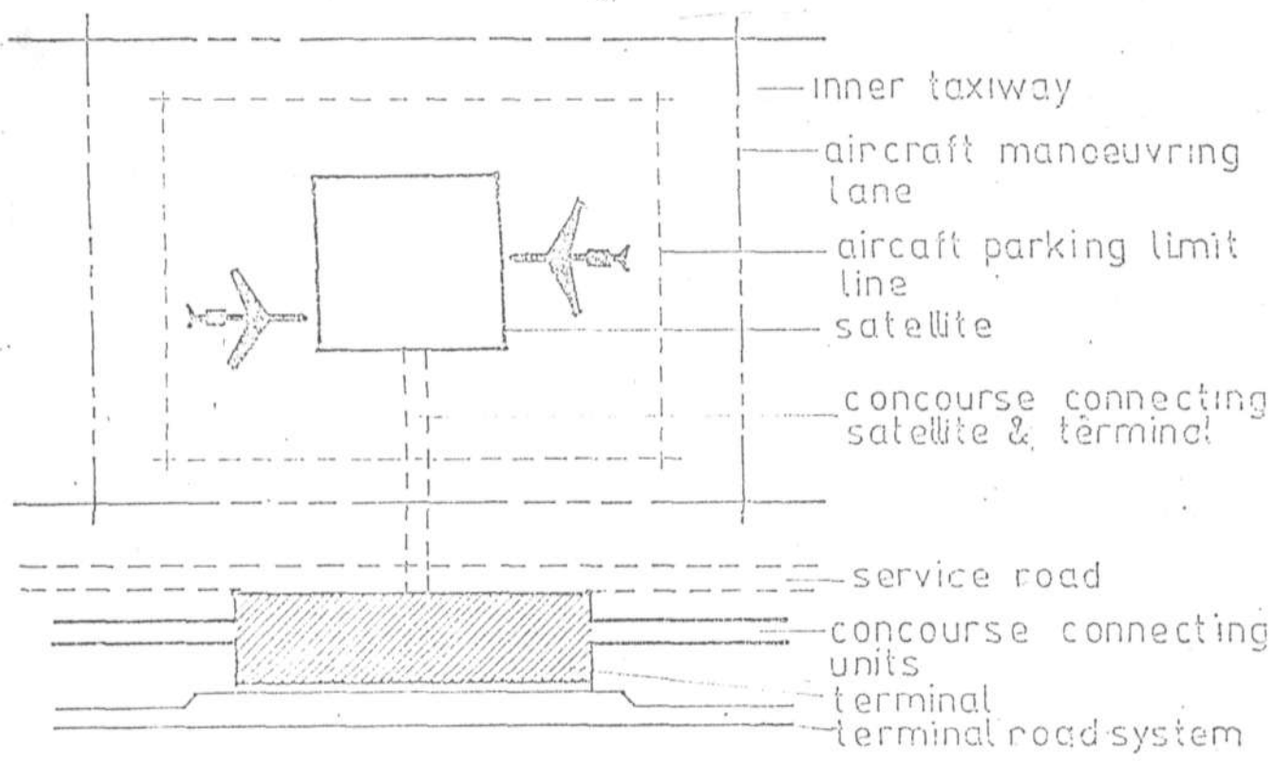


Fig 2·2 SATELLITE SYSTEM

Peirs were introduced in the first instance as appendages to a single main terminal facility to provide additional gates, however, inherent operational advantages in the scheme were soon to be realized, and it became the most commonly used concept in the United States. The scheme, when applied on two levels, offered possibilities for separating all systems associated with the various enplaning and deplaning functions, including separate curbs, ticketing baggage claim and in certain instances circulation to aircraft in the concourses themselves. The concept of systems separation has since been applied to human, satellite and transporter schemes, as has the introduction of second-level bridges which evolved with the second level peir as a means of mating terminal to aircraft as well as a means of separating passengers from potential danger at increasing congested range.

The peir concept has some serious disadvantages as with flexibility however it is limited to a maximum size in terms of its passenger walking distance when a passenger moving device is not in use. also, a non direct curb front relationship to aircraft gate positions. the chief advantages of this concept is the ability to be expanded in incremental steps as aircraft passenger demand increases. The economical value of the concept cannot be undermined in terms of operating and even capital cost. Example of where this has been used is the Atlanta, Georgia Airport and O'Hare airport Chicago illinois.

2. SATELLITE CONCEPT:-

This concept is that where a building is surrounded by the aircraft. This building which is separated from the terminal and is approached through a connector which might be underground or overground. Usually the aircraft is parked radially around the satellite. It often affords the opportunity for simple maneuvering and taxi patterns for aircraft, but requires larger apron area than most concepts. It can have common separate departure lounges. Since enplaning and deplaning passengers from the aircraft move from a common and often remote area, mechanical systems are usually employed, for there transportation between the terminal and the satellite.

They were initially introduced to improve airside flexibility through increased aircraft maneuverability and parking space by placing concourses below the apron. there is usually a central terminal building whose primary function is a line up with access/egress modes, such as ticketing, customs baggage claim/check. The main distinction between peir and satellite concept is that some main terminal functions may also be taken care of in the satellite. When transporters are introduced or travellators are introduced, walking distance are kept to a minimum, otherwise walking distances are maximised for all gates around a satellite, this is on the land side.

From the airside there are also mixed effects depending on the satellite configuration aircraft are usually concentrated about a points this may be put into a advantageous position in cases of sharing equipment and services, but can also limit expansion capabilities both for interior building function and for aircraft parking space requirement and flexibility. Although aircraft manourverability is usually increased by aprontaxi-ways completely surrounding the satellite necessary pavement areas may far exceed those found in other schemes.

Construction cost is relatively high due to the need to provide connecting concourse to the satellite. It lacks flexibility and exposure capabilities.

Example of this concept is the sanfrancisco international Airport.

3. LINEAR CONCEPT

This concepts work where the apron is adjacent to the terminal and has a direct linear access to the terminal. It is usually used where a low traffic or passenger turnout is envisaged and where constraints of space call for it. The development of the linear concept is an extension or multiplication of the oldest simple concept: A single building housing all terminal systems with the aircraft parking directly adjacent to it. It has a direct relationships between the linear ramp frontage and, the curb

area provided a better access/egress activity. In most cases this advantage is reduced by certain cost associated with multiplicity of necessary terminal systems and functions. Where airlines may want to use different terminals under the same building the linear concept becomes a good alternative. This is because it involves in most cases, the use of several small terminals arrange in a linear procession, each with a complete set of systems necessary to the function of an isolated terminal. In most cases the concept offers ease of access and relatively short distances if passengers are delivered to a point near gate departure by vehicular circulation. Expansion may be accomplished by linear extension of an existing structure or by developing two or more terminal units with connectors.

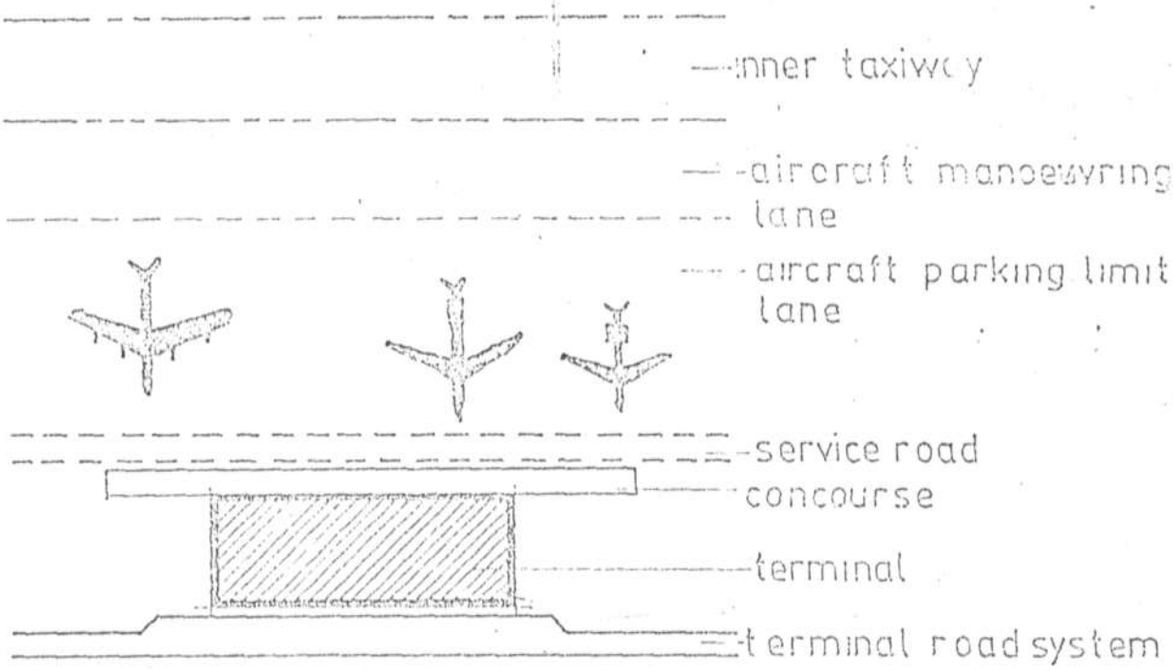


Fig 2.3 LINEAR SYSTEM

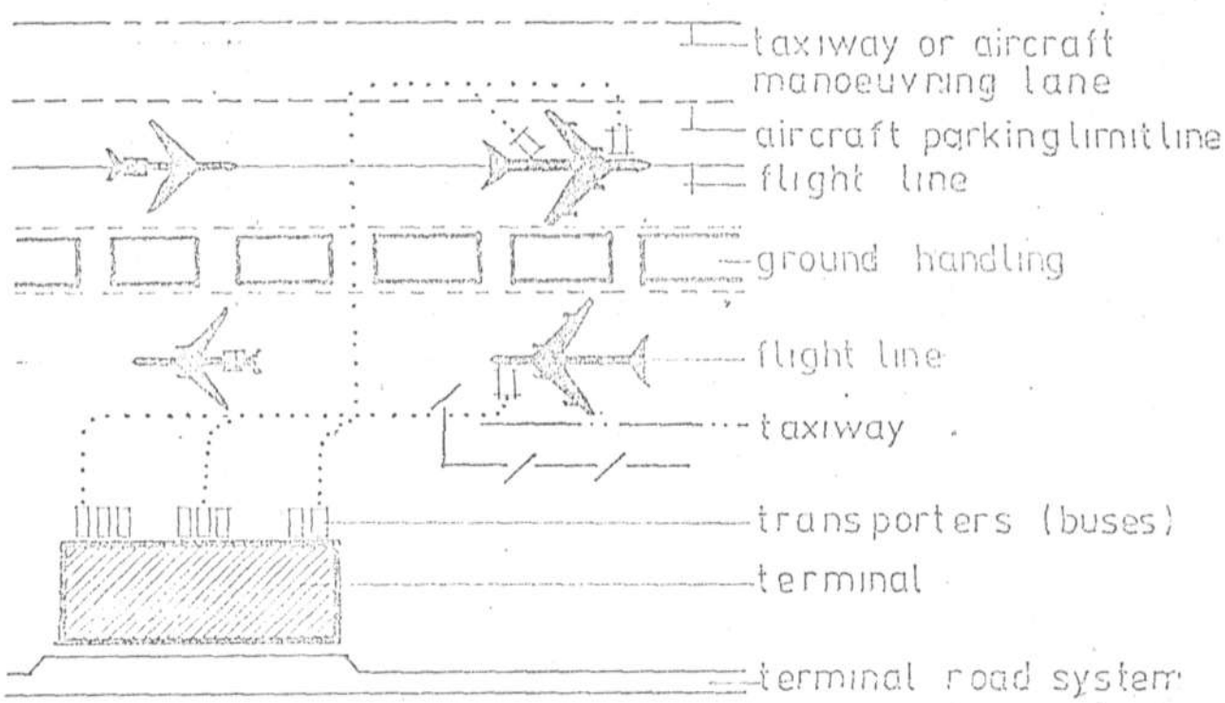


Fig 2.4 TRANSPORTER SYSTEM

4. TRANSPORTER CONCEPT:-

The transporter concepts which is similar to concourse scheme in that pairs and holding rooms have moved and replaced by mobile lounges or buses, however additional holding space is usually required within the main terminal building. From the air side there are apparent advantages, parking the aircraft away from the main terminal can mean taxi - in, taxi - out operations which eliminate expensive, time consuming aircraft tugging or towing operations for turning aircraft positions.

The characteristics of the transporter concept include flexibility in providing additional aircraft parking positions to accommodate increases in schedules or aircraft size. The capability to maneuver an aircraft in and out of a parking position under its own power, the separation of aircraft servicing activities from the terminal and reducing walking distances for passengers.

Capital cost levels are reduced due to the fact that building effectively uses minimal departure lounge space and has gate positions. For transporters rather than land side and the air side. One of the chief disadvantages is the passenger scheduling which when not coordinated with the passenger processing may cause delays and also the time involved in moving the passengers to the air plane from the terminal.

2.9.2 CONCEPTS FOR VERTICAL DISTRIBUTION:-

A multiple floor distribution for a public area has always helped space allocation and multiple usage but for a system effective situation which airport terminals are known for it would amount to a problematic solution if the aspects of the individual system are not looked into before vertical distribution of these systems are collected.

In most cases it is the passenger handling provision that calls for vertical distribution. Usually the basis for distributing the processing the passengers among several levels is to separate the flow of arriving passengers from departing passengers. The volume of passengers as well as the availability of kinds for expansion in the immediate vicinity may determine the decision on the number of the floors for vertical distribution.

Also the horizontal processing concept chosen may also affect the choice of the vertical distribution pattern when necessary.

With a single-level system all processing of passengers and baggage occurs at the level of the apron. Separation of the arriving and departing passengers occur horizontally. In this case the administrative function may occur on a second level. With this system, stair are normally used to load the passengers on the aircraft. When handling a low traffic of

passengers then it becomes quite economical most of the terminal building at domestic airports in Nigeria use the one level terminal vertical distribution, this is due to the non decentralization of airport maintenance activities which is still housed in Lagos.

Two level passenger terminal systems may be used for the separation of the passenger processing and baggage handling activities which occur at the lower and where the passengers system are separated to arrivals at the lower floor and departures at the upper floor their way, the passengers would be able to get to the aircraft without changing levels due to the compatibility of the level with aircraft door stair height due to apron configuration and terminal configuration this may not always be possible.

In most cases airline operations and baggage handling most likely occur at the lower level in this case departing luggage is mechanically lowered to that floor from where onward transmission to the aircraft occurs.

Vehicular access and parking usually occurs at both levels but mainly parking activities occur at the lower level where access to taxis and public parking is likely to be more suitable. In some cases parking may be sub-structural.

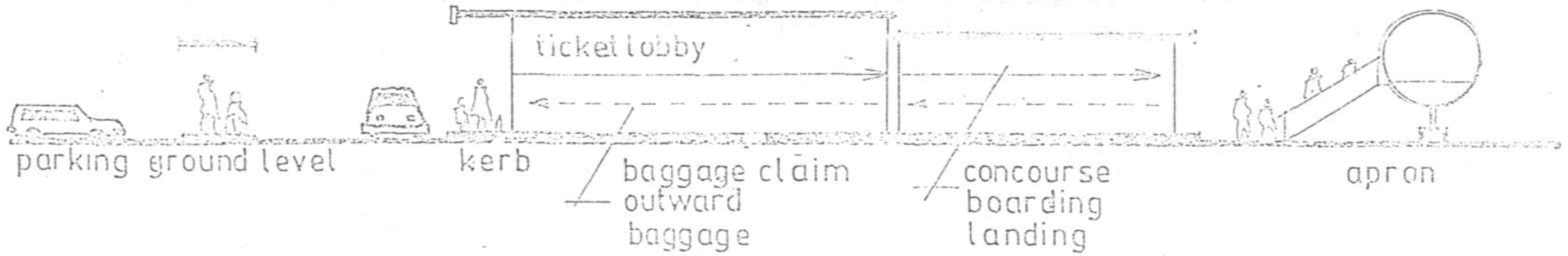


Fig 2·5 TERMINAL CROSS SECTION
SMALL 1 LEVEL

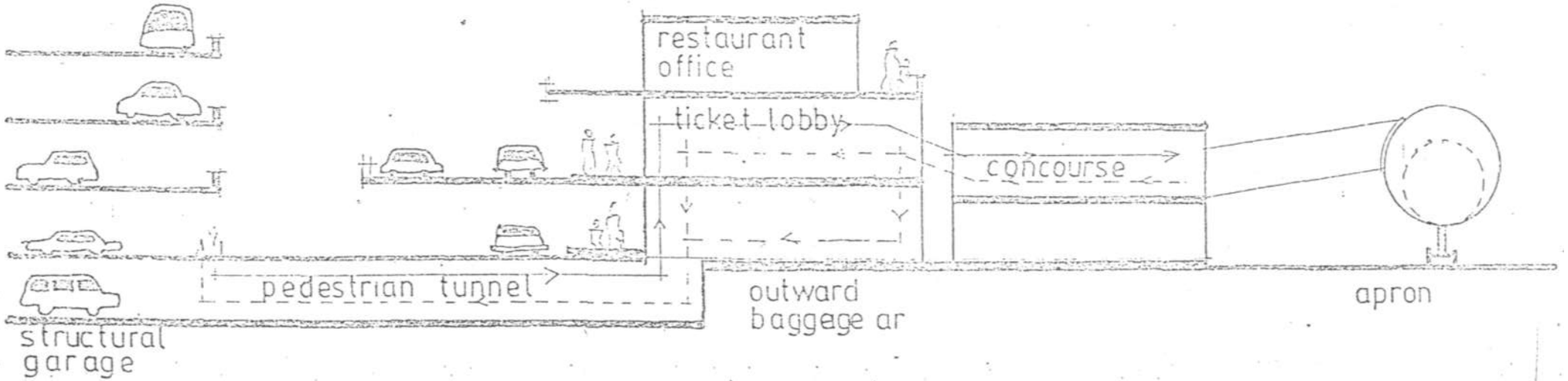
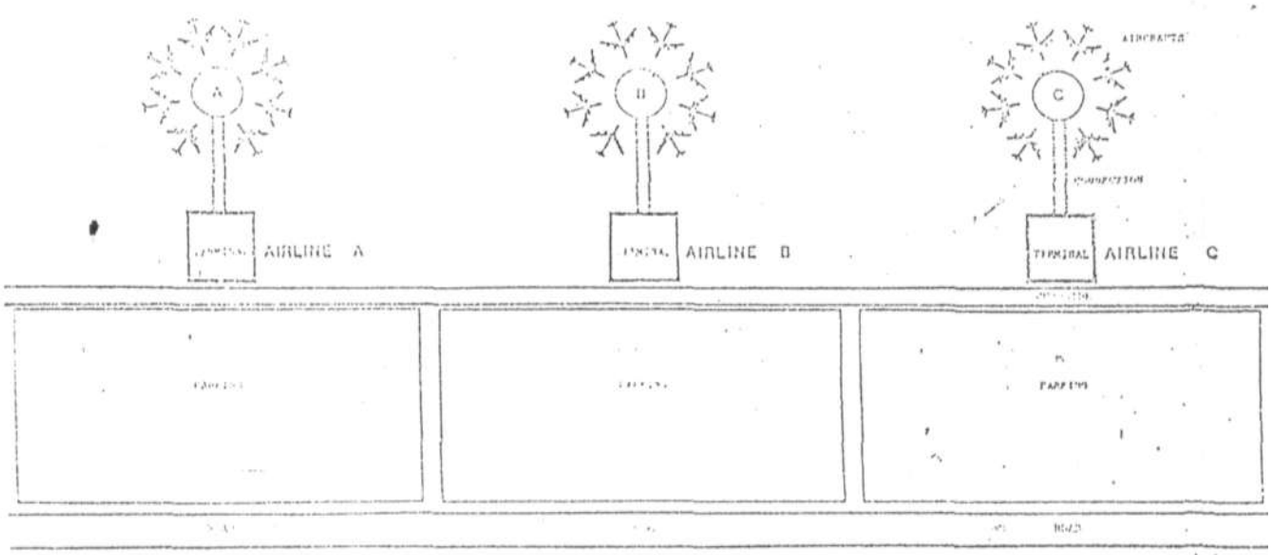


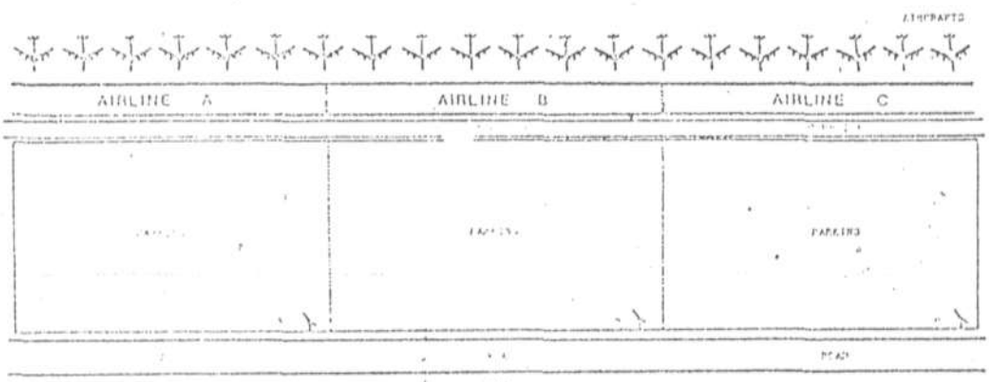
Fig 2·6 LARGE 2 LEVEL

Other systems may be included but to the tailored needs and necessities of the particular terminal. In the case of General Aviation Terminal (of the Murtala Mohammed Airport) in Lagos a lot of office space in needed due to the fact that most of the private airline operating the airport as compared to the other airport in Nigeria, that is why a level or levels for official accommodation has to be provided to the aid these operational needs.

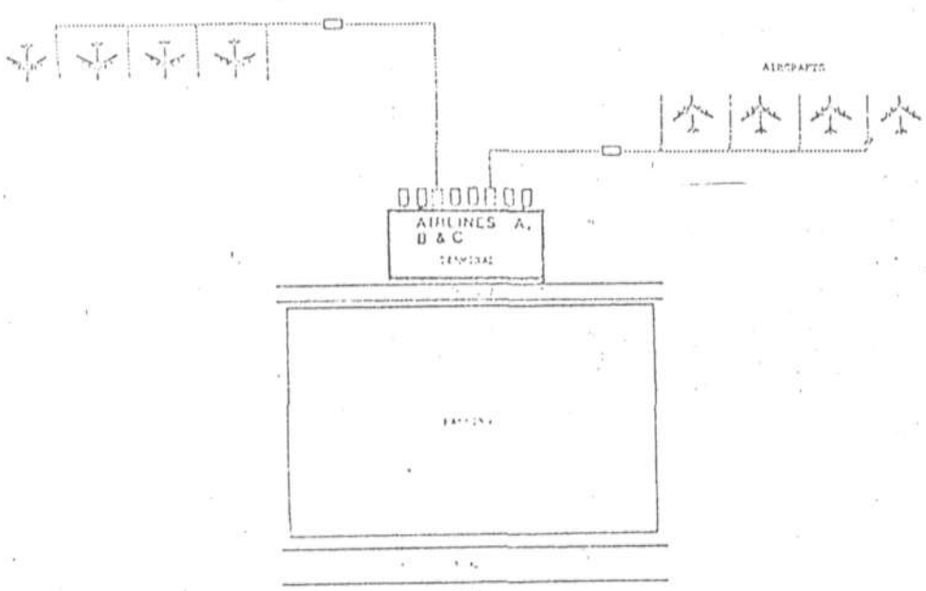
Typical terminals lack the inclusion of towers in multiple floors vertically distributed, this may be due to the existing had laws that determine land use acts in and around airports due to the hazards thereof. In most cases an evenly spread out horizontal distribution occurs and where there is lack of space for such a facility then the terminal is relocated and a transporter system is used for the transfer of passengers to and from the apron, or the facility for office accommodation is relocated to a more continent or conducive area of the airport master plan and communication equipment betted up to avoid delays that may be caused by the movement of information from one facility to another.



(e)



(f)



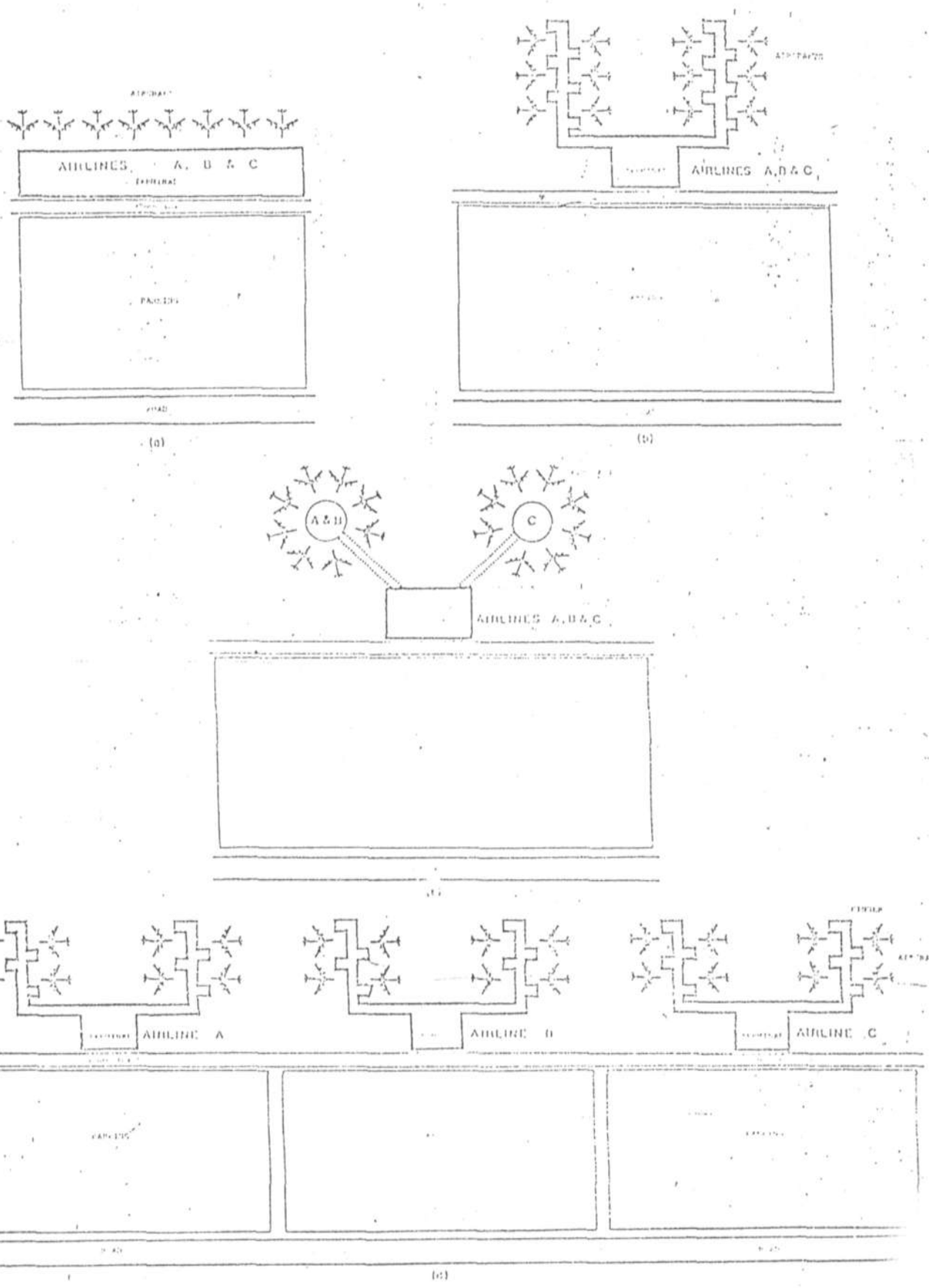
(g)

Fig 2·7 Terminal concepts. (e) Satellite terminals (decentralized). (f) Drive to gate. (g) Mobile lounge.

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...2-8 Terminal concepts. (a) Consolidated terminal, (b) Finger terminal (consolidated), (c) Satellite terminal (consolidated), (d) Finger terminals (decentralized).

2.10 TERMINAL DESIGN CRITERIA.

For this particular dissertation the terminal is to serve only as a domestic terminal and most systems existing on the ground to be considered immoveable but could be expanded and improved upon. Those considered temporary would be removed and those not useful any longer will be renewed.

The basis of a terminal may be accommodate passengers who are the most important through the safe arrival and departure system and to achieve this a final separation or division has to be imposed on the arriving as well as the departing passengers from each other, it is intended that the passenger is educated as to the procedure of arrival and departure through the terminal without much interaction with the staff, through the use of graphical (sign) representations.

2.10.1 THE DEPARTING PASSENGER:-

The departing passenger may be said to be more important than the arriving passenger because he or she tends to spend more time at the terminal, this time may be used in ticketing baggage check-in, waiting for the boarding call, in some cases delays due to operational reasons and the finally the boarding procedure. It is during this period that the passenger passes through the interface of the terminal, and this stares from the curb on the land side to the tarmac.

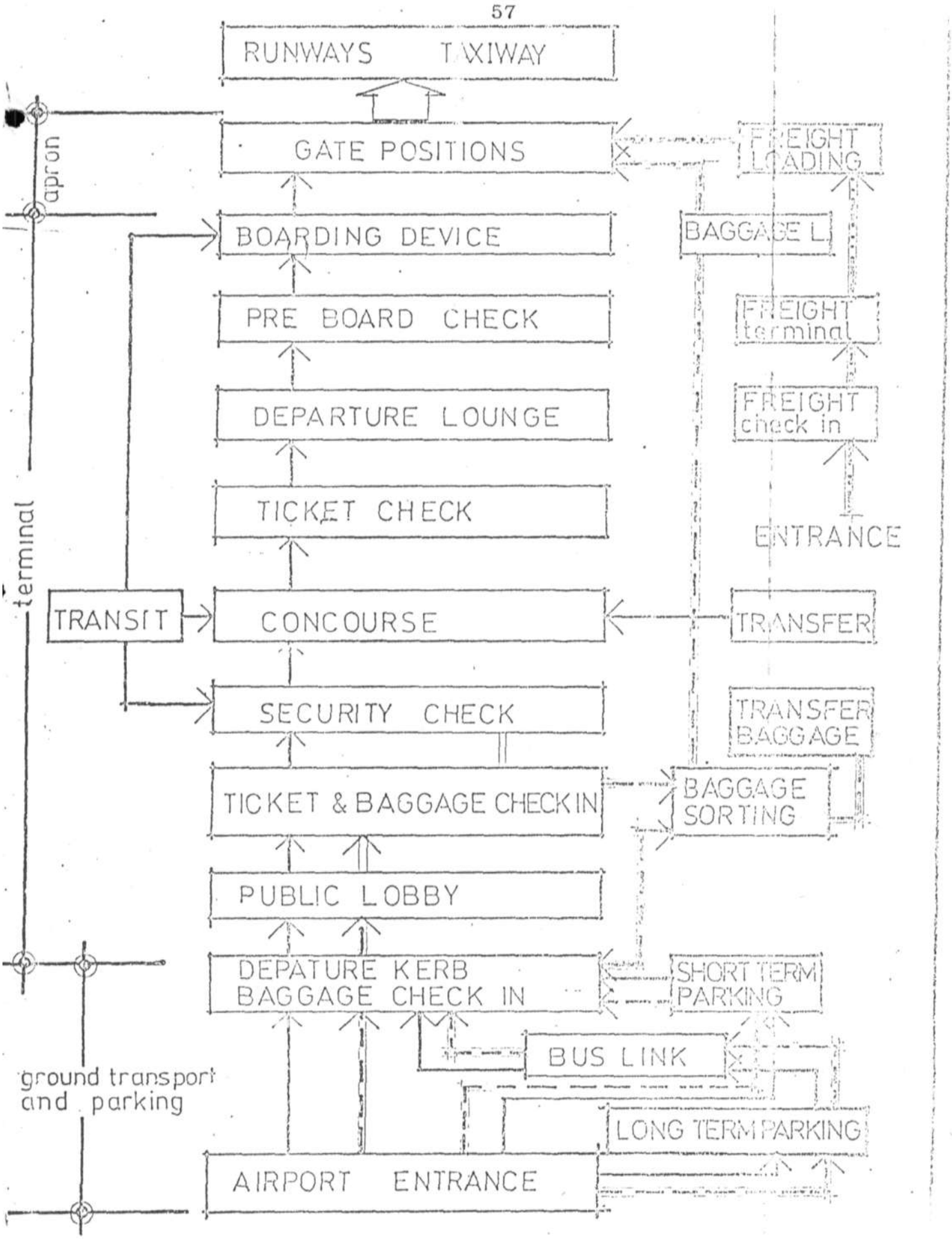

RUNWAYS
TAXIWAY
apron
GATE POSITIONS
FREIGHT LOADING
BOARDING DEVICE
BAGGAGE L
PRE BOARD CHECK
FREIGHT terminal
DEPARTURE LOUNGE
FREIGHT check in
TICKET CHECK
ENTRANCE
terminal
TRANSIT
CONCOURSE
TRANSFER
SECURITY CHECK
TRANSFER BAGGAGE
TICKET & BAGGAGE CHECKIN
BAGGAGE SORTING
PUBLIC LOBBY
DEPATURE KERB BAGGAGE CHECK IN
SHORT TERM PARKING
BUS LINK
ground transport and parking
LONG TERM PARKING
AIRPORT ENTRANCE
PASSENGER FLOW
BAGGAGE FLOW
FREIGHT FLOW

Fig 2.9

As the intending passenger disembarks at the curb he is helped by a porter who should have been registered by the airline operators or the authority taking care of the airport. The porter usually guides the passenger to the ticketing facility for the air line of choice and at the check in desk officials of the air line take over. A ticket is usually issued at the counter or has been previously obtained at designated centres outside the airport where reservations may be booked. After the ticket verification or issuance the baggage is weighed, numbered and these details are recorded on the ticket. The baggage is then taken away for safe keeping until loaded on the aircraft. In most cases the baggage is labelled as well as that those to be taken into the aircraft by the passenger which is refereed to as the hand luggage. Baggage should contain several personal effects and usually limited in weight and dimension. Regulations of the International Air Transport Association states the items that could be included as part of the free baggage allowance. usually a check in limit of 20kg/passenger is allowed.

Usually, an airport service charge is paid by the passenger this could be done at the check in counter or in some cases a different booth. The passenger is issued with a ticket which is clipped to the flight ticket and a boarding pass issued either before or after this procedure. The passenger then proceeds to the security area where his or her hand luggage is checked for security reasons and then to the

departure hall or the lounge where he or she stays till the flight is announced before proceeding to the aircraft for boarding. This particular procedure may take as little as 5 minutes or as much as 5 hours.

2.10.2 THE ARRIVING PASSENGER:-

Usually as the passengers leave the aircraft in whatever form of transport they head straight to the arrival lounge where necessary control facilities are in pace for their direction and safety. The arrival lounge in most cases duplicate the function of the baggage reclaim hall and porters await passengers with trolleys passengers then identify their baggage on the pneumatic belt collect them after identifying such and showing proof. In some airports self service trolleys are always made available.

Usually there is some forms of examination by officials of the customs and then the passenger move on to the concourse where he or she is met by friends or relations, from the concourse to the curb where car hire provisions are made for arriving passengers, the passenger than boards one of these cars to his or her final destination or moves to the car park if received by friends with cars in the cars in the car park and the out of the terminal.

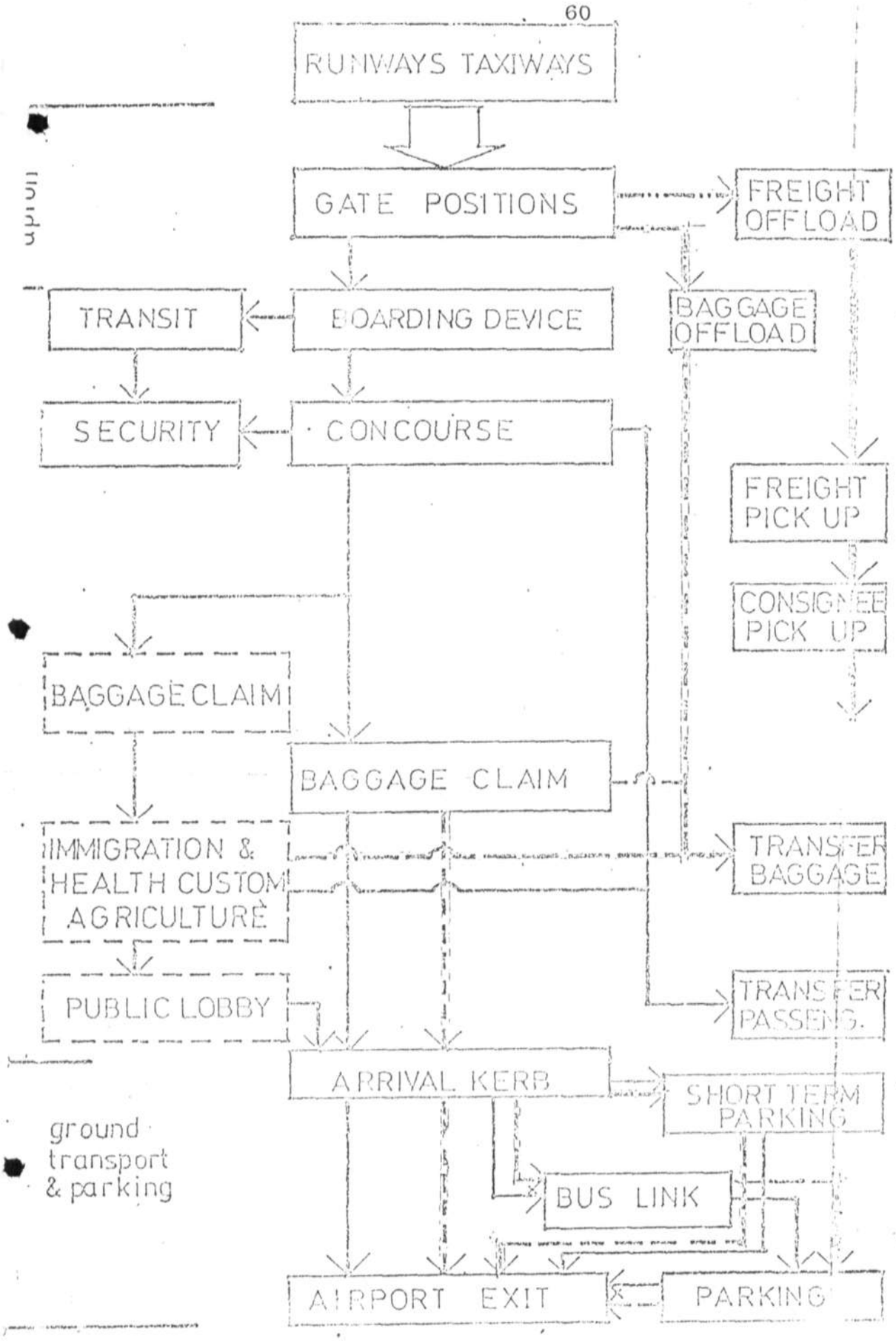
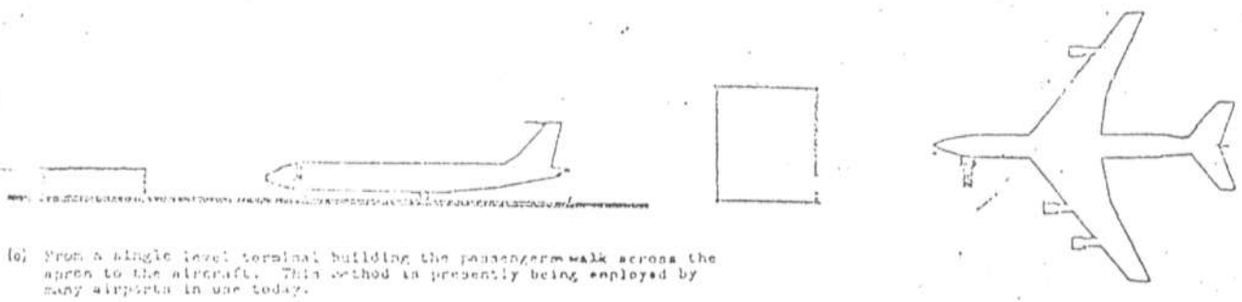
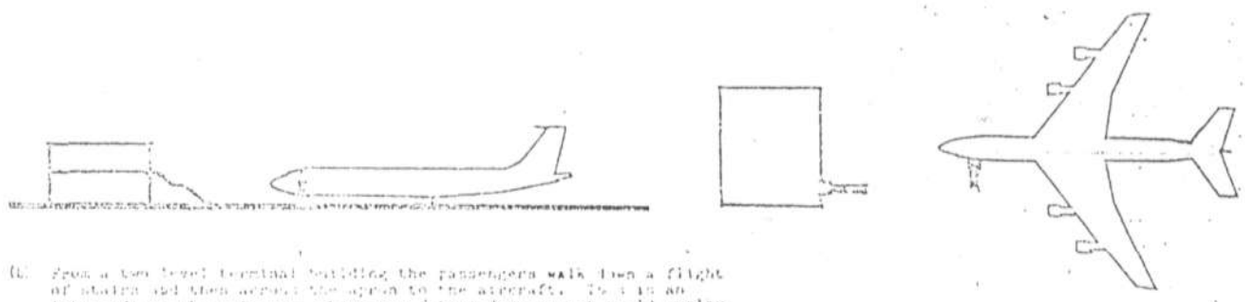


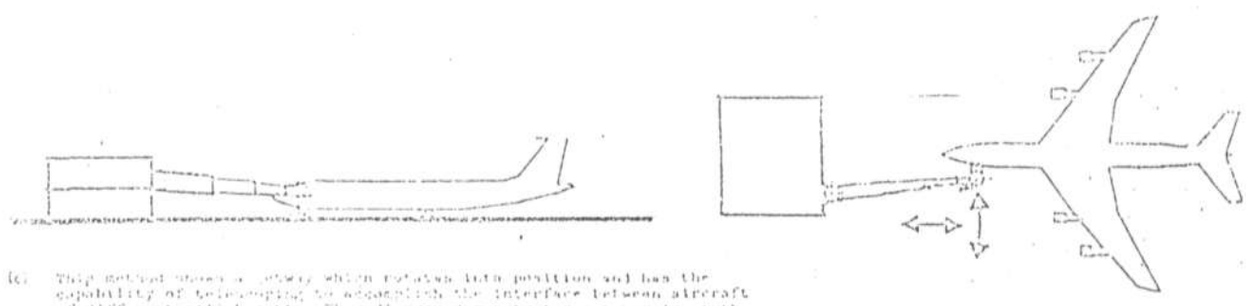
Fig 2.10 PASSENGER FLOW ARRIVALS



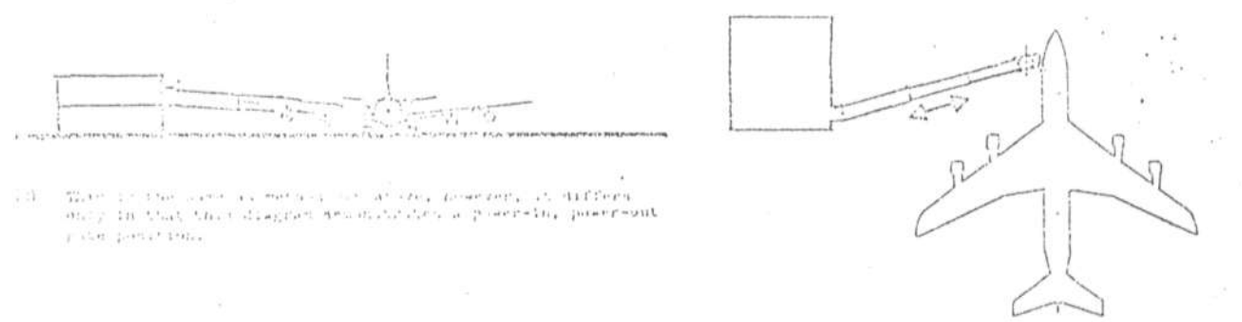
(a) From a single level terminal building the passengers walk across the apron to the aircraft. This method is presently being employed by many airports in use today.



(b) From a two level terminal building the passengers walk down a flight of stairs and then across the apron to the aircraft. It is an intermediate phase in use, where the future development would employ the use of jetways.



(c) This method shows a jetway which rotates into position and has the capability of telescoping to accomplish the interface between aircraft of different sill heights. This diagram demonstrates a power-in, push-out gate position.

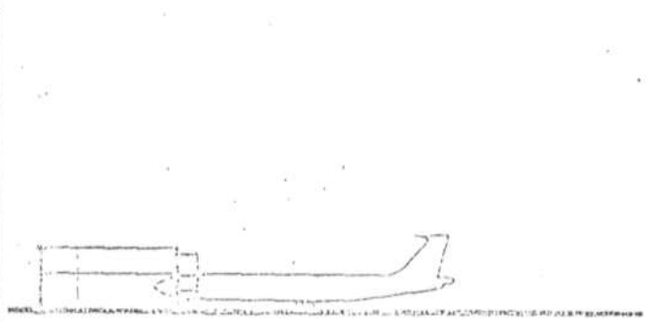


(d) This is the same as method (c) above, however, it differs only in that this diagram demonstrates a power-in, power-out gate position.

Fig 2-11 Typical loading methods.

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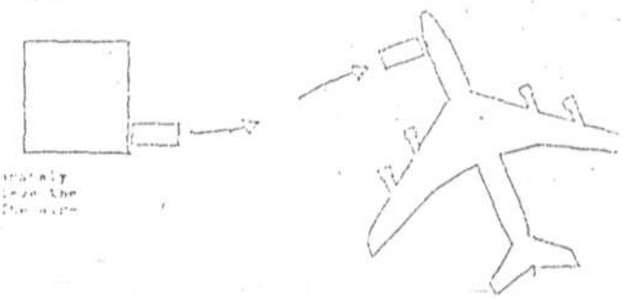


(a) This diagram demonstrates a fixed jet way of short length and with a small amount of telescoping capability. This jetway also has the capability of making some adjustments in all heights. The gate position can only be a power-in, push-out condition.



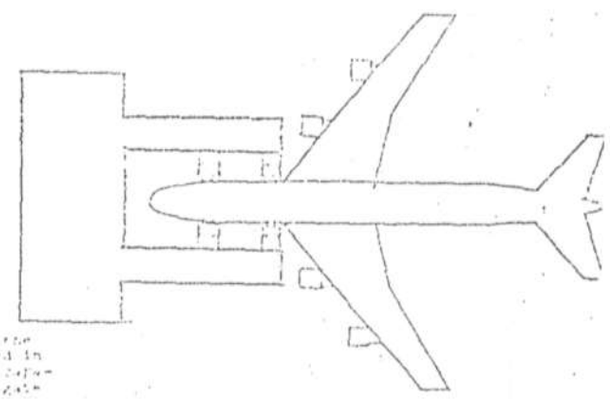
(b) This method, which is used in some present day airports, consists of a train of carts designed to carry passengers or it may consist of the use of buses to deliver the passengers to a remote aircraft parking position. The terminal building can be either a one level or two level structure.





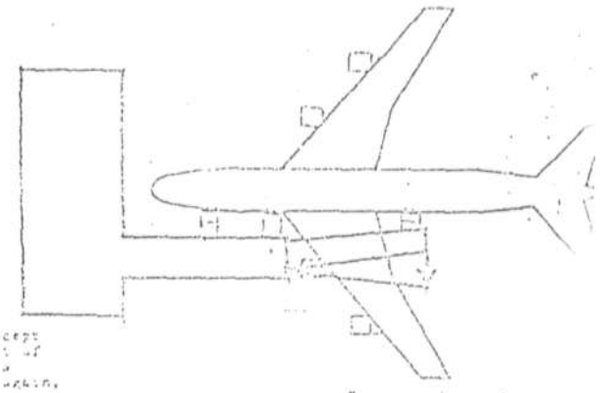
(c) This method is known as the Satellite type and consists of an elaborately furnished box with a scissor lift and a telescoping front to complete the interface between both the aircraft and the terminal building. The aircraft is parked at a remote position from the terminal building.





(d) This method is used for the wide bodied aircraft and will accept the B-747, the DC-10 and the L-1011. The two main corridors are fixed in their location, however, the four short jetways have telescoping capability in order to achieve the interface with the aircraft. The gate position requires a power-in, push-out condition.





(e) This method is also used for the wide bodied aircraft and will accept all three aircrafts as listed above. It is based upon the concept of a fixed corridor for access to the front two passenger doors and a cantilevered jet way over the wing to reach the rear door. Here again, the gate position requires a power-in, push-out condition.

Fig 2·12 Typical loading methods.

Information centre are usually provided around the arrival lounge for the easy identification of passengers through the use of public address system.

Usually delays that occur in this procedure may be caused during baggage reclaim activities but usually a period of 10 minutes is allocated for this activity depending on the procedure and terminal configuration.

From both passenger movement it should be seen that the passengers terminals system is put in place at airports to provide a form of interface between the transportation on the land side and that on the airside, providing security safety comfort and efficiency while performing the exchange role.

Route planning on the other hand helps airline operators to plan airport activities to reduce congestion and delays that occur at terminus where indirect or collective flights are scheduled. It helps reduce passenger load and also reduces operational costs for these airlines.

2.11 THE BAGGAGE

Airports world wide are reduced to simple activity areas when the baggage handling systems are efficient, this is due to the fact that the baggage inadvertently creates a problems that the airlines operators always plan to tackle a head to have a smooth operations. The need for a good system is obvious but the factors effecting this system is always extremely difficult to evaluate. The factors may include the

for originating, terminating and transfer both interline and intraline. It should also be related to the time schedule and the peak condition.

2.11.1 BAGGAGE CHECK IN SYSTEM:-

There are 3 main check - in system operated world-wide these are:-

1. CURBSIDE CHECK-IN:- This provides the greatest amount of convenience a past from the parking lot check in system. It allows for quick acceptance of the baggage. This also means that the rest of the floor area or public space in the terminal area would be free from congestion the curbside check-in isolates the major portion of the baggage handling with sky cap personnel and not with the airline agent but is usually used where tickets are schedule before the passenger get to the airport i.e in a very efficient situation. This are must provide convenience of tagging and usually some mechanical conveyance back to a central bag room.

2. COUNTER CHECK-IN In this case the passenger checks in his baggage when he is purchasing his ticket and getting boarding pass. The baggage is weighed and tagged and then a ticket is also issued for the baggage before the passenger proceeds to the waiting lounge. Usually, the check-in counter coincides with the counter in the main terminal area. It is

customary to provide mechanization from an area directly at the back of the ticket counter to the central baggage room. This is a more convenient procedure as it allows time for the baggage to be a properly tagged and related to the particular ticket of the passenger as it would also make it easier for collection of the baggage at the termination of the flight as it involves baggage identifications. Usually practiced in most Nigerian airport it is a little bit more discomforting on the part of the passenger.

3. GATE CHECK-IN:- In small quantities bags are received at the gate. These bags must be checked in at this point because many passenger mistakenly believe that their suit cases will be accepted for storage in the passengers portion of the plane. A significant number of airlines passenger frequently use carry on suit cases but unless such luggage can be stored below the seat and out of aisle space, it must be carried in the baggage compartment. In most of our airports in Nigeria the flight attendants still check in baggage at the foot of the stairs that leads into the aircraft and tag such baggage before placing it at the baggage compartment of the aircraft. This form of baggage check-in would be checked above others due to its convenience for the passenger and inconvenience to the airline operators.

It should also be noted that additional bags will be received at a convenient location adjacent to the baggage room for transfer, from other airlines of the same carries. All baggage room which utilize mechanized equipment must also be provided enough room for manual handling in case of a major shut done occurs.

2.11.2 BAGGAGE HANDLING REQUIREMENTS:-

Activities concerned with baggage handling are as follows: collection, sorting and distribution of baggage. This concerns out going or incoming baggage.

The activities needed for process outgoing baggage include:

1. Conveyance from baggage check-in points to central sorting area.
2. Sorting of baggage according to the aircraft on which it depict.
3. Conveyance of the sorted baggage to the appropriate aircraft gate position.
4. Loading of the baggage into the aircraft.

For incoming baggage the activities include:-

1. Unloading baggage from aircraft;
2. Conveyance from aircraft gate position to central sorting area;
3. Sorting to identify baggage that needs to be transferred to the other departing flights;

4. Conveyance of arriving baggage to baggage claim areas.

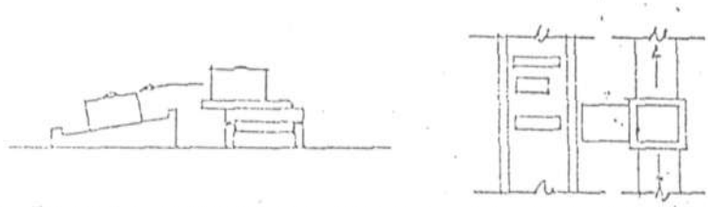
It should be noted that in order to perform these activities a number of mechanized system have been developed. The complexity of the required equipment depends on the baggage volume that need to be handled simultaneously. Thus at large terminals sophisticated, electronically controlled sorting system have been installed, while at small airports, sorting is performed manually.

Conveyance of baggage to the aircraft is usually done by loading baggage on wheeled carts and towing to the aircraft position as shown in the plate overleap.

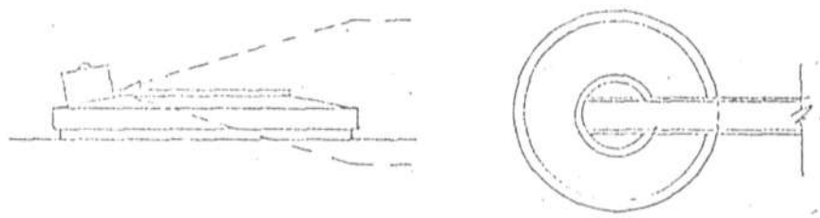
Baggage claim facilities also vary unsophistication and complexity depending on the magnitude of the columns of passengers and baggage claim area. At larger terminal



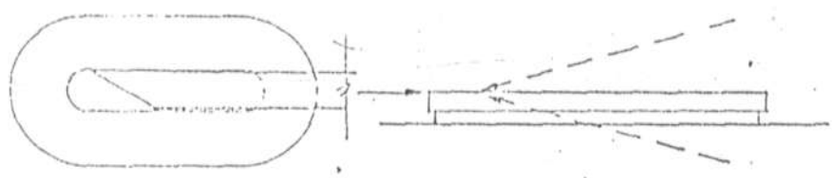
(a) The baggage is transported from the aircraft to the claiming device by a cart and is then off-loaded manually by an attendant.



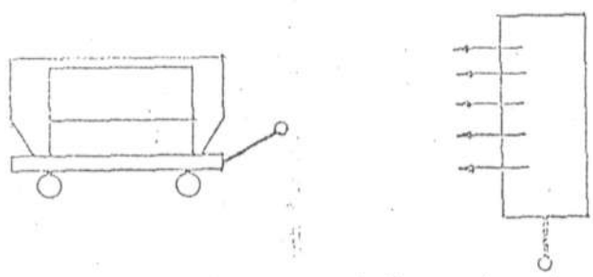
(b) DIVERTER In this system the baggage is placed on a conveyor at one end. A diverter moves back and forth along the conveyor and disperses the baggage onto the claiming device.



(c) CAROUSEL A conveyor, from underneath or from above, delivers the baggage to a rotating carousel.



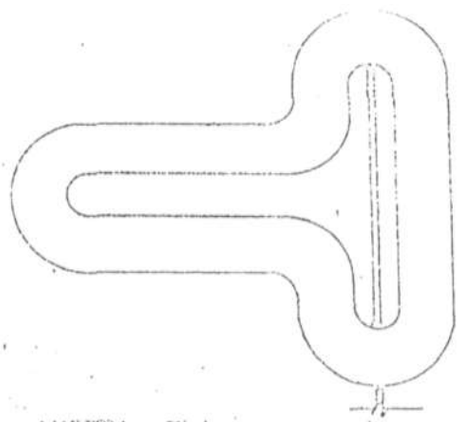
(d) RACE TRACK A conveyor from underneath or from above, delivers the baggage to a continuously circulating conveyor, the length of which will depend upon the terminal layout.

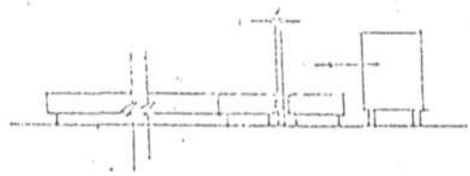


(e) POD The baggage pod is removed from the aircraft and delivered to the claim area. The passengers remove their baggage from the pod.

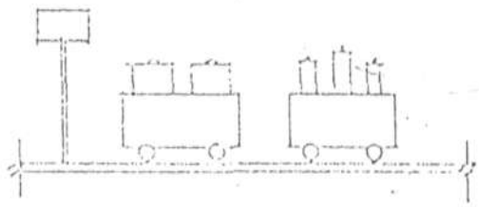
13 Baggage claim systems.

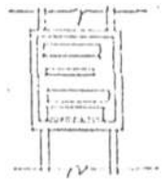
Source: (Time Saver Standards for Building Types)





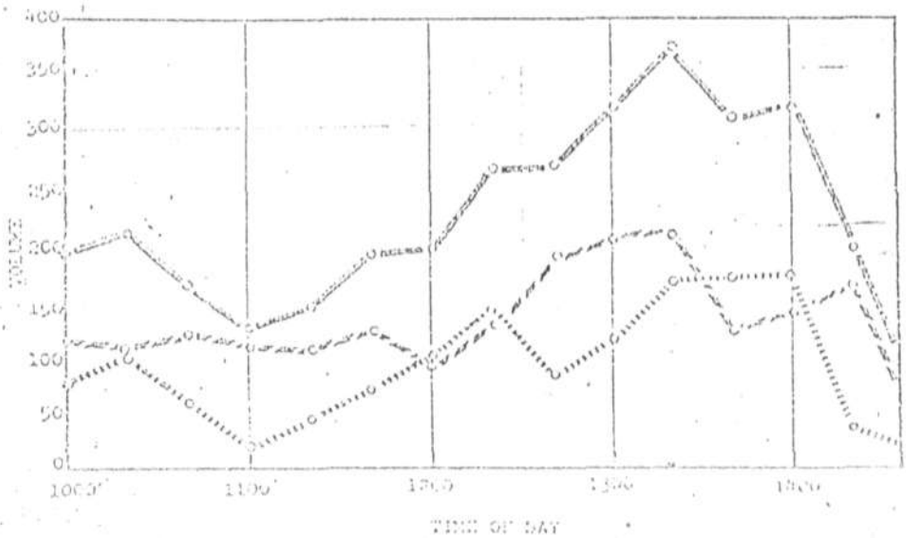
(f) AMOEBA This system is an extension of the race track system. The only difference being that the baggage is manually loaded directly onto the conveyor by an attendant behind a wall and out of view from the passengers.





(g) AUTOMATED This system consists of carts that are operated by a computer system. The passenger inserts his claim ticket into a call box at a desired location, the cart then delivers the baggage at that location.

Baggage claim systems.



This chart is only an example and does not pertain to any specific airport, airline, or passenger count.

One conveyor and deplaning waiting volumes at each frontage.

Source: (TIme Saver Standards for Building Types)

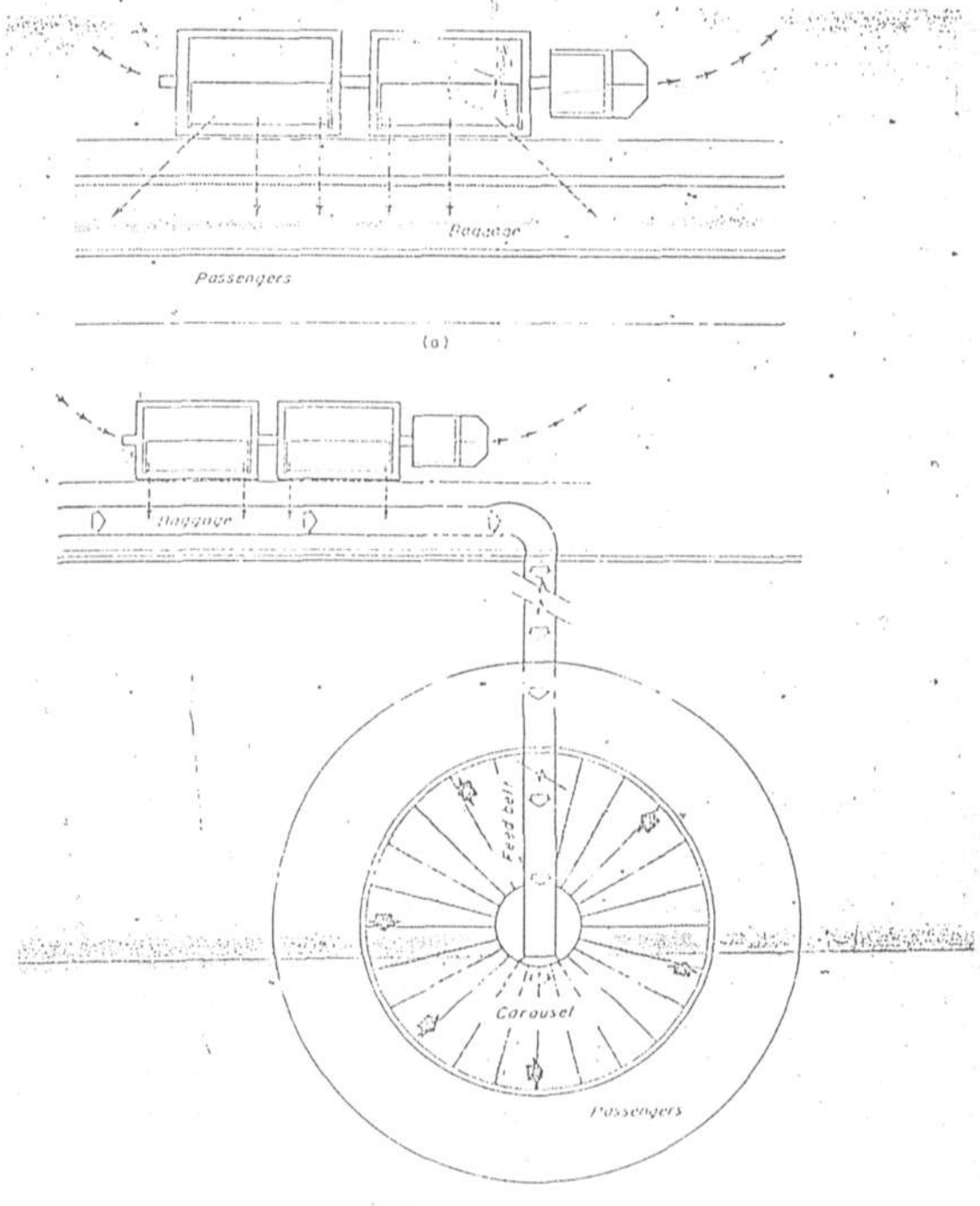
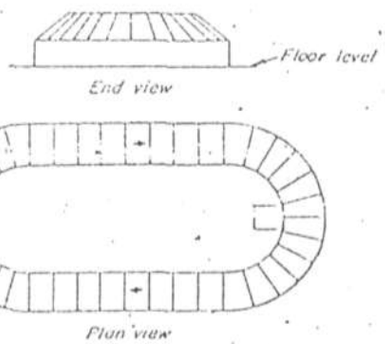


Fig 2.15 Baggage claim devices: (a) Simple shelf type. (*Ralph M. Parsons and FAA.*) (b) Rotating carousel type. (*Ralph M. Parsons and F.A.A.*)



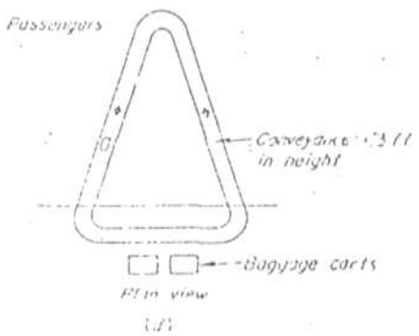


Fig 2·16 (c) Jet Claim (d) Race Track

buildings particularly those with multilevel passenger processing systems. More sophisticated equipment is needed to convey large quality of baggage from the apron level to baggage claim areas.

2.12 TERMINAL SITUATION: AN OVERVIEW

Considerations must be made in the design criteria of a terminal, this is due to the factor that may evolve from demand/capacity analysis and from kind use criteria but most especially from the apron configuration of the airport as a whole.

"The terminal area refers to that area used or intended to be used for such facilities as terminal and cargo buildings, gates hangers, shops and other service building automobile parking airport motels and restaurants; and garages and vehicles service facilities used in connection with the airport and entrance and service roads used by the public within the boundaries of the airport. This definition comes from the Airport and Airway Development Act of 1970. The system and activities mentioned above may be singular or grouped i.e into different locations around the airports or under a single roof. Usually the general location of these areas are usually presented on a land use plan.

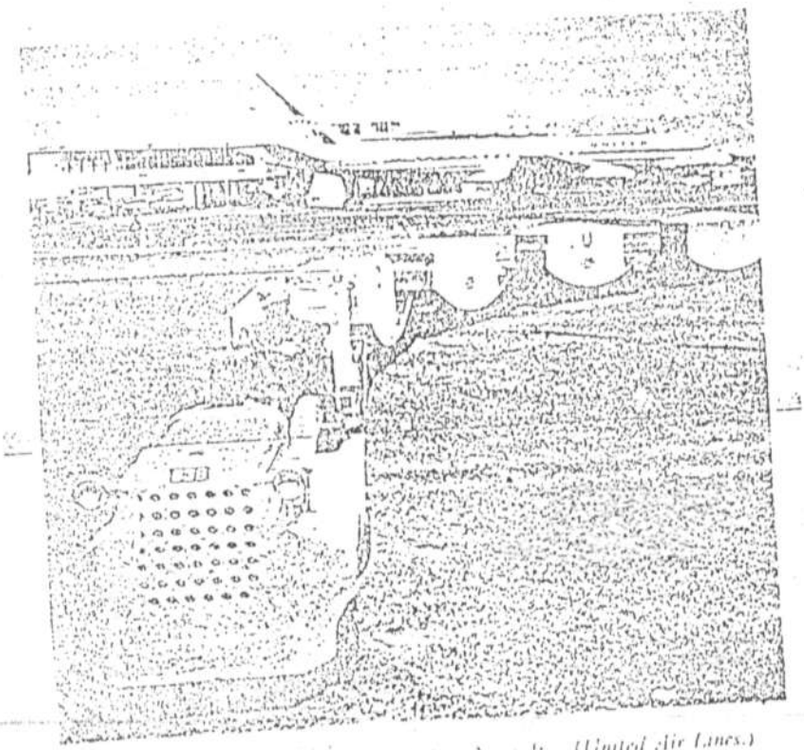


Plate 1 Baggage pods being wheeled to Aircraft. (*United Air Lines.*)

Usually airport terminals are planned around passenger movement and from these movement concepts and schematic data may be produced showing the basic flow of passengers and vehicles.

It may be said that the objective opterminal area plan is to achieve on acceptable balance between passenger convenience, operating efficiency, facility investment, and aesthetics. The physical and psychological comfort characteristics of the terminal area should afford the passenger orderly and convenient progress from his automobile through the terminal to the aircraft and back again at the end of his or her trip.

The walking distances becomes a cause of concern for the designer. The prime objective of the development should be to minimize the walking distance of developing convenient auto parking facilities, convenient movement of passenger through the terminal complex and conveyance which will permit fast and efficient handling of baggage. It is always better to consider mechanical means of moving the intending passengers and their baggage to and from the aircraft as this reduces the stress on the passenger.

Direct ticketing facilities should be provided to minimise time spent locating facilities that offer these services. Exposition should always be considered where availability of space permits and therefore flexibility and costs for future expansion of the terminal areas should also

be walked into the initial planning scheme so as to reduce in compatibility caused by expansion of such facilities.

2.13 GENERA DESIGN CONSIDERATIONS:-General Design Considerations:

2.13.1 PASSENGERS:-

1. Private and public transportation consideration during curb surface area location.
2. Minimise walking distance from parking facilities to ticket counter, ticket counter to passenger holding area passenger holding area to aircraft.
3. Passenger transportation where there is a long distances to cover.
4. Pedeststion walk ways to aircraft where applicable or as back up to mechanical transportation systems for passengers.
5. Baggage handling. Enplaning and Deplaning.
6. Efficient handling of visitors to the airport area including sight sees.

2.13.2 PASSENGER VEHICLES:-

1. Public automobile flow separation from service and commercial traffic.
2. Public transportation to and from the airport
3. Public Parking-long term (3 hours or more)
4. Public parking short term (less than 3 hours)

5. Airport employee parking
6. Airline employee parking
7. Public auto service area
8. Rental car parking and service area.

2.13.3 AIRPORT OPERATIONS:-

1. Flexibility
2. Passenger flow separation in the terminal building (departing and arriving).
3. Separation of apron vehicles from moving and parked aircraft.
4. Passenger flow separation from apron activities.
5. Concession availability and exposure to public.
6. Air field security and presentation of unauthorized access to apron and air field.
7. Air cargo and freight forwarder facilities
8. Airport maintenance shops and facilities
9. Utility plants and heating, and air conditioning systems.
10. Fire rescue facilities and equipment.

2.13.4 SAFETY IN TERMINAL:-

1. For enplaning and deplaning passengers
2. Escalators, travellators, Elevators, stairs, ramps, as to location speed and methods of egress and ingress also operation.
3. Load crossing as to protection of pedestrians.

4. Consideration for disabled people at curb and airside areas.

2.13.5 EXPANSION CAPABILITIES TO ACCOMMODATE:-

1. An increase in passenger volume during peak periods like holidays.
2. An increase in number of aircraft position
3. An increase in aircraft size.

2.13.6 ECONOMICAL VIABILITY

A concept and design that would be realistic due to the present economical situation of the country and to be able to provide a proper balance between capital investment, aesthetics, operation and maintenance costs passengers and airport revenue.

2.14 CRITERIA FOR TERMINAL SIZING

A critical review of passenger terminals in relation to passenger volume at existing airports show a wide range in size and this is related to the requirements put in place by the service designed or desired for a number of passengers. Baggage and baggage related support systems requiring terminal space in proportion to the demands for the air travel within a given region. Data has to be collected and this will inevitably change with time, how ever the methods by which various spaces and circulating areas are size and joined it

correct initially normally remains the same or valid for they are usually based on constant values the human size, method of arrival, circulation and departure also support systems which usually aid these systems and the movements they originate.

The aircraft sizes have come to play a very important role in terminal sizing due to peak hour passenger volumes where large amount of passenger may enplane and deplane at the same time, through a given time frame. This constitutes a problem if not well handled at the inception stage. Usually the peak hour passenger volume become one of the most important criteria for terminal sizing, but it is also known problem as concerns holiday periods when the surge of passengers increase and when there is usually a one directional traffic pattern, but this can be handled if well incubated into the design pattern initially.

2.15 AREA CONSIDERATIONS:-

GENERAL CONCESSION AREAS:

The comfort of the passenger is of importance therefore the terminal should also provide amenities for the travelling public. These may include any of the following list and such other items as may be determined by particular

Locations	Barber shop
Banks	Restaurants
Car Rental	News shed
Shops	Telephones racks
Duty free shops	Bureau de change
Money exchange	
Gift shops	
Shower/dressing rooms.	

The concessionaires occupy positions of prominence with regard to the main traffic flows in the terminal. Their sizing is not critical product of passenger flows as are corridors and holding rooms. Restaurants are usually directly responding to the quantity of people that would want a meal at meal times, and are not over crowded if meal times occur at peak hour demand.

Concession sizing are usually not developed as objectively as those associated with other terminal areas, concession must be provided to function effectively according to passenger flow is not impeded in addition to the amenities consideration should be given to travellers aid in large installation and nursery facilities adjacent to the main lounge in the main portion of the facility. Medical and first aid facilities should be included in the passenger terminal if they are not provided else where in the airport.

It is also of great importance to consider an internal telephone system that will operate between airline operators, the operating authority, and or police authority. The size of the terminal building and the complex needs of each user should receive consideration when planning the telephone system.

CLUBS:-

A point at the terminal that could cause the entire failure of the whole project is the curb area. If not well planned and integrated it could cause missed flights for explaining passengers and a safety hazard to pedestrians when they have to cross this road system. Investigation and analysis of methods for determining curb lengths at airport terminals demonstrate that with the use of elementary data concerning characteristic of passenger/vehicular activity at the airport, a range of curb length dimensions can be determined for preliminary planning. Normally this periodic preliminary planning data is historical, based on actual surveys made on the field. Several criteria are existing field conditions. Such as building frontage exposure, roadway geometry, graphics and signing complexities, parking lot functional relationships and capacity, and so on.

It is important to devote considerable time and effort to designing the curb side frontage and the road system to it. Present design trends and concepts have separated the

enplaning and deplaning road system, consideration of all forms of vehicular movement such as private passenger vehicular valet driven cars, rental cars, taxi and public transportation especially buses should be undertaken.

To determine the quantity of curb frontage, the following factors and assumptions must be considered.

1. All vehicles will require approximately 35 linear feet approximately 10.6 metres. This is a realistic interpretation of the indiscriminate manner in which vehicles are packed.

2. The average time required at the curb for passenger vehicles should be surveyed for passengers by type of vehicles.

3. Duration time for valet parking will exceed the standard for passenger cars in order to provide time for an attendant to queue the vehicles prior to its being parked and so as not to impose a penalty on the need for curb frontage. The total of parking/queuing time is estimated at five minutes.

4. In order to compensate for heavy congestion periods resulting from holiday, delays, etc. occurring 12 times or more per year. It is recommended that the working frontage be increased by 30 percent beyond the normal calculations.

5. The system of curb frontage must be allowed for in the total master plan and thereby its expansion from the initial operations.

6. Under no circumstance should the prime criteria circulation road be used as curb frontage. Rather a spur from the main net work of roads should be extended to the curb frontage.

7. The curb frontage should be divided into active and passive curb. The passive curb is utilized for valet queuing or other long term uses such as bus connections.

8. It is necessary to determine the average peak vehicular traffic for both enplaning and deplaning passengers. If possible a graph or summation sheet should be prepare. It is helpful if this is done by 20 minutes increments and the cumulative total peaking can be determined if there is no separation of explaining and deplaning traffic. In the event that the explaining functions are

totally separated. The summation peak will result in isolating the time frame for maximum parking demand as well as vehicle peak of appropriate road. A typical example of a chart is shown and the format to be utilized.

Working curb footage requirement schedule 35ft + Units x Time duration at curb x 35ft (No. of cars) 20mins.

Example:-

Assume 40 private cars on the enplaning road.

$$35 + \frac{40 \times 2 \times 35}{20} = 175\text{ft or curb required}$$

Note: After all vehicles types are calculated increased total by 30%

175 + 52.5 = 227.5ft.

On the average, passengers begin to arrive at a slow rate approximately 120 minutes prior to departure, and reached a peak between thirty and forty minutes prior to departure. The curve then tapes off to zero at the point where no arriving passenger could travel the distance from the curb to the gate in the remaining time. Rate curves will vary greatly among airports and also depending primarily upon the type of traveller (i.e business, pleasure, etc).

In the deplaning curb more emphasis is given to volumes of passengers. Deplaning passengers move out of the airport rapidly and over a short period. Of time and almost

simultaneously. Usually passengers not claiming baggage arrive at the curb first. They are jointed in 3-5 minutes by the passengers who have claimed the first arriving baggage. The total peak is reached in about 10 minutes after the flight arrives so far as the mechanism works. Actually the length of time for which this peak is sustained or diminished is dependent on the rapidity with which the passengers are removed from the curb.

2.15.2 THE LOBBY:-

The lobby size is also directly dependent on the passenger number expected at peak periods and this size also includes the employees, those who use the lobby generally belong to one of the following groups.

1. Passengers moving from curb to concourse either directly or passing through a ticketing process baggage check in or other pre-flight activities.

2. Visiting or accompanying passengers, interline and other waiting passengers.

3. Employees including prefers, ticket and baggage attendants.

As the rate of passengers arriving at the curb and the lobby is usually, the same process through which they have to pass before they get to concourse has to be quickened so as to reduce the number of passengers at any given time in the lobby which the active space must be able to support.

Usually, it is expected that the passengers start arriving at about (120 minutes) before the take off time and at a particular time the level of passengers in the lobby start reducing towards the inception of the flight and the rate of passengers at the concourses start increasing.

But as with the case of the general aviation terminal the flights are usually packed between a peak period from 10 am to 2pm at a flight take of interval of about 30 minutes so the lobby has to accommodate the passenger volume for an average of 12 flights.

2.15.3 THE CONCOURSE:-

Essentially this may be divided according to the traffic occurring in the deplaning and the enplaning traffic. Although these two types of traffic is quite different characterized by their various process, they tend to be governed by certain dominators which may include average walking speed, depth separation and the peak passenger volumes flows, as effected by projected aircraft schedules, which make it possible to size the concourse.

It is at best separated from one another as this reduces any security risk that would otherwise have occurred due to unification.

While the enplaning function may frequently cause congestion in the course due to queuing of passengers at the ticket line the deplaning function by its volumetric nature is perhaps the more critical to the circulation and the size of the concourse when both are unitrilly located.

2.15.4 THE OFFICE AREA:

This area is not determined by the passenger volume but the airlines need and quality of accommodation provided. The spaces are the result of the individual needs of also other organisations and government agencies whose function may also dictate the location of the airport.

2.15.5 THE PARKING AREAS

The different types of parking are short term, medium term-one a two days, long term parking, valet parking and car rental parking. Each parking area will require a system for revenue collection in an economical manner.

It is possible to establish a formula for determining the number of parking space required, but this is complex and unwieldy as it is based upon the passenger traffic. In addition each airline and the airport has a completely different transportation environment.

Every airport has a large number of employees who also require parking space. It is of importance to ensure that employees do not take the parking space designated for he public. An understanding of the shift schedule where it applies is important. Consideration should also be given to control of pedestrian safety and vandalism within the parking areas.

REFERENCES:

1. Barry W.S. (1969). The language of Aviation Chatto and Windus, London.

2. Chambers Twentieth Century Dictionary (1972) W & R Chamber Ltd Edinburgh EH 21Dg, Great Britain.

3. De - Chiaria, John Callender (Ed) 1973). Time Saver Standards for building types. MC. Graw Hill book company New York, U.S.A.

4. De Chiaria, John Callender (1973), Time Saver Standard for building types. M.C. Graw Hill book company New York, U.S.A.

CASE STUDIES

2.16 CASE STUDY ONE:-

AIRPORT TERMINAL KADUNA INTERNATIONAL AIRPORT

2.16.1 INTRODUCTION

At the turn of another decade it had become necessary that the pre 80's Kaduna Airport had to be relocated. One of the main reasons put forward then was the proximity to the ever expanding metropolis, another was the facilities on ground which was adjudged inadequate. also a bigger terminal was needed to accommodate the passenger increase which was due to an unprecedented increase in commercial activities and a population explosion which was estimated to hit the million range at the turn of the century.

The Nigerian Airport Authority had to find a location that would satisfy all the qualifies evolved, a location about 30km from the city centre was chosen on the outskirts of Kaduna town.

The Kaduna International airport was moved from its former location at the mando area to its permanent site in the month of November 1989. It was designated as an international airport due to the intention of the federal government to lose it to airlift intending pilgrims to the Hajj in Saudi Arabia

occasionally, so provision was made to accommodate wide bodied aircraft occasionally during the airlift.

2.16.2 OPERATION:

The airport operates like all other airports in Nigeria under a strict 12 hour schedule from 7.am to 7. pm.
Usually due to operational status aircraft land in groups of twos (2) and threes (3) inside an hour frame approximately every four (4) hours but occasionally flights have known to land and take off during the period mentioned as inactive.

Baggage handling activities are centralised as the airport operates a direct baggage system of collection and loading.

Enplaning and Deplaning passengers board and deboard the aircraft by the use of stairs which mean that they have to get on the tarmac before boarding the plane parked on the apron.

2.16.3 DESIGN FEATURES:

The airport terminal is of the traditional linear concept featuring a single floor building with both arrival and departure on the same level. The terminal is designed on 12 bays each 5x20 meters. Boasting of two halls one for the arrival and one for departure where each hall has toilets for both male and female convenience. Gift stalls line up the window walls of the departure halls which is more than twice the size of the arrival hall. Terminal operations offices are

positioned centrally to enhance its effectiveness. an extra lounge is provided for use by government personnel and V.S.Ps.

On the air side, two fingers lead the passenger towards the tarmac and they act as arrival and departure concourses for organised enplaning and deplaning.

On the land side there are three main parking areas one for long term parking and the others for car hire service and short-term parking. Restaurants are littered around the landscape as there was no provision made for such inside the terminal confines. A totally different building houses the administrative offices set apart from the terminal area with its own access.

2.16.4 MERITS:

1. Departure hall conductive
2. Toilets are adequate
3. Easy check in facility for passengers comfort
4. Direct passengers movement
5. Adequate parking facility.

2.16.5 DEMERITS:

1. Arrival hall is too small causing congestion and no provision for waiting area inside.

2. No planning for catering activities at the initial stage of planning.

3. Offices too small for human comfort and inadequate.

4. Administrative block too far away from terminal area.

2.17 CASE STUDY TWO:

CONVERSION OF AIRPORT TERMINAL, HEATHROW MIDDLE SEX

2.17.1 Architects: Pascal & Wetsan Britain

Clients: British Airport Authority

Interior Design: Murdoch & Associates

Initial Design: 1955

Construction Period: June 75 - March 80.

2.17.2 INTRODUCTION:

Terminal 2 building at Heath row airport was designed by Sir Fredrick Gibbered and Partners and Completed in 1955. It followed what was at the time the common practice of mixing departing and arriving passengers in one large concourse. By the early 70's it had became apparent that the terminal would have to be either rebuilt or greatly altered if it was going to handle the enormous growth in passengers traffic.

Since rebuilding could only be achieved at the cost of losing passengers to other rival European Airports, it was decided to carry out a phase conversion of the existing building while maintaining the capacity of the terminal at 1200 passengers per hour throughout the operation. This was functionally less than the maximum rate of 1300, which was to be increased to 1700 passengers per hour to meet the anticipated 1983 figure of 9 million passengers per year. The

brief also required the designers to improve passenger and baggage facilities to meet modern operational practice including the introduction of wide bodied aircraft and to provide a new identity for the terminal.

2.17.3 DESIGN FEATURE:

The old terminal was organised about a central axis, with a ground stair case coming up in the middle of the first floor concourse. On the same axis another stair case which is preserved led to the second floor buffet and restaurant. At concourse level passengers were channelled as they were departing or arriving. On the ground floor the check - in hall was too rigidly compartmented. Allowing no flexibility and impeding the flow of departing passengers. On the airside there were the usual departure lounge baggage reclaim hall and immigration and customs control.

This basic dispositions of key areas and pattern of flow have been kept in the alteration. But the spaces have been opened up or freed of what had become obstacles. the check-in hall, for example has been enlarge by moving the external wall some 10ft. It is now an undivided space in which the number of desks of one airline can expand or shrink at will. The several escalators which cut into the central space of the concourse have been removed to provide a continuous floor area. Instead staircases, lifts and escalators now snuggle discreetly along the unchanged window wall. While the shops

and counters which used to stand here, have been move to the inner wall.

2.17.4 EXTERNAL FEATURE:

Externally the finished nature of the original design has been respected and the two ramps linking the underground station check-in concourse and bridge to the public car park have been conceived as clip on accessories in light steel frame structure, clad in white G.R.P.

The other new element, the office block stands as a separate entity lovely attached to the existing building, but in no way impinging on its integrity. G.R.P. is also the material which redominates the conversion work to the existing building. It is used among other things for the check in and airline enquiry desks, for the cladding to the shops and counters and for ceiling penels in the concourse, for the survey counters in the second floor coffee bar and restaurant and in the baggage reclaim hall practically every surface is clad in plastic coated corrugated sheet. Steel which looks like G.R.P to the uninitiated. The positive use of colour is very effective and would have been even more so if the lack of money had not prevented the principle to be extended to certain floor surface.

2.17.5 MERITS:

1. Use of colour very positive
2. Provision of a disparate and complex group of spaces, with an unusual degree of cohesion.
3. Car parking facilities increased
4. Directional passenger flow impressive.

2.17.6 DEMERITS:

1. The character of the detailing appears somewhat aggressive in some places.
2. maintaining some area for arriving and departing passengers.
3. Non directional link to office area.

2.18 CASE STUDY THREE:

AIRPORT TERMINAL STANSTED GREAT BRITAIN:

2.18.1	Architects:	Foster Association London Sir Norman Foster & Spencer.
	Client:	British Airports Authority
	Light Planning:	Claude and Danielle Engle
	Engineer:	Ove Arup & partner London
	Profect Team:	Micheal Jellitte, Micheal Jones, Joachim Kappeler, Mouzian Majidi, Sven Oilman, Victoria Pike, Giles Robinson, Meredith Robinson, Brain Timmoney, Kenwai, and Cindy Walters.

2.18.2 INTRODUCTION:

To relieve the two airports in London, Heath row and Gatwick, A third Airport was built on the grounds of the former military base at stansted London. the new terminal war to be cheaper than other B.A.A. Terminals, more comfortable for the passengers and flexible for further developments. Also the building was not to disturb the hilly landscape of Essex. Sir Morman Foster, on architect and private pilot went by his imagination of a new terminal from flying, as the passenger goes on foot over the roll riel to the airplane. He wanted to avoid the long ways over the halls, endless passengers and staircases and that the first sight of the airplane was at the very end of it and he was able to fulfill all these.

Stansted airport lies about 52km North of central London and has a good connection to the road network. From the railway station liverpool street in central london, The new airport can be reached by stansted express from British rail is about 40 minutes.

The stansted airport is furnished for 8 million passengers and allowance for an expansion to accommodate 11 million passengers was also provided for by the designers. Although located at the out skirts of London its integration into the transportation system makes a good case for effective communication advice. This terminal has the capacity of being

moved into the position that would pioneer the effective handling of the aviation boom expected at the turn of the century.

2.18.3 DESIGN FEATURE:

Initial construction on this terminal started in 1986 with the construction of the connecting road this gave way to the building proper. After a construction period of 5 years the terminal was opened in March 1991.

The complex uses a frame work which is made from tubular steel complex structures that spain 36 meters. it is around these structures that the main hall lies. On the land side the drive in advances upwards to the level of the hall, while the short term parking and the bus stop lies south on a lower level, through which the entry under the drive leads. The star stead Express station is constructed in the underground floor under the drive. The passengers comfort was considered when ramps and lift's are used to convey them to the arrival and departure lounge which shares the same floor. all the terminal services including air conditioning and plant rooms are located on the underground hall also baggage handling is located on the same floor. No support systems are located on the roof due to the construction mode and materials. The supports and the roof were first constructed and it runs through to the underground floors. The roof construction covers an area of 198 and 198 square metres, and

are made up of elements of 18 and 18 metres.

The main design feature is the combination of natural and reflected artificial light. Glass both clear and opaque was used to create this. Due to this singular action the plants were floor mounted which actually give easy access to them for servicing. Air supply is through channels created inside the structural frame work and has its inlet and out let at the top of the system distributing such evenly over the heads of the crowd expected at the airport terminal.

2.18.4 MERITS:

1. Large span create unobstructed space for passenger circulation.
2. Baggage handling facilities conducive.
3. The use of artificial and natural lighting.

2.18.5 DEMERITS:

1. Locations of toilets make it not possible for general use where accessibility in concerned.

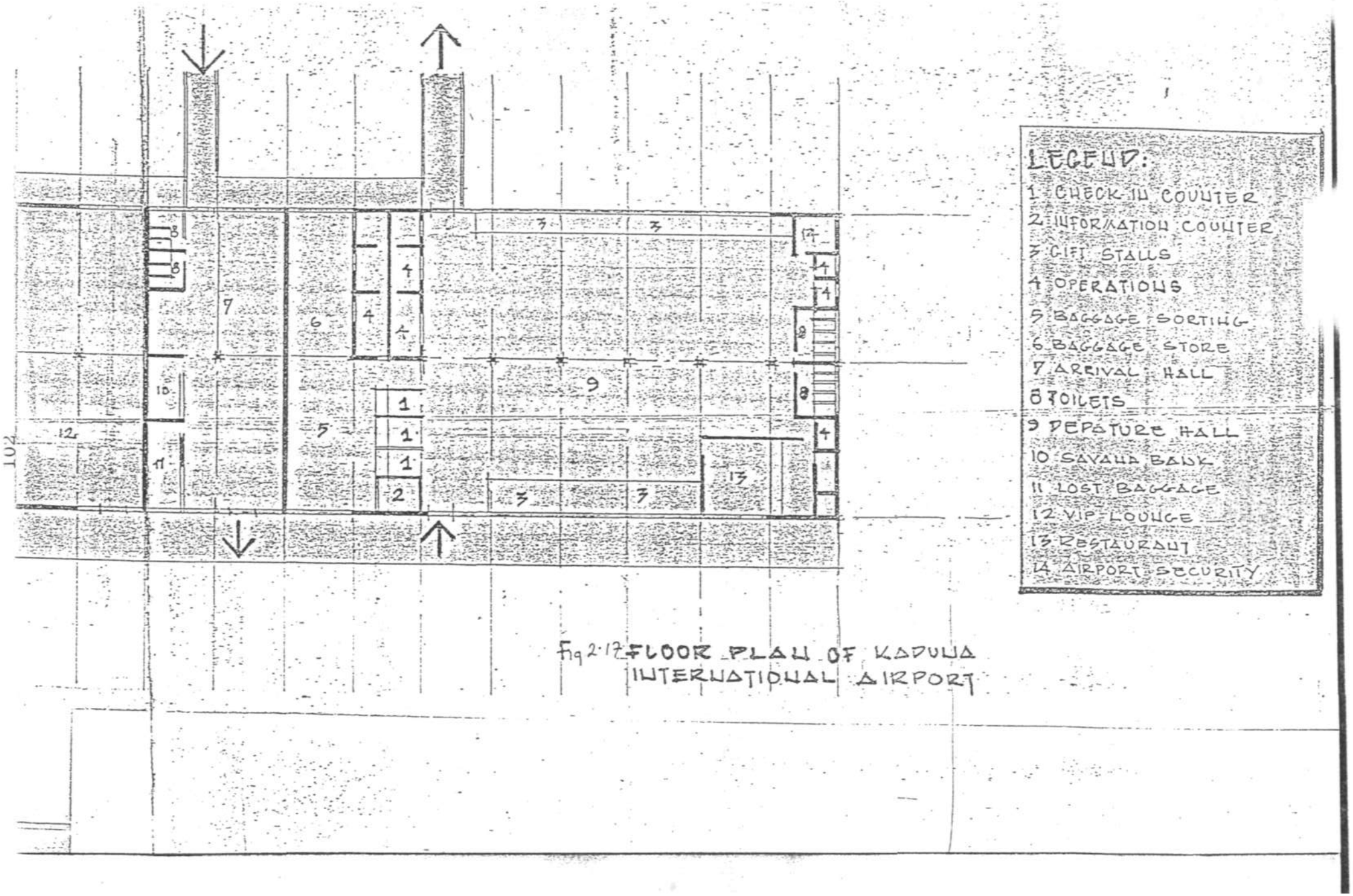


Fig 2.12 FLOOR PLAN OF KADUNA INTERNATIONAL AIRPORT

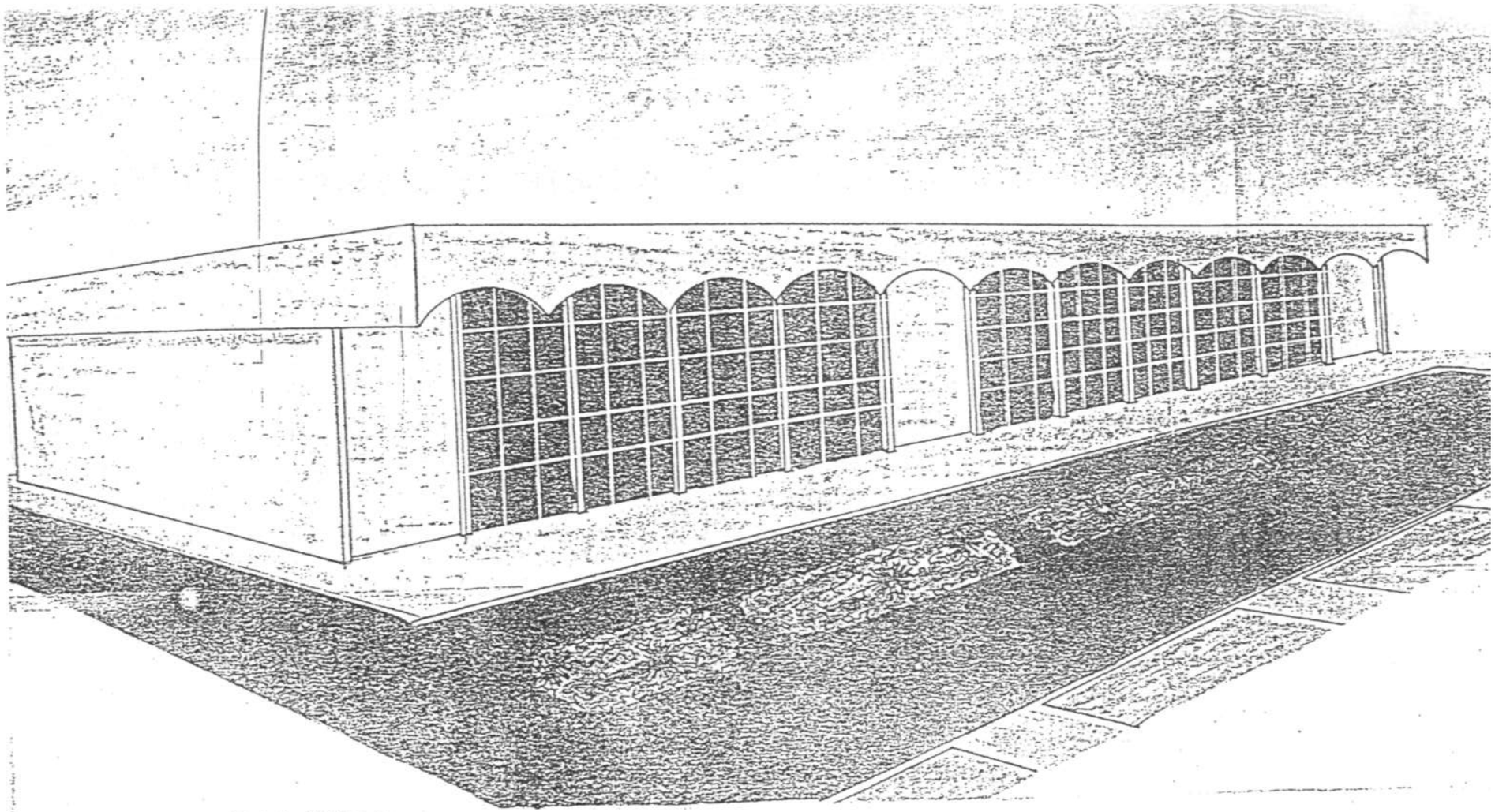
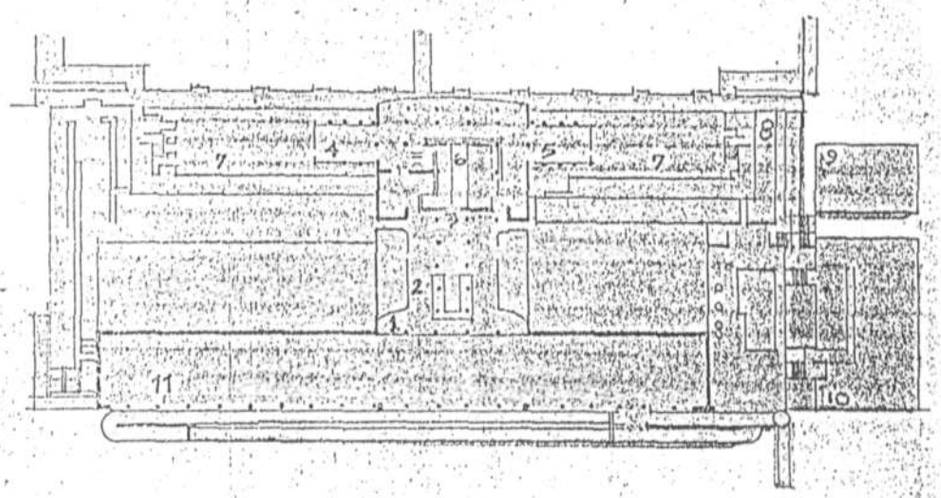


Fig 2.18 KADUNA INTERNATIONAL AIRPORT

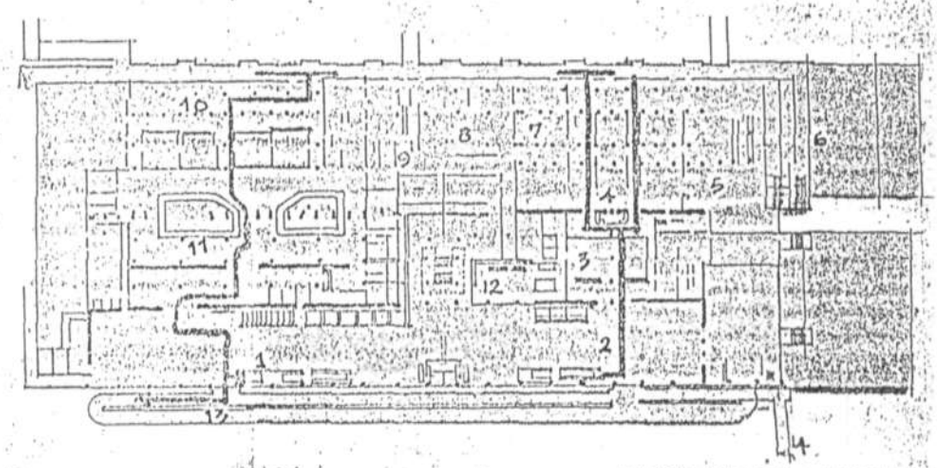
PLANS : HEATHROW AIRPORT MIDDLESEX.

1. LANDSIDE BUFFET
2. TELEPHONES
3. BAR
4. AEROGRILL
5. COFFEE SHOP
6. KITCHEN
7. ROOF TERRACE
8. BOOKING OFFICES
9. PLANT ROOM
10. NEW OFFICE BLOCK
11. VOID OVER 1ST FLOOR



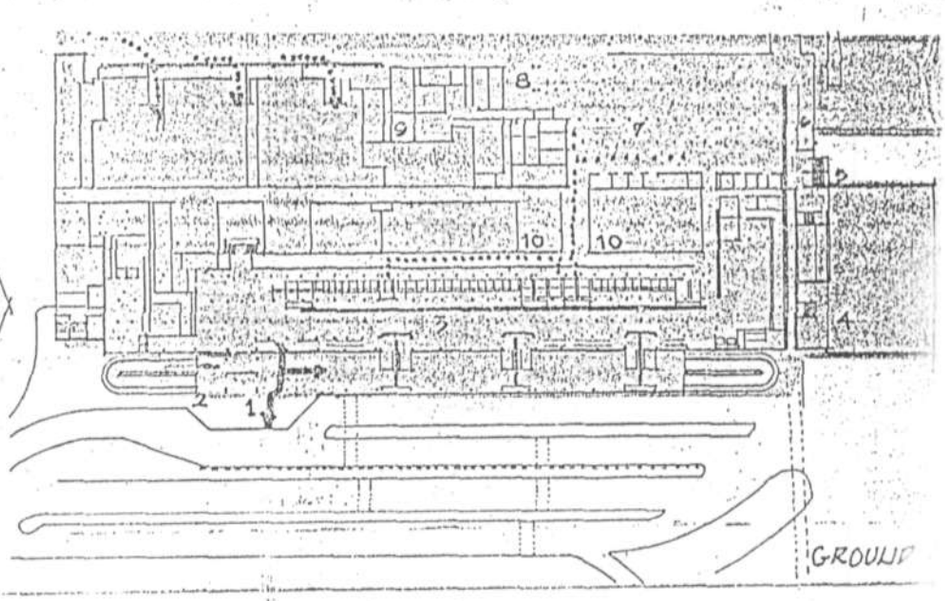
SECOND FLOOR PLAN

1. ARRIVAL CONCOURSE
2. DEPATURE CONCOURSE
3. DEPATURE IMMIGRATION
4. DEPATURE LOUNGE
5. DUTY FREE SHOPS
6. DEPATURE COACH STATION
7. BAR
8. BUFFET
9. KITCHEN
10. ARRIVAL IMMIGRATION
11. BAGGAGE RECLAIM
12. LAND SIDE SHOPS
13. RAMP
14. CAR PARK BRIDGE



FIRST FLOOR PLAN

1. TO UNDER GROUND
2. RAMP
3. MAIN CHECK IN HALL
4. NEW OFFICE BLOCK
5. AIR SIDE COACH STATION
6. DUTY FREE SHOP
7. BAGGAGE SORTING
8. TRANSFER BAGGAGE
9. CATERING ACCOMMODATN.
10. NEW PLANT ROOM



GROUND

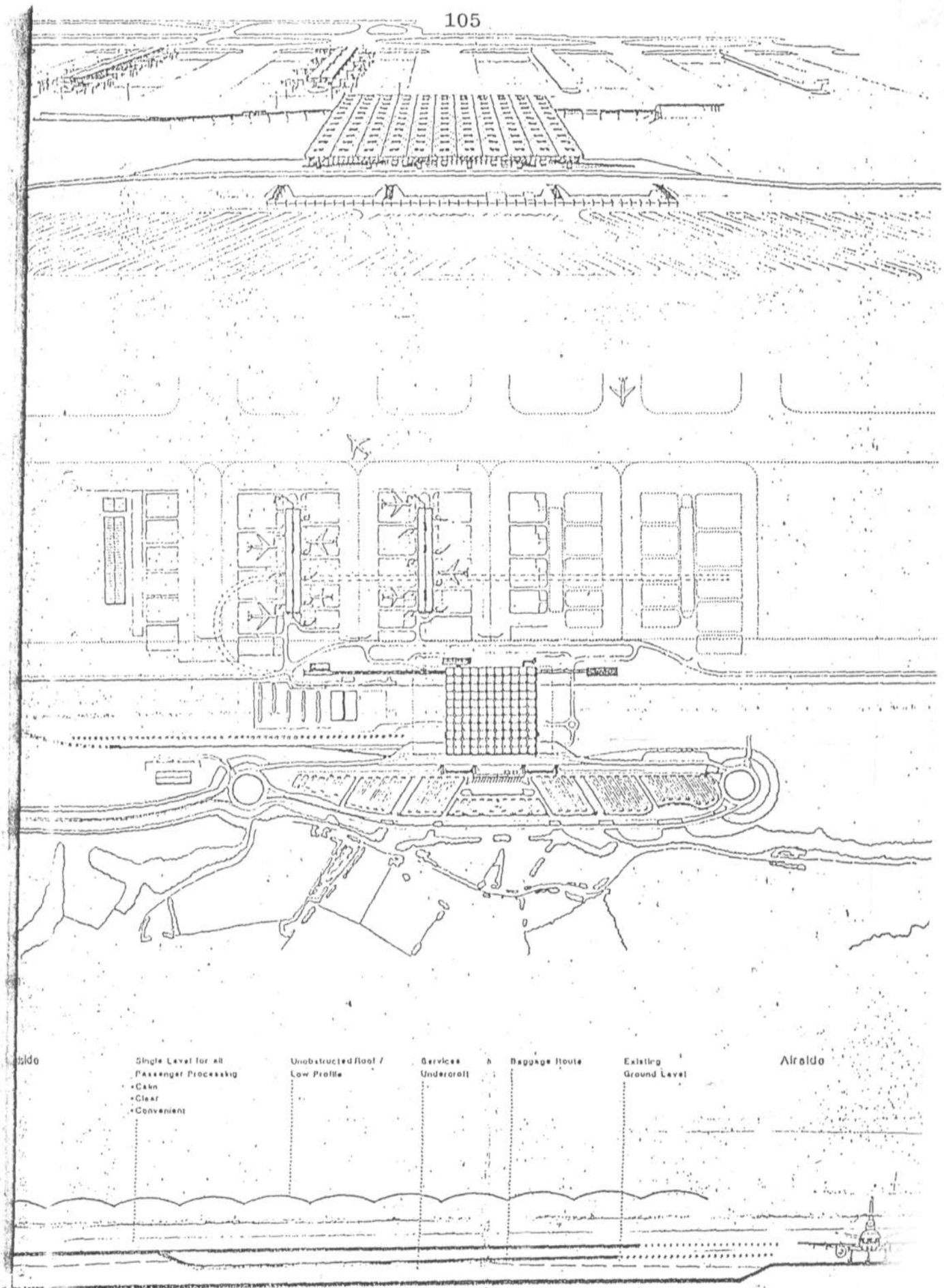


Fig 2-20 AIRPORT TERMINAL STANSTED GREAT BRITAIN

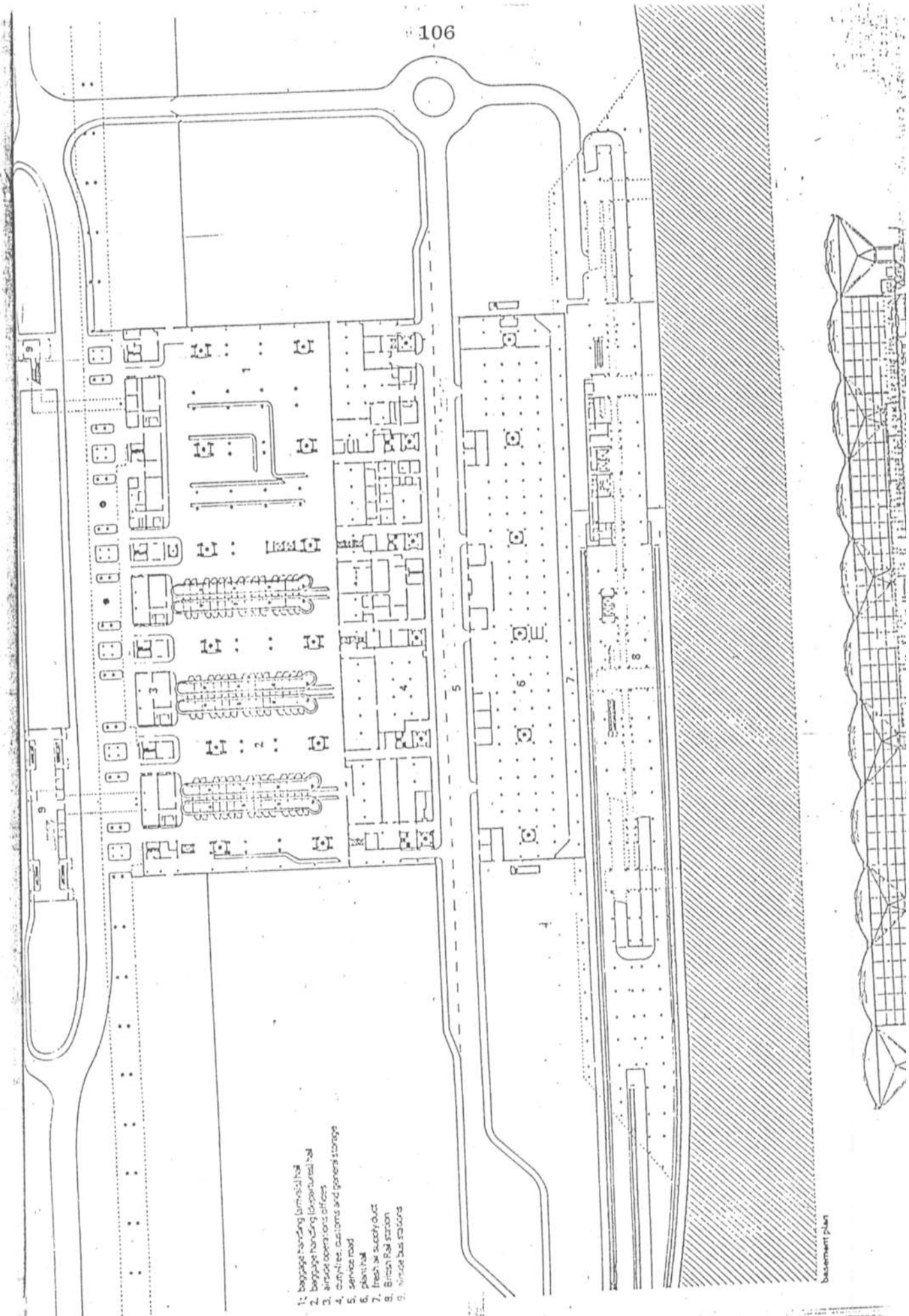
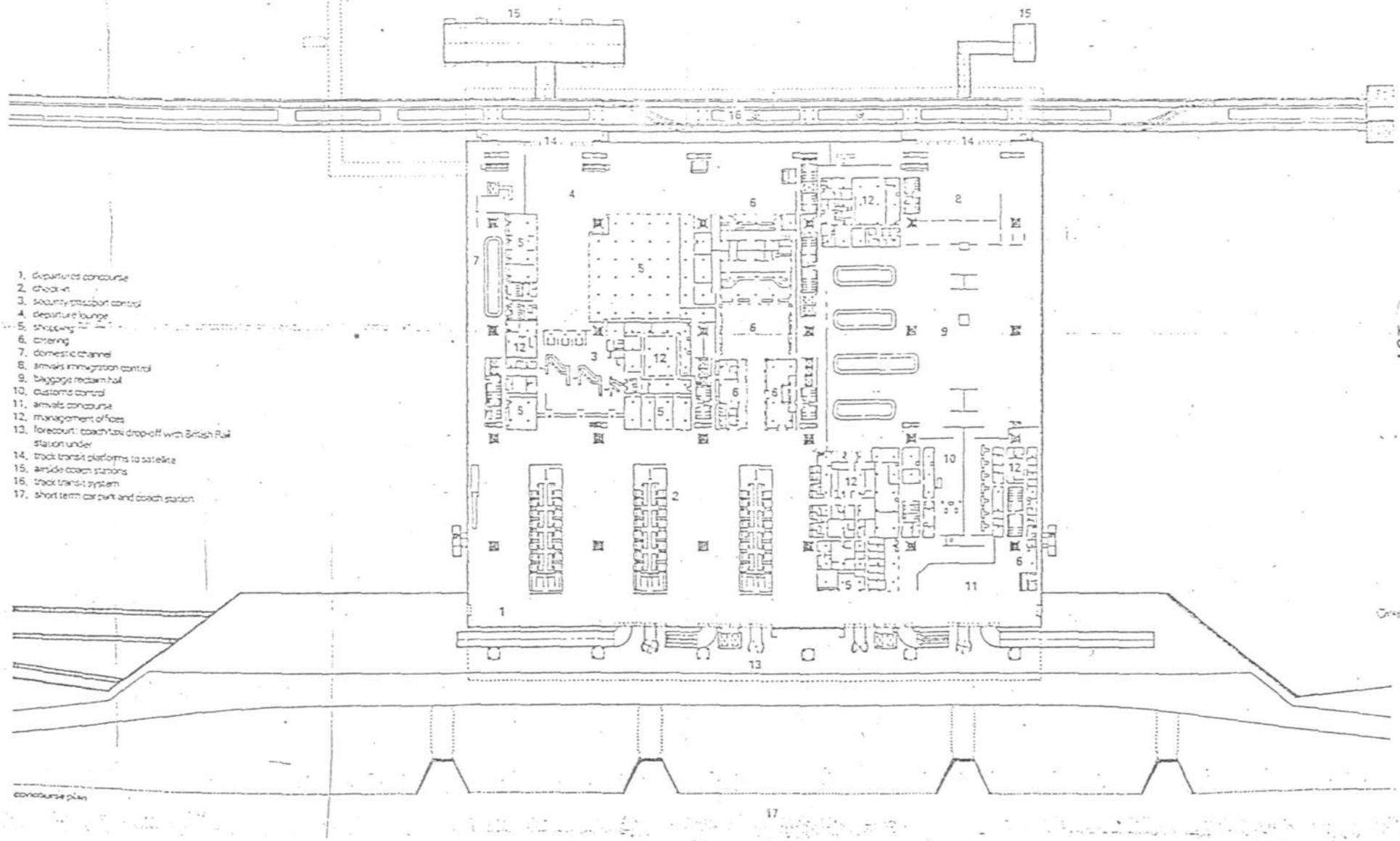


Fig 2.21 AIRPORT TERMINAL STANSTED
GREAT BRITAIN


1. departures concourse
2. check-in
3. security/passport control
4. departure lounge
5. shopping
6. catering
7. domestic channel
8. arrivals immigration control
9. baggage reclaim hall
10. customs control
11. arrivals concourse
12. management offices
13. forecourt: coach/taxi drop-off with British Rail station under
14. track transit platforms to satellite
15. airside coach stations
16. track transit system
17. short term car park and coach station
concourse plan

CASE STUDY FOUR:

2.19 DULLES INTERNATIONAL AIRPORT

Architect:	Eero Sagrineu and Associates, hamden, connecticut, U.S.A.
Sponsor:	Metropolitan Washington Airport Authority.
Situation:	7km North - West of Charity Virgina, Washington, D.C. U.S.A.
Built:	1958 - 1962
Reference Location:	Longitude 38^0 56' 39" W Latitude 77^0 27' 44" N
Elevation:	95m above sea level
Terminals:	Two level passenger terminal, separate general aviation terminal and three (3) Cargo buildings.
Airline Operators:	14 scheduled carriers and 2 commuter airlines.

Traffic Volume:	1980	1985	1986
		2,528,407	
	2,157,463		2,841,495

2.19.1 HISTORICAL BACKGROUND:

The need for a second airport to serve Washington D.C. became apparent shortly after the close of the world war II. The second Washington Airport Act of September 7, 1950 as amended by a congressional Act of July 11, 1958, approved for the construction protection, operation and maintenance of a public, airport in or within the vicinity of the district of Columbia.

2.19.2 ARCHITECTURE:

A compact two level structure 180m long and 60m wide without fingers. It can be readily expanded to 360m in length by adding 90m extension to either end.

The public parking lot is slightly lower than the ground floor of the terminal. this permits a passenger flow that effectively separates Enplaning and deplaning passengers.

A centrally located south concourse contains a passenger lounge area, a restaurant and an observation deck on the main floor. The lower floor contains offices.

2.19.3 FUNCTIONALITY:

Enplaning passengers enter through one of the eight (8) entrances located directly in front of the airline ticket counters and walk less than 70m to the mobile lounge. Enplaning passengers leaving cars in the public parking lot

(lower level) ascent to the ground via a short ramp and an escalator to the main floor level.

Deplaning passengers descend through one of the two escalators directly in front of the mobile lounge doors and kind in the centre of baggage claim area. A short ramp links the baggage claim area to the public parking lot.

2.19.4 STRUCTURE:

The roof is supported by a row of columns 12m apart, 20m high on the approach side, and 12m on the air field side. It is made of light suspension bridge cable between concrete panels of the roof deck fit. The concrete pillars are sloped outward to counteract the pull of cables.

2.19.5 CONCEPT:

In order to minimise tremendous distances covered to, aircraft and to satisfy the increasing need for flexible interiors space a transporter departure lounge was invented. the transporter departure lounge on wheels and stilts in a part of the terminal which detaches itself from the building and travels out where the aircraft is conveniently parked or serviced.

1.19.6 MERITS:

1. Commendable departure lounge that satisfies passengers convenience requirements.

2. Effective separation of Enplaning and Deplaning passengers traffics.
3. Lateral expansion possibility
4. Flexible interior space
5. Decentralised entrance system
6. Symbolic architectural expression.

2.19.7 DEMERITS:

1. Restrictive expansion possibility, expansion is only possible laterally.
2. Uneconomic departure lounge system, operational cost is high but could be economic cally reasonable where there are highly schedule peak traffic flows.

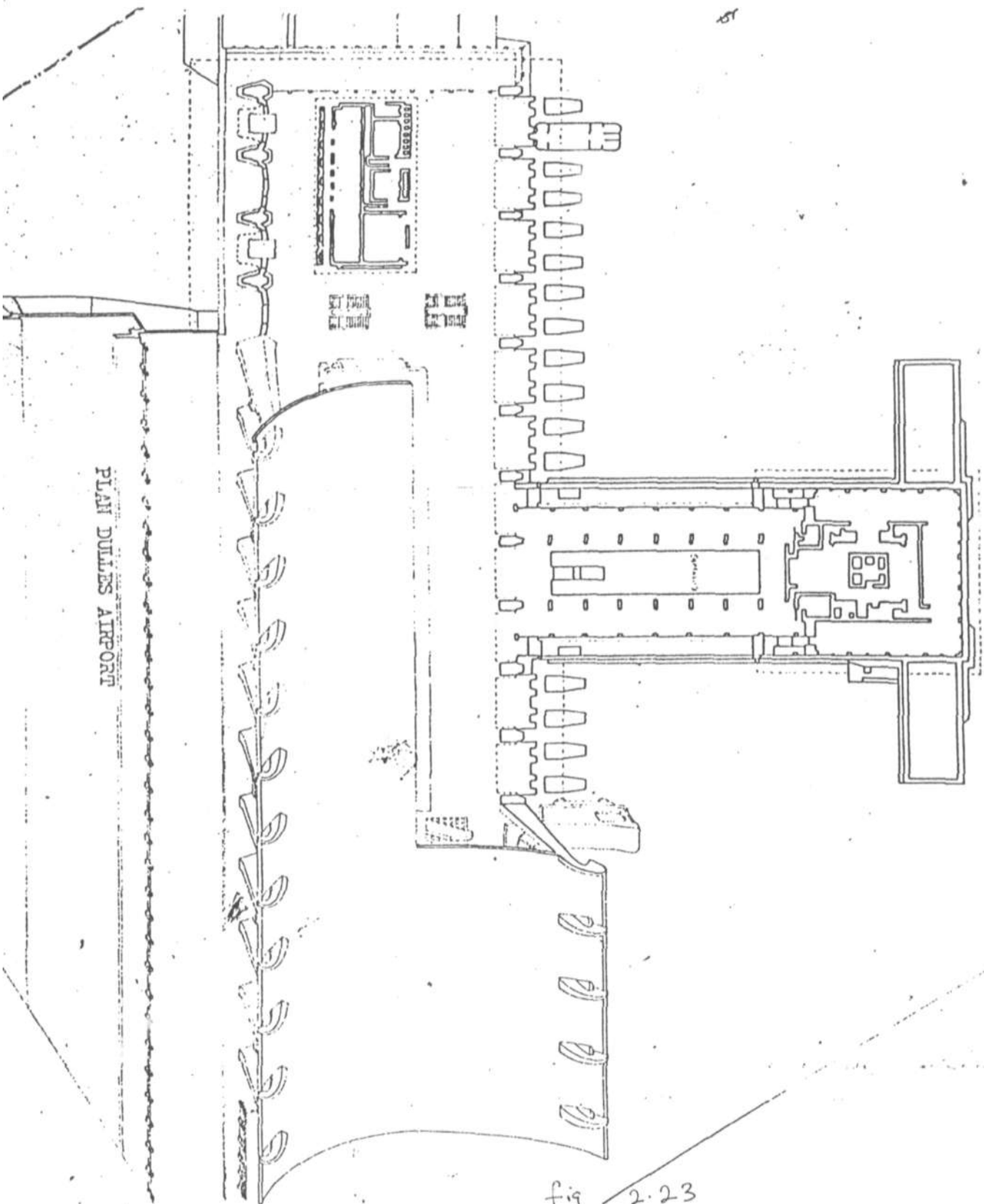
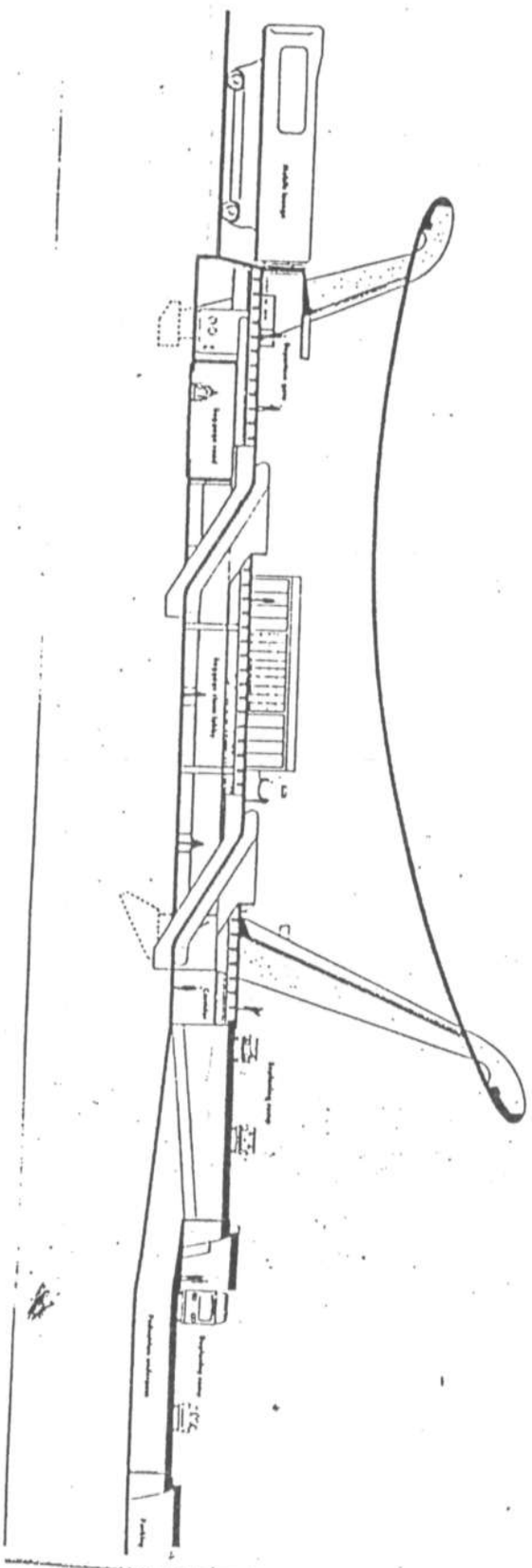


fig 2.23



SECTION DULLES AIRPORT

fig 2·24

CASE STUDY FIVE

2.20 JOS AIRPORT

Architect: Adenrele, Omisore, Adebanjo Associates
9 Nnamdi Azikiwe Street, Lagos.

Sponsor: Federal Airport Authority of Nigeria, (F.A.A.N).

Situation: 3/KM off Jos Metropolis

Airliner Operators: Nigeria Airways, Harka air.

Runway Dimension: 45m x 3000m

Elevation: 350m above sea level.

Location: Longitude 13^0 01' East
Latitude 05^0 15" North

2.20.1 FUNCTIONALITY:

2.20.1.1 User Group One Passengers

An Enplaning passenger drops along the curb, and enter the ticketing hall to check in his/baggage. He/she remains in this hall until he is issued a boarding pass. He/she proceeds to the departure lounge which leads to the apron through a 24m long finger structure.

The Deplaning passenger enters the terminal building through a similar 24m long 'arrival' finger structure into baggage claim area.

2.20.1.2 MERITS:

1. Effective separation of Enplaning and Deplaning passengers traffics.
2. Openness of connector elements
3. Space manipulation of centrally positioned functions such as V.I.P lounge and restaurant.

2.20.1.3 DEMERITS:

1. Ticketing hall not adequate for peak hour capacity.

2. Inadequate seating facility to cope with possible congestion of departure lounge which may arise from the inability of operating airlines to meet their schedules.

2.20.2 USER GROUPS TWO-OPERATING AIRLINES

Nigeria Airways sell ticket and checks - in passengers in the ticketing hall. Its office accommodation lies behind the ticketing counters. The station managers and the general officer along with air-crew rest room lie on one side while the duty officer and record personnel overlook ticketing and checking-in procedures from their offices on the other sides.

Harka Airlines sells ticket and checks-in passengers in the same ticketing hall but has it's administrative facilities along the corridor that leads to departure lounge.

2.20.2.1 MERITS:

The Nigeria Airways space by virtue of their location encourages operational efficiency, for instance, the station manager overlooks the aircraft parked on the apron.

2.20.2.2 DEMERITS:

Tenant spaces meant for Harka Airlines hinder operational efficiency. Lack of first aid facility.

2.20.3 STRUCTURE:

A system of columns and beams of varying dimensions. the internal columns accommodates drain pipes running down their heights. The walls are of masonry construction. The roofing system comprises of reinforced concretes (damp proofed) decks

finished with creed. The foundation is of deep strip type with a system of underground beams running below load bearing vertical elements. The staircase is a dogleg type having risers of 17'5cm and treads of 25m finished with marble slabs of 27.5cm.

2.20.4 FINISHERS:

The facade is a stone - faced and other sides are smooth plastered and painted. Soffits are finished with acoustic tiles suspended on the metal bearers. Floors are finished with regard to their functions. Polyvinyl chloride (P.V.C) tiles in Offices, quarry tiles along corridors and passages, non-slip cement finish in the cargo hall, precast concrete slabs on concrete bed for both explaining and deplaning curb on plat forms.

2.20.5 MERITS:

1. Functional selection of finishes
2. Expressional effect of stone - facing along the main facade, it localizes the entire architectural piece.
3. Openings are wide enough to allow adequate daylight illumination.

2.20.6 DEMERITS:

1. Ineffective shading device for offices.
2. Drain running through columns constitute a menace to the structure.
3. Structural systems reduces security in the terminal area.
4. Mass of structural system seen monstrous when compared to the human scale.

CHAPTER THREE

PHYSICAL SURVEY

SITE STUDY

3.1 SITE STUDY - LOCATION: LAGOS STATE:-

This is the gate way to Nigeria and it has been described also as Nigeria gate way to the world. The state retains its identity in a 30 state structure that forms the federal republic of Nigeria, before moving know to Abuja.

With a population of approximately 5.5 million and a total area of 3,577 sq km. Lagos State is one of the smallest state in the federation, its relative position in the national economy has outstanding significance. Besides being he gateway to the federation, the state is also the financial, and economic nerve centre of the entire country.

The state has a coast line of about 180 kilometres of the atlantic Ocean along its southern border, besides the extensive Lagoon system which opens into the sea at the Lagos Habour. the Lagos metropolis accounts for about 90% of the total population. However metropolitan, Lagos is only about 37% of the total land mass from the shores of the ocean to the borders of the state with the surrounding states. This percentages land mass covers just about 15 kilometers radius.

The metropolitan area of Lagos being relatively small coupled with high population growth rates has brought about high population density. Average population density being 15 times that of the entire Nigeria. This also represents a relatively great pressure on the existing land and land use allocation. the present population density of Lagos is at about 251 person per square kilometer. government and Private effort result in sand filling of swampy and water filled areas in a desperate attempt to create land area for use. The state has now expanded northwards towards the capital Ikeja.

Ikeja is located in the northern part of the Lagos metropolis with an area of about 320 square kilometer. small scale industries have always been the pride of this area.

Ikeja always had a position in the aviation map of the world boating of the first major airport in Nigeria as it is the capital city of Lagos state. Its functions are dualized interms of the directs activities inherent. These may be said to be governmental as it is the seat of government in Lagos State with its head quarters at Akusa, and economical mainly in terms of consumer related activities culminating in our own Allen avenue.

Ikeja has a relatively high urban planning system which creates areas mapped out for certain kind use. It should be worthily to note that the area mapped out for the aviation land use had been in existence to the early fifties. Governmental edicts and by laws protect and check development

around this area.

Lagos State as a whole has the problem of traffic congestion this is brought about by the time indicated one directional traffic flow which is due to the location of the city centres.

The area mapped for this development is clearly indicated as an aviation area and has been use earlier than 1952 when the first air strip was constructed. Traffic around this area at peak periods is very hectic and resulting in congestions.

3.2 DATA ANALYSIS:

MACRO-CLIMATIC ANALYSIS OF LAGOS STATE:

PHYSICAL CLIMATE: Lagos State lies within the humid climatic regions of the world. The vast expanse of water adds to giving Lagos State its characteristic humid climate, with pockets of lagoon and beach fronts the terrain may be regarded as generally flat with a tendency to slope towards the ocean.



Fig 3.2 MAP OF NIGERIA.

NATIONAL DOMESTIC AIRPORT.

INTERNATIONAL AIRPORT.



Fig 3.2 MAP OF LAGOS STATE.

RAINFALL: The total rainfall for Lagos State averages about 130cm. the maximum rainfall usually occurring in June with the minimum in December and usually there is rain all round the year with breaks upwards of 5 weeks recorded. This is also can be directly related to the presence of water bodies around the Lagos area.

TEMPERATURE: The average daily minimum temperature is about 27^0C while the average maximum temperature is at about 30^0C. The coldest month usually August with temperature of about 27^0C and the hottest month is March with the temperature of about 30^0C, but it should be noted that temperatures of 24^0C and 33^0C has also been achieved from the records.

HUMIDITY: The relative humidity averages about 37^0C which reduces to an amount of 73% average in the afternoons. The presence of large water bodies mainly the lagoon Badagry creek and the Atlantic Ocean have a great effect on the humidity of the state.

PREVAILING WINDS: These are primarily the northeast trade winds and the south-west monsoon winds.

The north east trade winds are usually accompanied by dust particles due to its path way which includes the sahara desert. The wind generally lowers humidity and brings about

cooler nights. These winds come from about November to February. It should be noted that the effect of these trade winds are not very well felt in the Lagos area due to the vegetation.

The south west monsoon winds brings with it heavy rains which could lead to soil erosion. The rains that came about due to these prevailing winds reduce between the month of November to about March.

SEASONS:

The long wet season:	middle of March - July heavy rains.
Short dry season:	July/August last for 5 weeks.
The long dry season:	From November to March and refereed to as the hammattan period.

3.3 THE SITE:

The site is located inside the area earmarked for aviation purpose. On the North eastern portion of this area. the kind area covered by this site is 38400 sqm. At present the site houses buildings of the federal Airport Authority of Nigeria (FAAN) who is the sole caretaker of the land that falls into this.

As at the time of this study a road network runs around the site although same is now partly blocked by temporary structures most of which are illegal.

A road network runs on the southern and eastern boundary of the site which is utilized as the major access and exit to the site. the road that runs at the northern part of the site is utilized as the service road to the terminal area and is heavily managed by security personnel to avoid unauthorized movement into and out of the area but this is not successful due to the present lack of security in the terminal area.

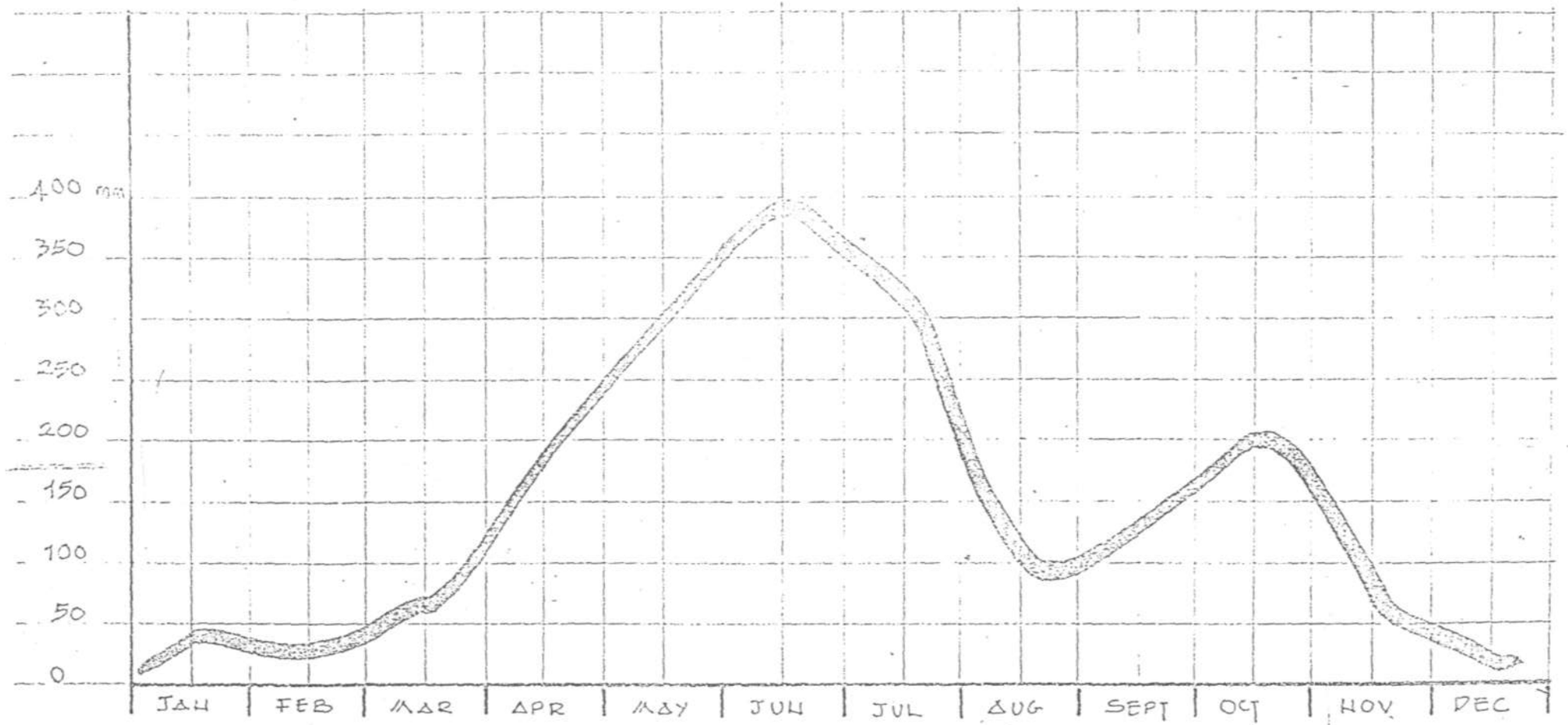
About 15 buildings exists on the site these are divided into two main groups permanent buildings and temporary buildings 9 out of the 15 are permanent buildings while the remaining 6 are temporary buildings.

Those classified as permanent structures are those made out of concrete structures while those constructed out of temporary materials included corrugated iron roofing sheets, plywood and timber chip boards cladding. Other structures on the site include metal containers that have been turned into office buildings and restaurants/snacks shops alike. the topography of the site is partly natural and partly man made as some gutters exist. On the site but must are not utilized as they have been filled up with sand which came about from non maintenance. About 80% of the site is tarred while the remaining part of the site that is not tarred is conversed by laterite and this occurs towards the north western part of the site where also a band of trees occur with a little grass ground covers.

LAGOS - CLIMATIC SITUATION

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Average monthly rainfall	41.7	26.8	62.5	180.8	298.1	390.5	315.8	105.2	136.7	194.5	75.8	13.4
Mean relative humidity at 0900hrs	87	84	83	80	86	86	84	84	84	83	82	82
" at 1500 hrs.	72	73	73	75	76	82	81	80	79	78	75	69
Daily max. temperature	30.9	31.5	31.6	31.3	30.3	28.1	27.5	27.7	28.4	29.5	30.5	30.9
Daily minimum temperature	25.1	26.0	26.0	25.8	25.0	23.7	23.5	23.5	23.7	24.2	24.6	23.9
Mean duration of sun shine hours	6.1	5.3	5.6	6.0	5.0	7.5	2.3	2.4	3.2	4.3	3.3	3.2
Evaporation	3.0	3.5	4.2	4.1	3.6	2.8	2.9	3.8	3.0	2.9	3.4	3.4

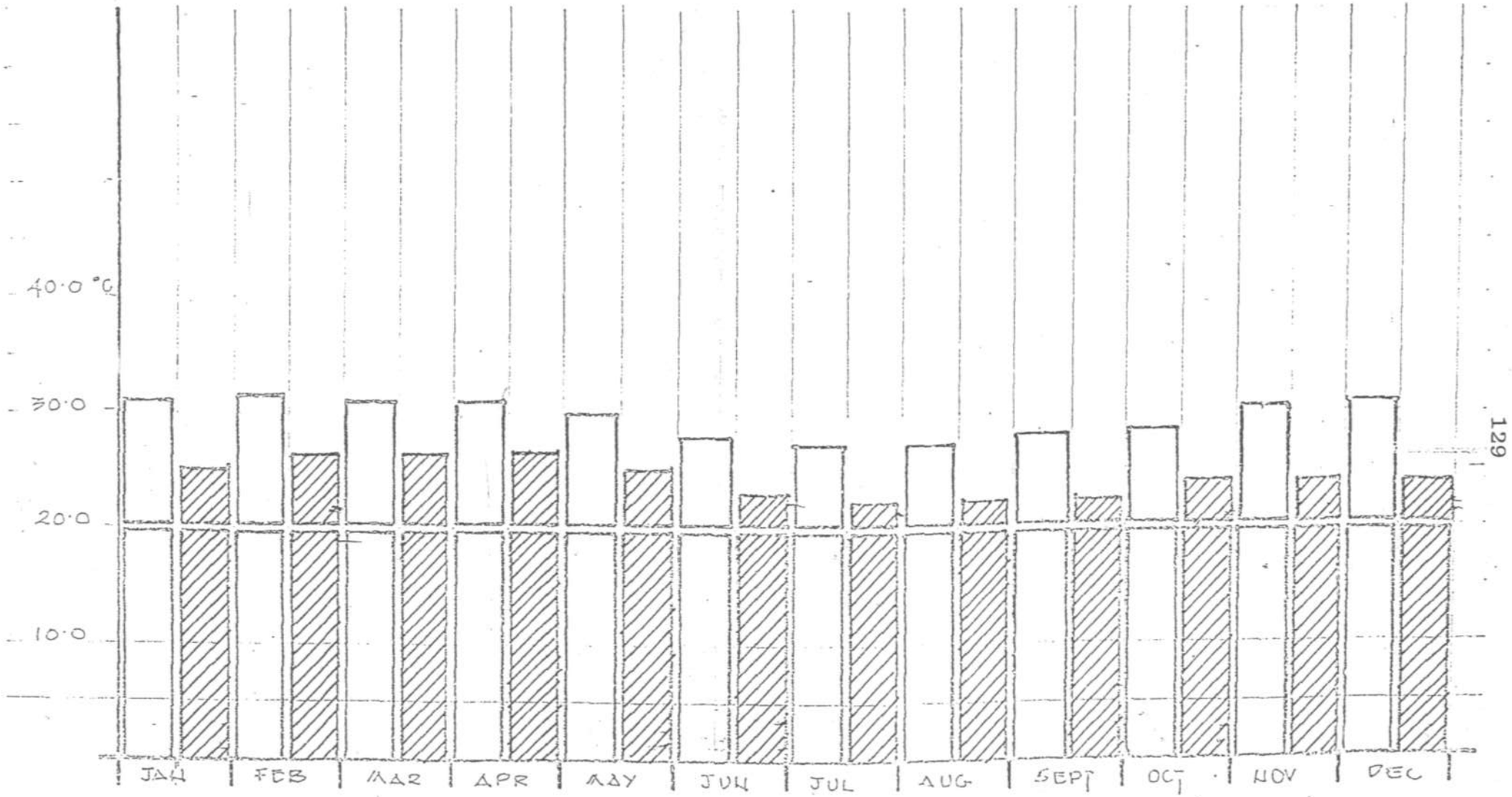
Source: Lagos state Meteorological Services Unit.



SOURCE: LAGOS STATE METEOROLOGICAL SERVICES UNIT

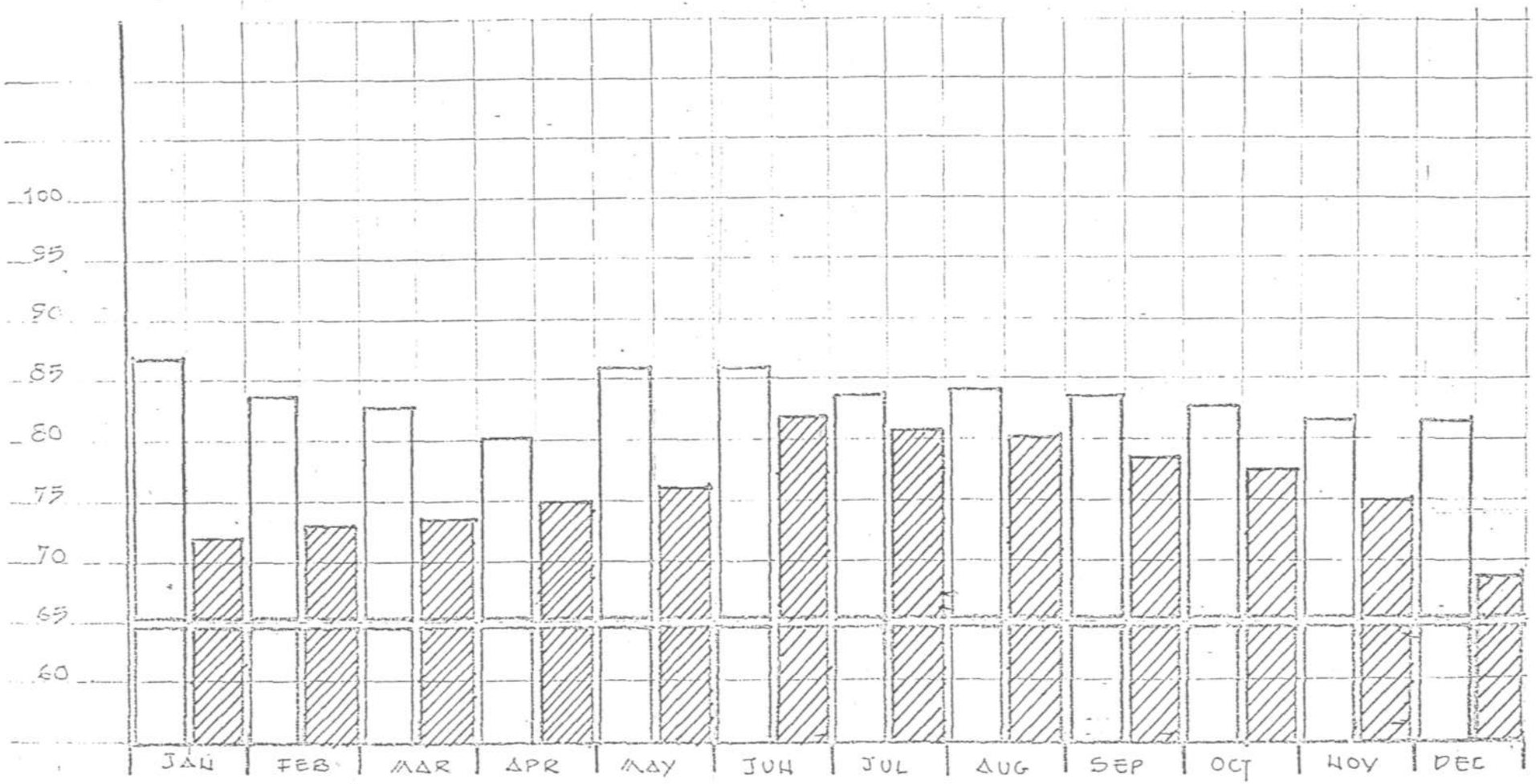
PURPOSE: TO DETERMINE NEED FOR SPECIAL DESIGN RESPONSES

Fig 3.4 AVERAGE MONTHLY RAINFALL FOR LAGOS AREA.



SOURCE : LAGOS STATE METEOROLOGICAL SERVICES UNIT.

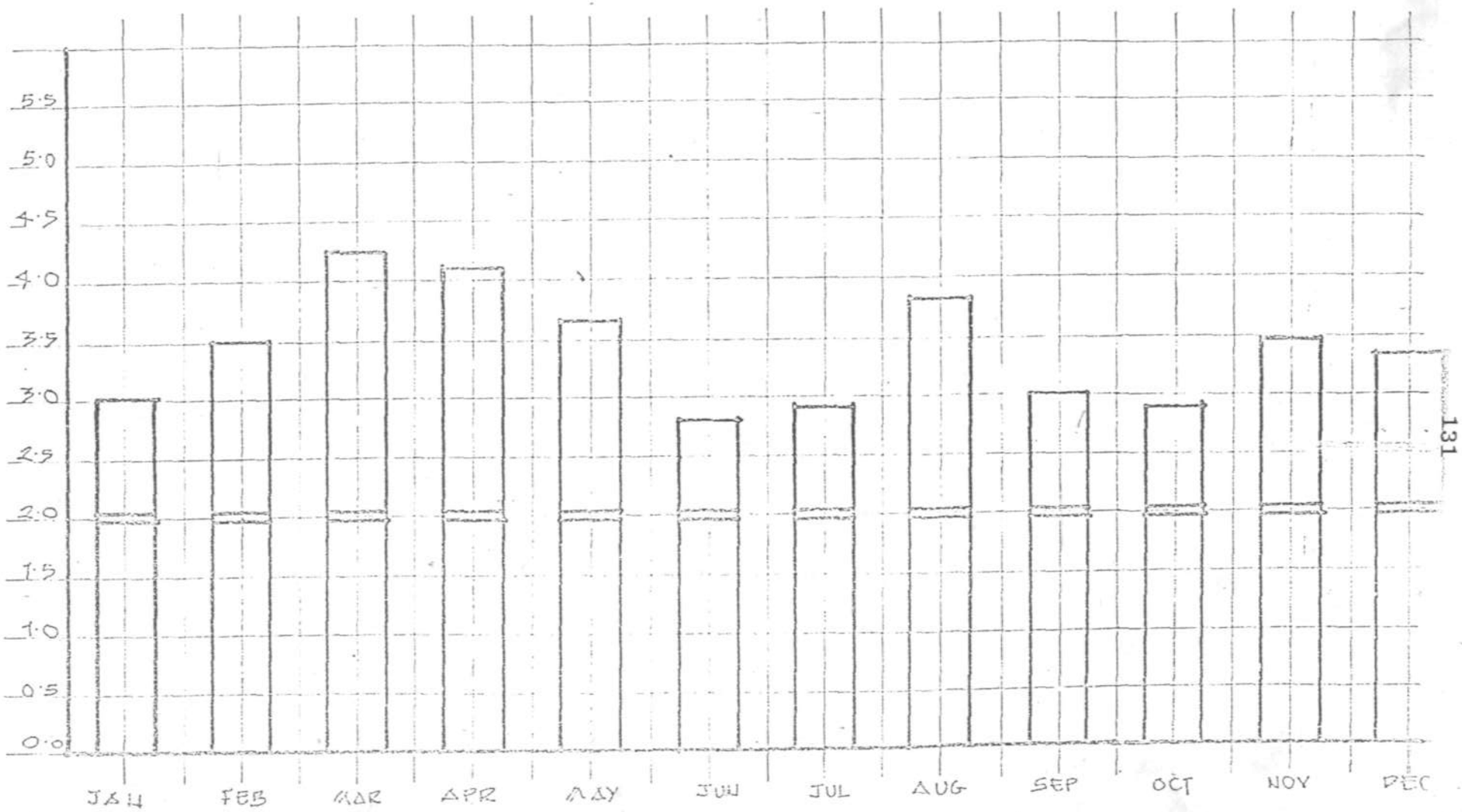
PURPOSE : EXTREMES BY MONTH TO DETERMINE HEATING AND COOLING REQUIREMENTS



SOURCE: LAGOS STATE METEOROLOGICAL SERVICES UNIT.

PURPOSE: TO DETERMINE THE NEED FOR HUMIDIFICATION OR DEHUMIDIFICATION

Fig 3.5



SOURCE: LAGOS STATE METEOROLOGICAL SERVICES UNIT.

Fig 3.6 ☐ EVAPORATION LEVEL

PURPOSE: TO DETERMINE AIR-EXCHANGE MECHANISMS AND FORMULAE

REFERENCES:

1. Exposition Press Smithtown New York, Page 135.

2. National Population commission Gazette.

3. Takiv Folani (1982): A History of Lagos, Nigeria

4. Udo R.K. (1970): Geographical Regional in Nigeria. Hienemann Educational Books Ltd, Ibadan.

CHAPTER FOUR

BRIEF AND DESIGN PROPOSAL

4.1 DESIGN PROPOSAL:-

To the average passenger touch down marks the end of the journey, to the airport authorities this is the beginning of a carefully planned sequence of procedures covering aircraft and passenger movement within the airport. In fact take off, approach, landing and positioning passenger guidance and checking moving baggage and ensuring safety are all part of the tremendous complexity of services involved in ensuring a smooth flow of passengers and traffic through the airport. Such facilities are partially in place at the terminal but most are non functional and inadequate where present others are just not in place, which cause a lot of hardship to the passenger using the facility and also the worker working on the facility.

Due to the advancement being experienced in the aviation industry and the growth of the industry in Nigeria, it becomes necessary to look into the situation at the terminal as it exists and to proffer a solution with considerations as to other alternatives which might be useful to the study.

A case study was made by the authority for the absolute removal and relocation of the Apron from its present site to a new area in the airport vicinity, but the financial input to this, alternative was too colossal to be achieved, so it was considered herculean due to the following reasons with high financial input that must be fulfilled before the proposed terminal can become functional:

(i) Clearing of the area chosen

(ii) Construction of a taxiway to the new area from the existing runway and taxiway.

(iii) Construction of a New Apron for the parking and turning of aircrafts on ground.

(iv) Construction of anew road network from one of the existing road network. Around the airport.

(v) Construction of a ground transportation link from other terminals to the new terminal.

After due consideration of all the above mentioned facts, it was decided that to minimise cost as much as possible due to the economic situation of the authority and the country as a whole the best alternative was to Redeveloped the facilities at the existing terminal area; re-organise the whole area for a more effective functional operative status and increase the original capacity of the existing structure to meet the demands of the aviation industry in the next century.

It should be of note that the Proposal for private airlines terminal design is that of the whole facility at the area known s the General Aviation terminal and not only the building serving ticketing and departure lounge activities.

4.2 FACTS:-

4.2.1 Airport Terminals function better under a unitary frame work due to the related activities inherent.

4.2.2 Commercial activities are an important part of airport economic viability, they help passengers to keep busy during their brief stay in the terminal building also they afford extra comfort for individual passengers. But this is possible when they are well arranged in the terminal area and not as it exists in the area.

4.2.3 Car parking facility is an important part of the terminal area, it increase the chance of an airport being chosen over another where two or more airports exists. The security at these carparks is must due to the incessant theft recorded in these areas. as at present car parking facility at the terminal is non existent due to the illegal structure that have overtaken the parking facility provided.

4.2.4 Security of life and property in the terminal area is increased when such operates under a modern frame work. As at present the airport terminal area lacks any form of immure selection that should be the case and this allows

for vagrants, touts and dupes to operate from the terminal and generally terrorizing the passengers. Organisation becomes necessary so as to prevent this presence of insecurity.

4.2.5 For a total renewal of the terminal area as a whole early construction would be the most realistic as at this time. It is a process by which substitution is employed until the airport terminal area is brought up to the standard envisaged. Building should be renovated then substituted for one another and then removed from the site.

4.2.6 The concern of this proposal would be the initial substitution of the terminal building and the renewal of this building as to raise its status and then the final occupation of the building. This process is to be carried out without the reduction of passenger volume at the Lagos domestic Airport as a whole.

4.3 SITUATION REPORT:-

The general aviation terminal as at present is an arrangement of an assortment of buildings functioning in a unitary way. This is due to the fact that control was not placed on the erection of these buildings due to no plan on the ground for the area. This particular area refereed to as the General Aviation Terminals has metamorphosised over the years to become what it is today. From the years when it was only an airstrip to when it was being utilized as the international airport, to when it became the domestic terminal

and now the general aviation terminal or the terminal 2.

Most of the buildings on site has also witnessed this metamorphosis as they has been changed from one function to the other as the terminal area gathered its history. Some were built during this process while other were renovated and still yet other were renewed.

Nevertheless these buildings have been able to function together as at present but not without generating problems and difficulties for the users and visitors alike. some of the buildings on the site have been vacated due to their state of disrepair.

Basic planning objectives are to be put in place through this design proposal to renew, renovate and integrate the buildings on site to form a workable trigon of terminal area, office area and parking facilities.

It should be noted that the first airstrip on the site was constructed in 1938 by then. The west African frontier force being operated by the American Airforce, buildings were then constructed to house machines and staff and as the system expanded more buildings were added to help out with the increase in the number of users due to its new designation as a civil aviation airstrip.

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located inside the central area such passengers to be able to get to their destination without much inconvenience that occurs during stair climbing, with baggage also pedestrian access is to be planned from the inception stage so as to provide as much a different route for pedestrians as for vehicular traffic. The use of lobbies and kerb recessions would have to be considered.

4.4.2 VEHICULAR TRAFFIC REORGANISATIONS

As at present a state of chaos is what the traffic situation is and around the General Aviation Terminal vicinity could be described as. A situation which was brought about by the lack of parking areas and the overtaking of such parking areas by commercial activities where such had existed earlier. Also another main reason, is the wrong directional movement of traffic system operates in Nigeria, the system this problems would be looked into with resolution of such being cn important design consideration.

4.4.3 PARKING AREAS:

As such parking areas needed to service the terminal area is lacking a situation occurs where the passengers cars or valet cars are parked off the road surrounding the airport area.

The revenue that is collected from the public parking areas of an airport is one of the airport authority's largest sources of income. It is therefore the intention to the creation of the different types of parking as discussed in chapter three (3). The dilapidated buildings existing on the site would be too costly to rehabilitate for permanent use and the areas they occupy could be put into a more revenue fielding activity, if converted into parking areas. When such activity that will occupy these buildings during the construction period, have been transferred into the new terminal building.

4.4.4 PASSENGER INCONVENIENCE:

Due to the fact that the terminal area is already in use it is importance to plan for the passengers as well as the workers and the general users of the area visitors inclusive. As with the redevelopment of transportation nodes as observed world wide, during the period of construction proper. Care must be taken to prevent the lowering of activity rate in the area as it concerns the General Aviation terminal not to reduce the number of passengers and to try as much as possible to reduce the discomfort caused as intention to Redevelopment is to alleviate the discomfort and not to add to it.

It is intended that as the Murtala Mohammed Domestic. Airport is underutilized due to the fact that it serves only four(4) airlines as at this period. 50% of the airlines

operating from the General Aviation Terminal, those with light passenger pay load should more to the terminal to reduce traffic at the G.A.T. while those to be displaced by the removal of the terminal i.e. the remaining 50% would now be housed in the temporary structure to be constructed.

4.4.5 PASSENGER INFORMATION:

Any passenger terminal system will rely heavily upon the ability of the public to secure information. it is therefore incumbent upon the architect to give consideration as early as possible to the nature and types of information systems that will be made available to the general public, so as to guide them to their desire locations.

Public information system unfortunately rend to become an after thought of the prime airline. Information system that the airline user feels he can afford. Little consideration has been desolated to the net effect of space demands in presenting accurate updated information to the travelling public.

Closed circuits television system (C.R.T) dynamic alphanumeric display boards, and manual display boards are available. These, systems to a lesser or greater degree can tie into an airline internal information system.

Another information system which is required is a public address and paging system. This plays an important role in last minute announcements but is frequently excluded from the

KASHIM

amenity areas, thereby reducing the system's effective use. Actually its importance during emergency conditions warrants the cost of installation. Such a facility exist at the terminal building at present but is so much under utilized due to congestions and the complex arrangement inherent but with its incorporation into the neo terminal it would go along way to increases passenger awareness and the ease at which information is passed onto the passenger from the airlines operators.

4.5 PHASED DESIGN PROPOSAL:

It has always been in practice that the planning of an redevelopment proposal all over the world is done in phases. This helps the trouble shooting agenda and brings about a sequential and interrelated format of activities that would bring about the realization of intended results.

For the purposes of redevelopment of private airlines terminal building four phases are being proposed and are as follows.

4.5.1 PHASE 1

Renovation of the old managerial block including the temporary structure that could act as the departure and arrival halls. Removal of the ticketing and baggage handling facility to this block. Relocation of 50% of the airline to the Murtala Mohammed Domestic Airport and the remaining 50% to

the temporary terminal. Demolition of existing structure. Construction of extension (vertical) on commercial arcade.

4.5.2 PHASE 2:

Removal of all temporary structure (which include all contains on the site, all kiosks made out of plywood and corrugated zinc and pota-cabins. Also renal of debris from such demolition. Construction of proposed terminal building. Relocation of commercial activities to commercial arcade.

4.5.3 PHASE 3:

Construction of Apron bridge and range to arrival hall. Rearrangement of traffic directions and construction of Jet ways. Installation of electric systems around the terminal building.

4.5.4 PHASE 4:

Mobilization and occupation of new building. Demolition and dismantling of the temporary terminal to creates space for carp parks and the construction of such can parks.

4.6 SPACE DETERMINATION:

4.6.1 PASSENGER VOLUME:

The domestic Airport in Lagos handles 37.8% of the total traffic volume of Nigeria which is estimated to hit 5 million by the year 2,000. 65% of this number is handled by the General Aviation Terminal which is calculated as follows:

37.8% of 5,000,000 = 1,890,000

65% of 1,890,000 = 1,228,500

4.6.2 SPACE DETERMINATION [ESTIMATION OF PEAK HOUR PASSENGERS]

The Federal Aviation Administration of the United States recommended certain relationships for the computation of peak hour passengers from the annual figures.

The protected annual passengers for the terminal by the year 2000 is 1,300,000.

Total annual passengers	Peak hour passengers (%)
20,000,000 and other	0.030
10,000,000 - 19,999,999	0.039
1,000,000 - 9,999,999	0.040
500,000 - 999,999	0.050
100,000 - 499,999	0.065
Under 100,000	0.120

Peak hour passenger:

$$= \frac{0.040 \times 1,300,000}{100}$$

= 520 passengers.

SHOPS:

$0.22m^2 \times 520 = 11.4m^2$

HOLDS ROOMS:

Approximate area = Total aircraft capacity $\times$ $1.0m^2$ (excluding toilets)

$= 350 \times 1.0m^2$

$= 350m^2$

ARRIVING PASSENGERS:

Baggage Claim:-

Pre-claim waiting area

allowing 30% of peak hour passenger per $1.0m^2$

$\frac{30}{100} \times 520 \times 1.0m^2 = 156m^2$

RETREAVAL AREA

Allowing 80% of peak hour passengers

$\frac{80}{100} \times 520 \times s1.0m^2 = 416m^2$

CUSTOM CONTROL:

Allowing $0.4m^2 - 0.5m^2$ per passenger per design index.

$0.5m^2 \times 520 = 260m^2$

PEDESTRIAN MOVEMENT:

Ramps should not have greater gradient than 1:12.

Maximum distances kerbside to baggage check in or Reclaim = 20m.

Furthest carparks to baggage check - in or Reclaim = 300m.

Furthest gate position to baggage check-in Reclaim - 330m

Gate to aircraft = 50m.

CATERING:-

70% of total passengers, visitors, and staffs use facilities in ratio.

65% use buffet/bar - $1.3m^2$ per person

-65% of 520 x $1.3m^2$ = $439.4m^2$

25% use grill/coffee shop - $1.60m^2$ per person

- 25% of 520 x $1.6m^2$ = $208m^2$

10% use restaurants - $1.4m^2$ per person

- 10% x 520 x $1.4m^2$ = $72.8m^2$

Total space requirement =

439.4 + 208 + 72.8 = $7.20.2m^2$

Inclusion of staffs and facilities

720.2 +(60% 720.2) = $1152.32m^2$

Approximately $1160m^2$.

REFERENCES:-

2. Ashford, N. and Wright, P.H. (1979) Airport Engineering John Wiley and Son, New York, U.S.A.

1. De Chiarig, John Calendar (Ed) (1973) Time Saves Standards for Building Types. Mc Graw Hill book Company New York, U.S.A.

CHAPTER FIVE

SUMMARY AND CONCLUSION

An analysis of the problem definition was undertaken in the first two chapters, which introduced the topic and went ahead to define parameters already in place and the sequence they must have undergone to arrive at their present state.

A metamorphosis of the aviation industry was undertaken with the inflation of delineating the different users status as it affects the design, all in all these chapter tried to define the research proposal, creating a basis for its necessity while also discussing relevant issues that would affect the research content.

The field of aviation being a highly technical area made for the presentation of the following 2 chapters, that defined terms in the aviation industry, creating a working insight to the operations of the industry while comparing configurational chronicles and generally carrying out a survey of relevant case studies. Relevant in the sense that all the five (5) case studies had to do with either the conversion, relocation or proposal design. Three were chosen from international settings in Great Britain while the remaining two was from Nigeria, to be specific Kaduna and Jos. These case studies went on to discuss the terminals and the reasons why they were altered, that include both sociological and operational.

The fifth chapter deals with the location of this proposal, incorporating social parameters for the problems incurred and also discussing the site with a through investigation of the existing facilities and analysing the climatic conditions of the area under redevelopment.

The site is directly in the middle of an area earmarked for aviation development so this makes it easy for access to other aviation departments that would have needed an input in the development for a smooth operational status.

The last main chapter deals with the proposal itself defining the proposal with a situation report that gives an insight into the present state of the terminal area. Certain considerations were made for special activities which would enhance the passenger comfort and the optimum output from the proposals design. The considerations went on to resolve the problems of mixing operation and construction, this brought about the phased design that makes for a smooth design of the transportation to take place. The vertical expansion of the commercial arcade would help to relocate displaced commercial ventures on the ground when the removal of illegal structures take place. These commercial ventures create a lot of finance for the airport authority and also airline operating in the terminal area could occupy some of the shops as temporary office area till the new terminal building is completed at the end of phase four.

It is true that most transportation nodes are congested due to application of such above mentioned operational status, but this is brought about by their actual underutilization because most are left unoperational at night. It is projected by the airport authority that night time flights would start operating in domestic routes in near future, so design consideration have been put in place for such activities that would enable such to be functional for optimal output, such considerations include flood lighting and security.

The parking areas created in the proposal are to generate more funds for the authority especially the time parking area which is expected to bring in a sum of approximately N30,000.00 on daily basis when fully operational.

It is an accepted fact that the area is at present choked up, but with this proposal on ground, it is my belief that most of the problems inherent would be alleviated so as to create a more conducive environment for the passenger and airlines staffs who operate from the terminal and the visitors to the terminal.

SCHEDULE OF ACCOMMODATION

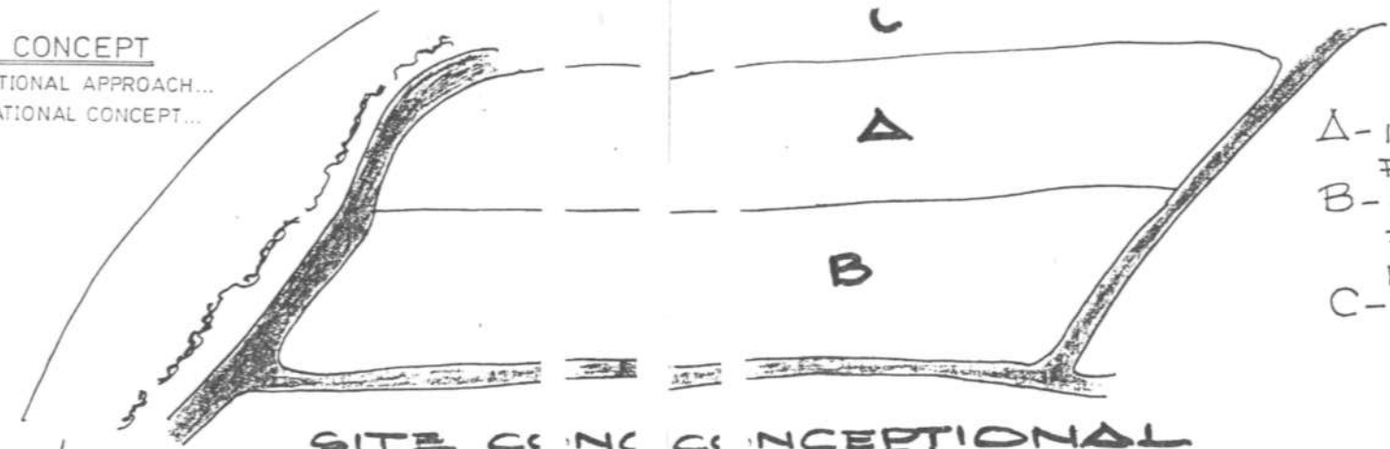
AIRPORT TERMINAL SPACE FACILITY			SPACE REQUIREMENT/M^2
ARRIVAL			
Lounge	=	$229m^2$	$229m^2$
Baggage Reckim Hall	=	$58m^2$	$58m^2$
Baggage Sorting Incoming	=	$13m^2$	$13m^2$
Baggage Sorting Outgoing	=	$13m^2$	
Shops	=	$20m^2$	
Toilet	=	$1.8m^2$	
DEPARTURE			
Lounge	=	$98m^2$	
Concourse	=	$19m^2$	
V.I.P. Lounge	=	$28m^2$	
Restaurant	=	$123m^2$	
Commercial Area	=	$20m^2$	
Flight Conformation	=	$28m^2$	
Tickets	=	$4m^2$	
Corlufing	=	$14m^2$	
General Office	=	$28m^2$	
Chief Security	=	$25m^2$	
Terminal Security	=	$55m^2$	
Store	=	$8m^2$	

3. TERMINAL MANAGEMENT

Managing Director	=	$75m^2$
Public Relation	=	$109m^2$
Account Department	=	$133m^2$
Personnel Department	=	$107m^2$
General Office	=	$28m^2$

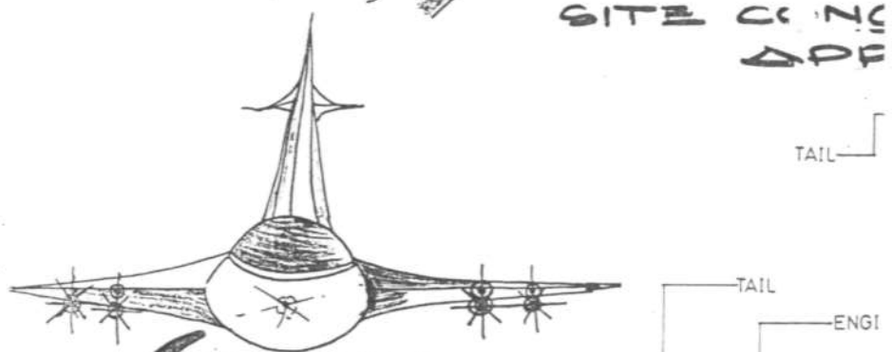
DESIGN CONCEPT

1. A SITE CONCEPTIONAL APPROACH...
2. ADOPTED ELEVATIONAL CONCEPT...



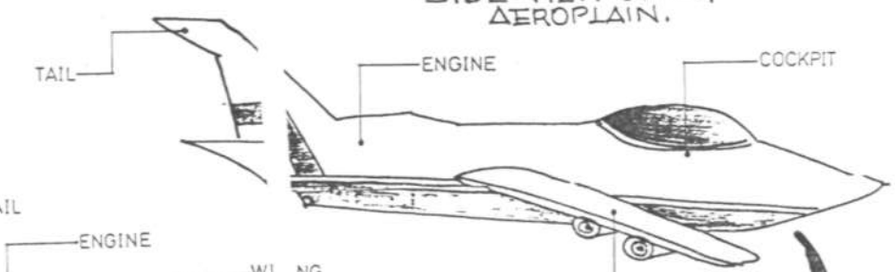
A- IDEAL LOCATION FOR TERMINAL
B- IDEAL LOCATION FOR VEHICULAR/ PEDESTRIAN TRAFFIC
C- EXISTING APRON.

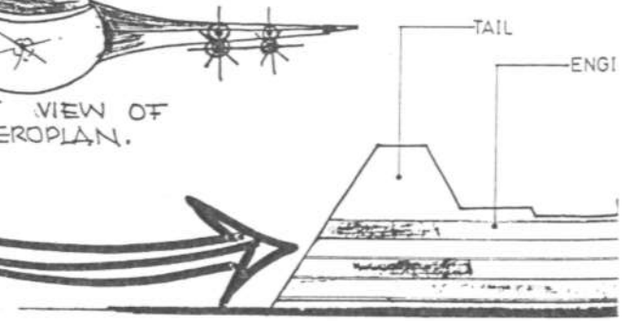
SITE C... C...NCEPTIONAL
AP... APPRO...CH...

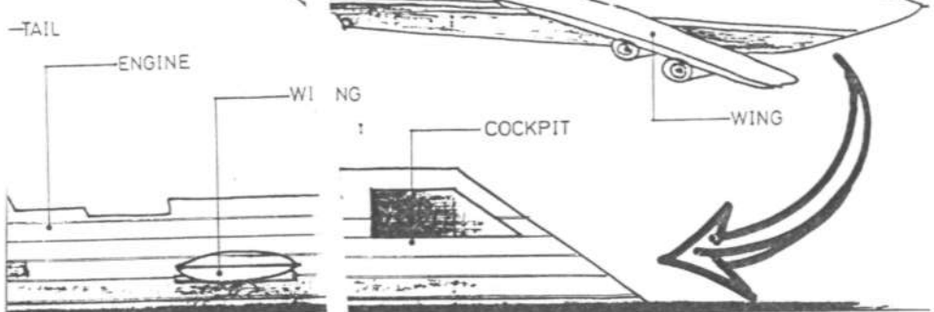


FRONT VIEW OF AN AEROPLAN.

SIDE VIEW OF AN AEROPLAIN.





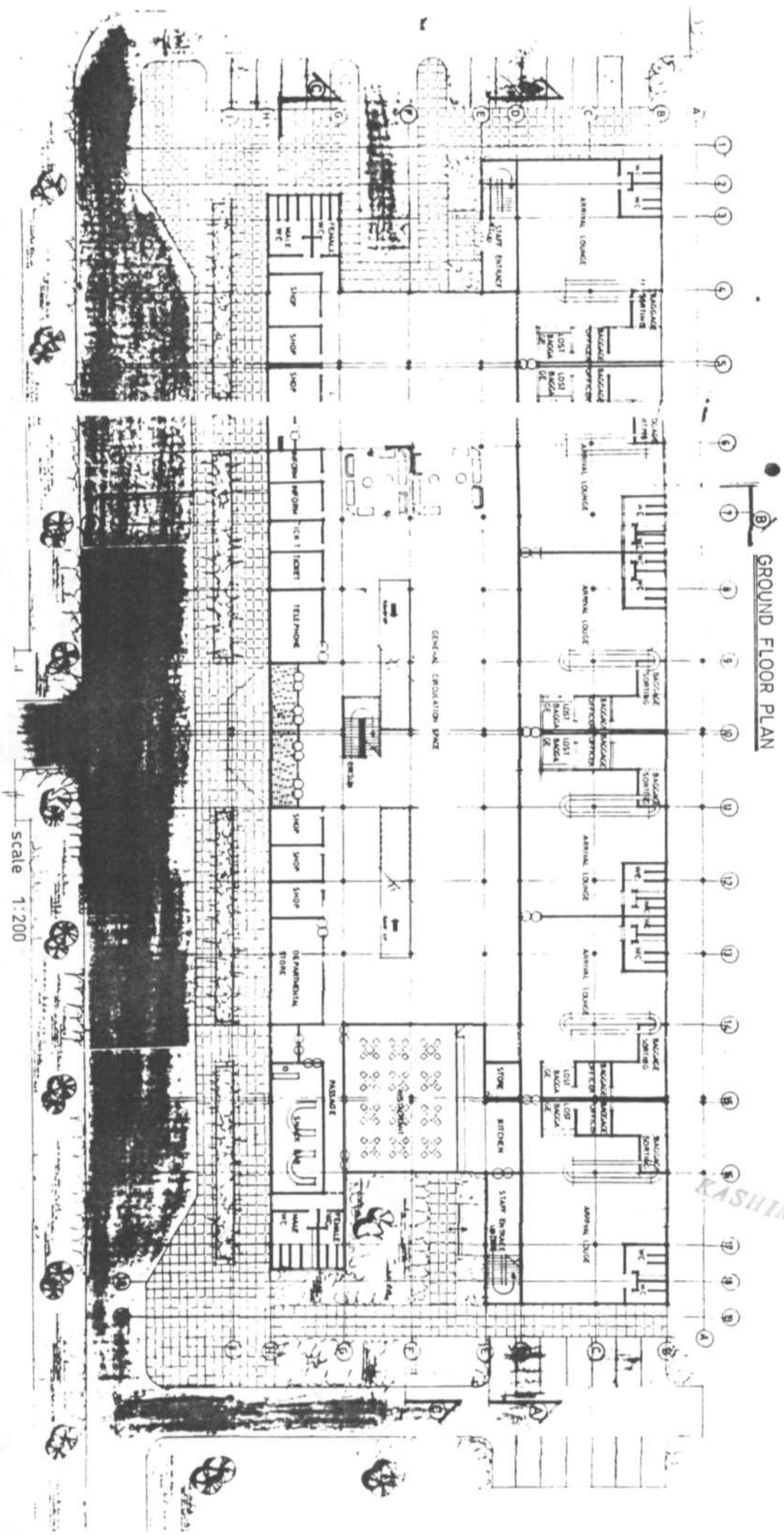


ADOPTED ... ADOPTED ELEVAT ...IONAL

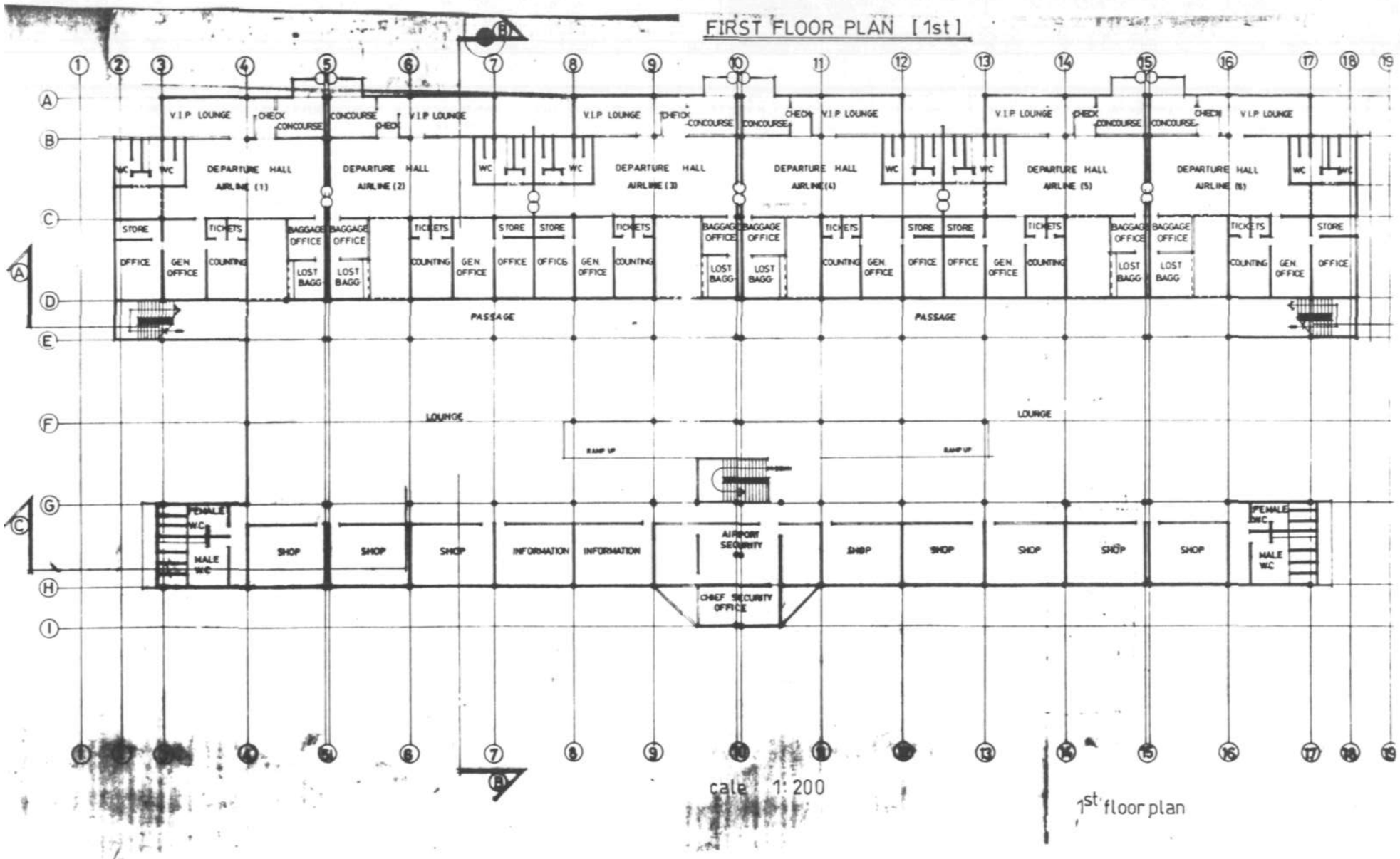
SITE PLAN

SITE PLAN

scale 1:500



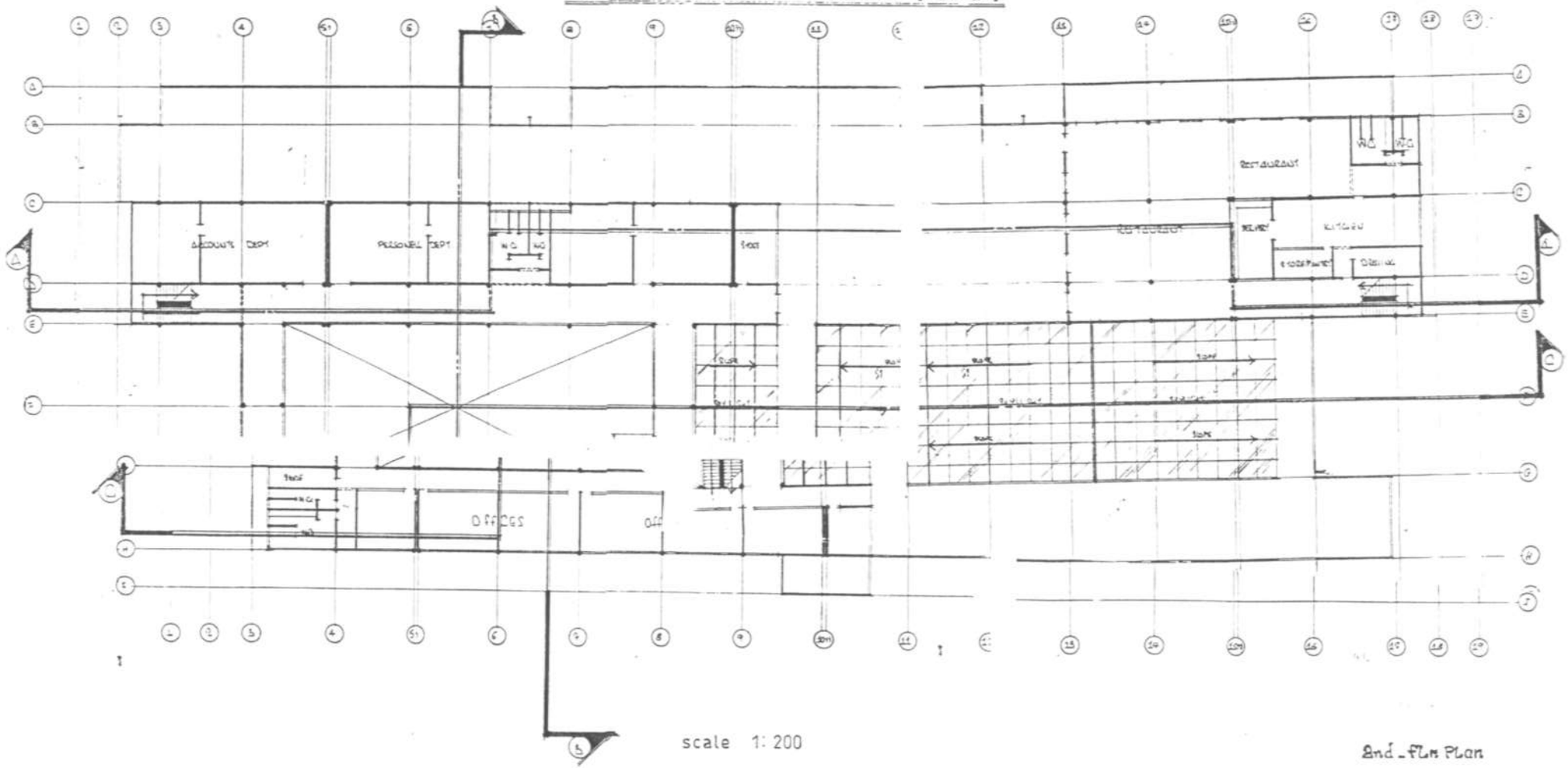
KASHIM IBRAHIM LI



cale 1: 200

1st floor plan

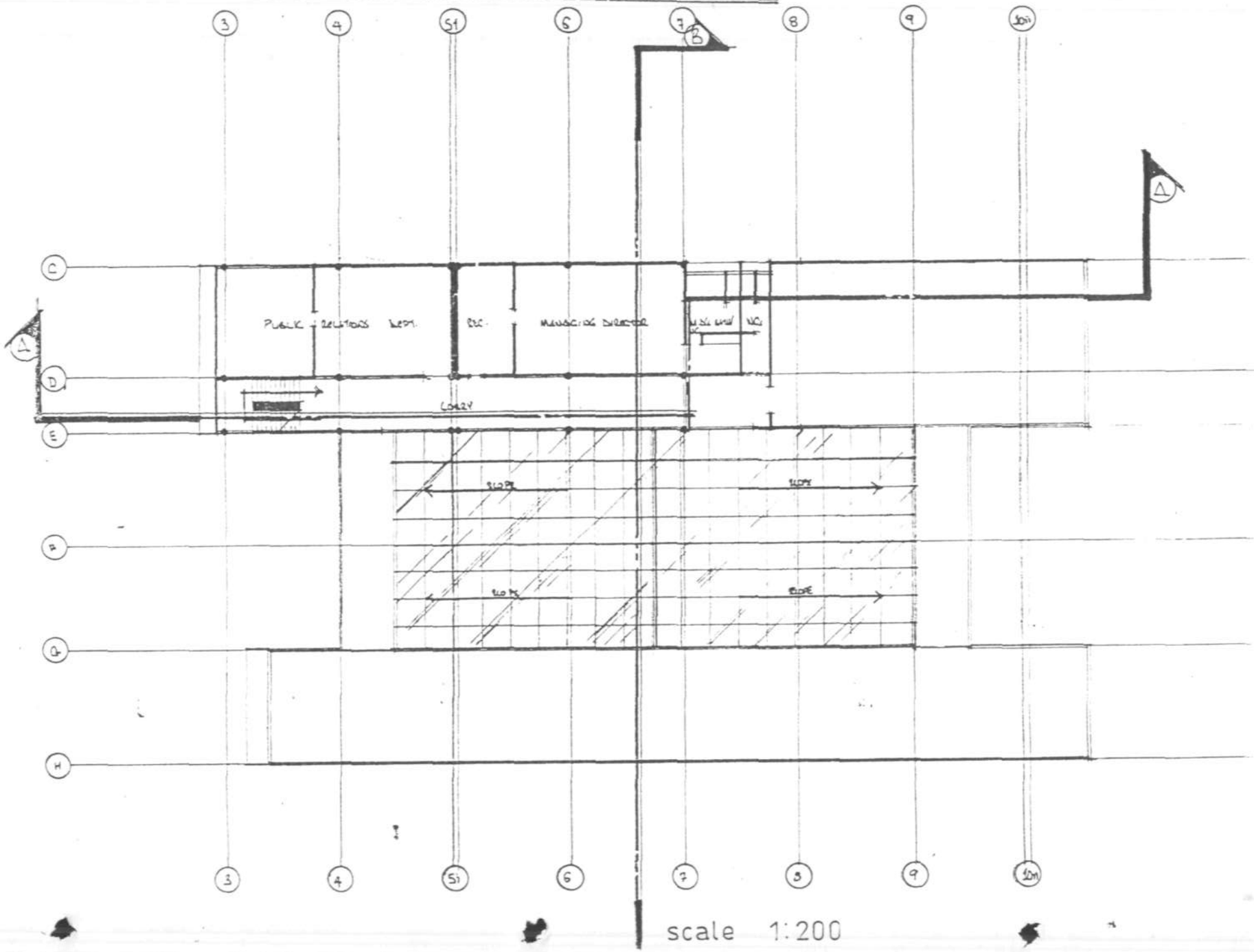
SECOND FLOOR PLAN [2nd]



scale 1: 200

2nd - FLR PLAN

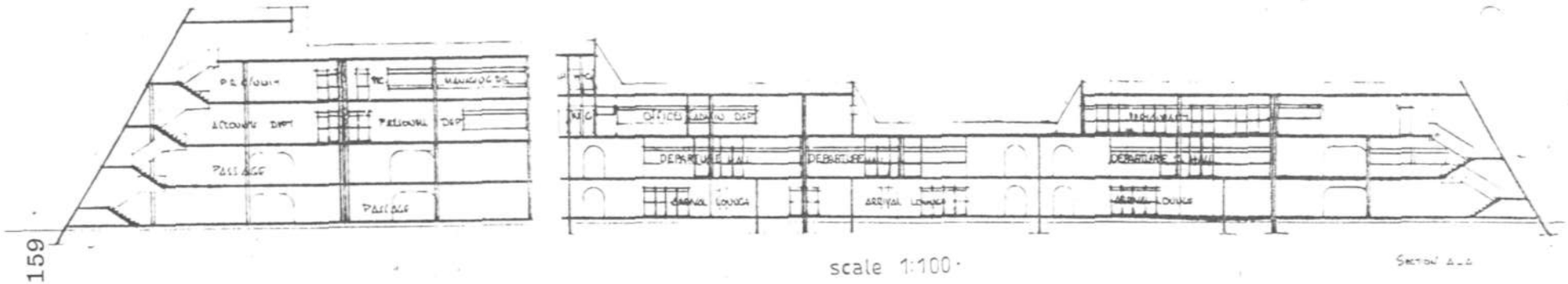
THIRD FLOOR PLAN [3rd]



158

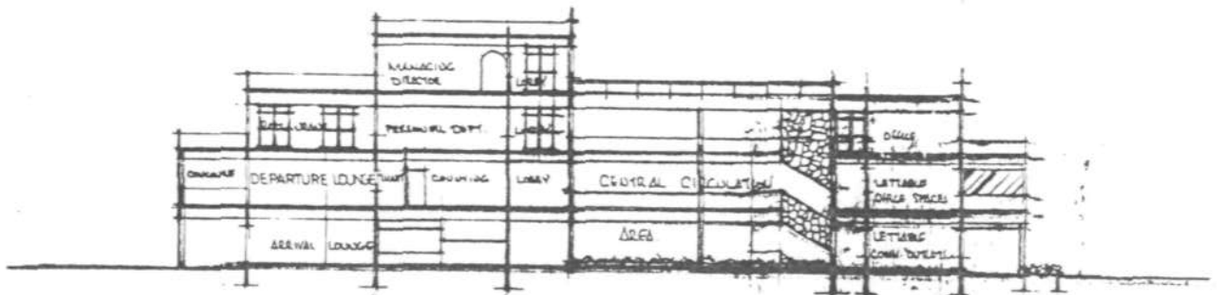
scale 1:200

SECTIONS



scale 1:100

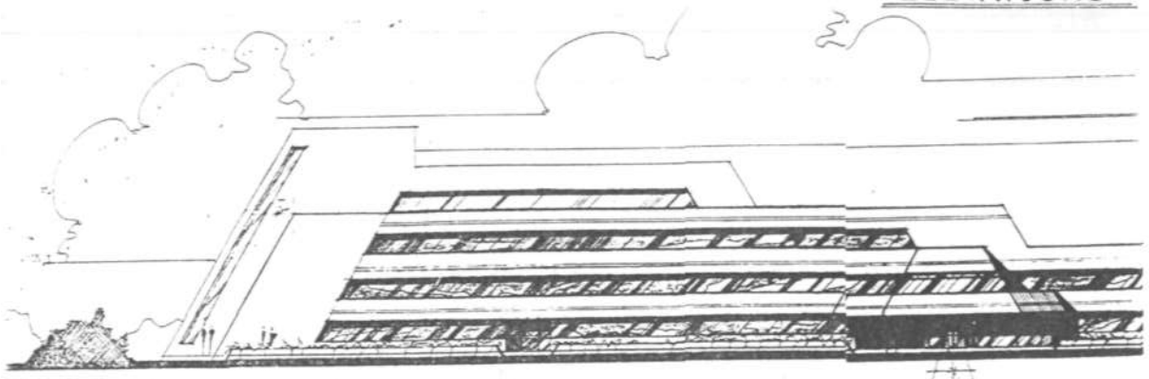
SECTION A_A

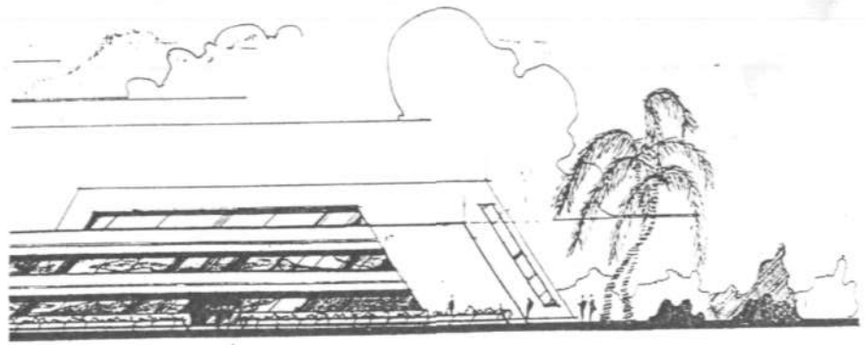


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SECTION B_B

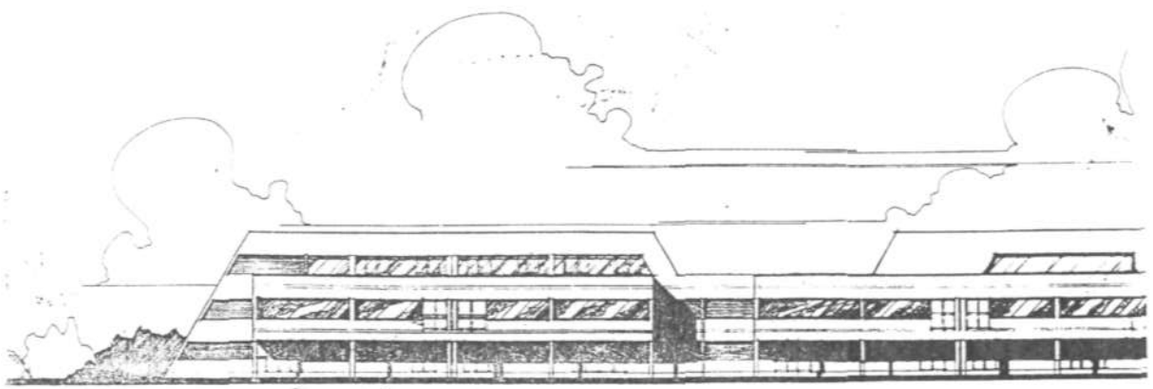
ELEVATIONS

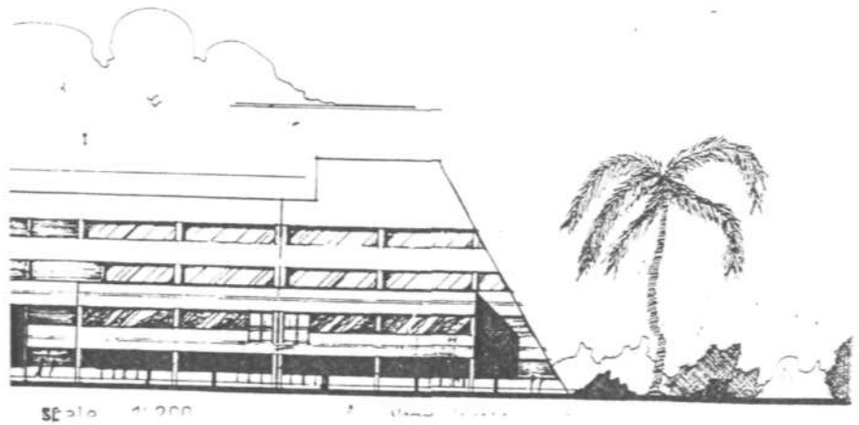




scale 1:200

South Lakeside Elevation



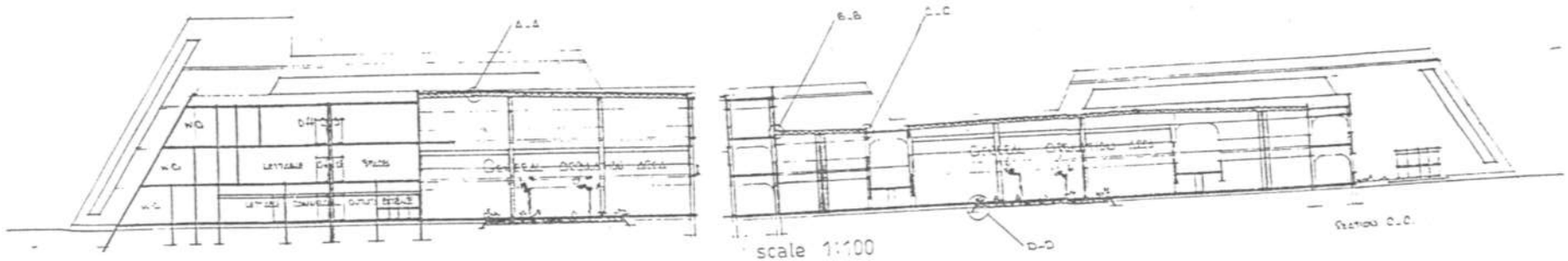


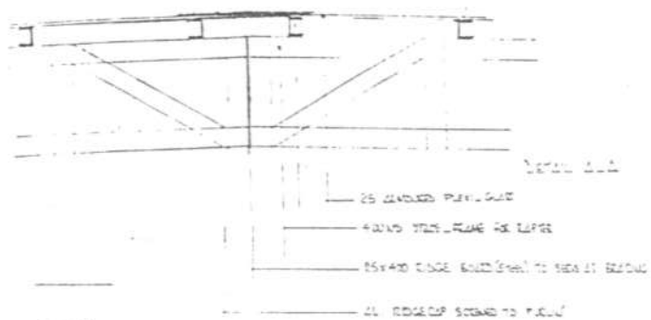
Scale 1:200

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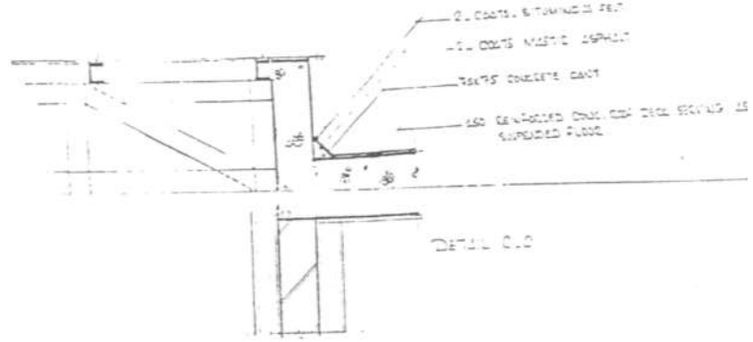
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SECTION & DETAILS

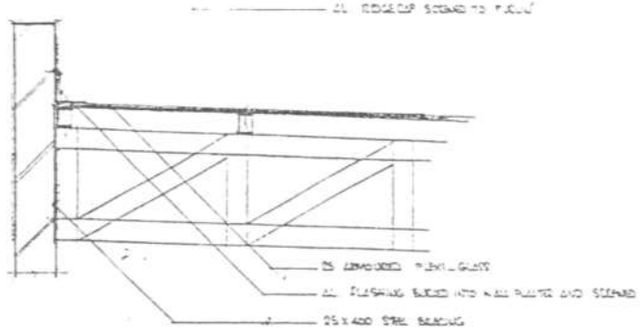




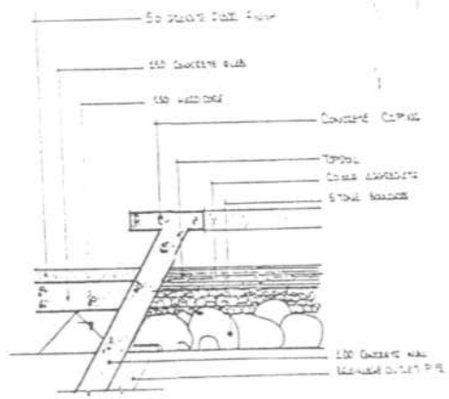
DETAIL A-A



DETAIL C-C

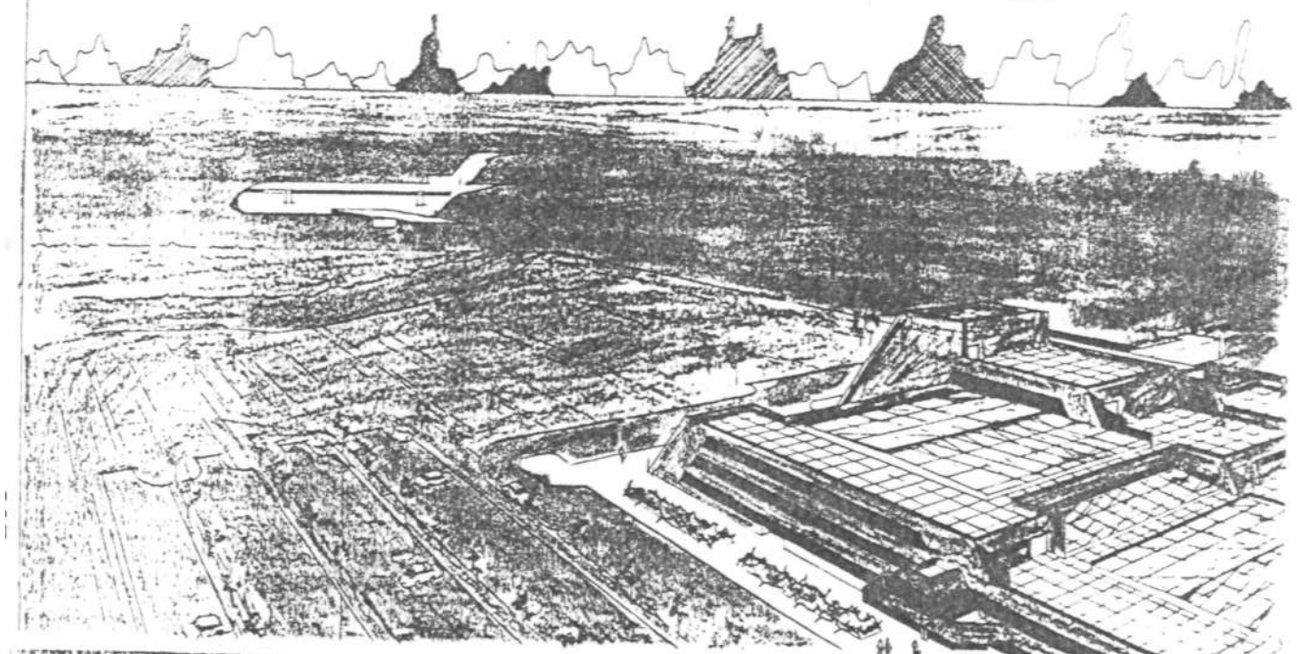


DETAIL B-B

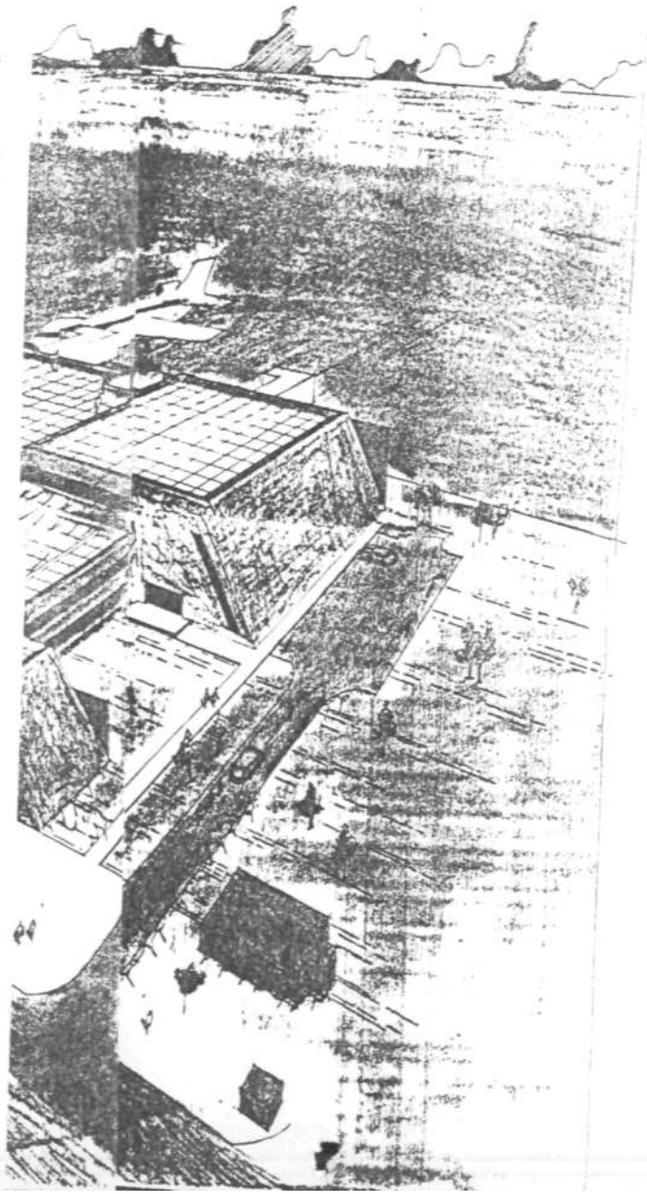


DETAIL D-D

PERSPECTIVE







REFERENCES

1. Ahmed, A.T. (1981). Nigerian Airports Authority and the Development of air Transportation in Nigeria. A seminar presented at the Nigeria College of Aviation Technology, Zaria.
2. Ashford, N. and Wright, P.H. (1979) Airport Engineering. John Willey and son, New York, U.S.A.
3. Barry E.S. (1969). The Language of Aviation, Chatto and windus, London, Great Britain.
4. Bernado, J.V. (1960) Aviation and Space in the Model World. E.P. Dulton & Co., New York, U.S.A.
5. Burbeurg, P. (1979) Environment & Services. The Anchor Press, Essex, Great Britain.
6. Ching, F.D.K. (1975) Building construction Illustrated Van Norstrand Reinhold Company, New York U.S.A.
7. De Neufille, R. (1980) Airport Systems Planning. Then Macmillan Press, London, Great Britain.
8. Deru, J.S. (1980) The Aviation Industry in Nigeria A seminar paper presented at the Nigerian College of Aviation Technology, Zaria.
9. Foster, J.S. (1979). Structure and Fabric. The Anchor Press, London, Great Britain.
10. Gniadzik, J.S. (1984) Structural Systems in Architecture, Ahmadu Bello University Press, Zaria

11. Horonjeff, R. and Mc Kefvey, F.X. (1983) Planning and Design of Airport. They King Post Press, New Yourk, U.S.A.

12. Neufort Ernest (1980). Architects Data. Halsted Press, New York, U.S.A.

13. Nayler, J.L. and Dwen, E. (1965). Aviation: It's Technical Development, Peter Owen/Vision Press, London, Great Britain.

14. Pachard, R.T. (1961) Architectural Graphics Standards. John Willey & Sons, New York.

15. Schmertz, M.F. (1979). Office Building Design.. MC Graw Hill Book Company. New York, U.S.A.

16. Siegel, C. (196) Structural & Form in Modern Architecture. crosby Lockwood and sons, London Great Britain.

17. Snyder, J.C. (1961) and Catanese A.J. (1979) Introduction to Architecture, MC Graw Hill Book Company, New York, U.S.A.

18. Tapes H. (1967). Air Cargo, Cassel and Co, London.

19. Tutt, P. and adler, D (1979). New Metric Handbook. The Architectural Press, London.

20. Willey, J.R. (1981). Airport Administration. Eno Foundation for Transport, Inc. West Port Connecticut, U.S.A

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