# AIRPORT TERMINAL BUILDING.

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SCHOOL OF ENGINEERING

PROJECT REPORT



AMERICAN UNIVERSITY OF BEIRUT

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PROJECT : THE KLEIAT AIRPORT
TERMINAL BUILDING
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Air transportation in peace and in war has reached the point in its progress where careful planning and special engineering consideration must be given to the ground facilities. Among these the most important in commercial air transportation is the terminal building , which should be designed so as to give maximum comfort to the passengers as well as guarantee a steady flow of traffic where land and air lanes meet .

In designing an air terminal it should be kept in mind that air and passenger service is not the only source of revenue but that the automobile is just as important to the airport as the airplane ; the spectator is just as important as the traveller and the ground revenue is probably more important than air revenue . The terminal building must be planned in such a way that the ground facilities make money from non travellers as well as travellers . In one word an airport and its terminal building should be a "wharfside of aviation".

# PART I

# INTRODUCTION

# G E N E R A L

There have been many airport terminals built which have been criticized . In most cases lack of space has been thought to be the cause of trouble , in some others the lack of planning passenger circulation ; and still in some others inadequate methods of airline and airport management procedure.

One thing that should always be kept in mind is that there will be great growth in air transportation and that all structures at the airport must be so designed that they can be expanded . This is particularly true in the case of the terminal building .

Because the success of an airport depends largely upon its ability to "take in money" from non travellers , the element of appearance obviously is important , but full realization should be given at the start that the problem confronting a community is not only that of getting "a good-looking-big-airport-building" . The problem of developing proper building facilities for an airport goes well beyond that . Above all the building must be efficient. This however does not mean that the building need be unatractive. On the contrary the structure should be made as attractive in appearance as it is efficient in planning so as to

draw people in general thus increasing non passenger revenue.

The "terminal group" of buildings are the ones housing those facilities which have to do with the actual handling of passengers , baggage , mail , and express .

In large airports the terminal group is not one building but is actually composed of several buildings which in turn house the main concourse ,(which houses the pedestrian circulation between the building and the plane) the terminal building proper , the customs and immigration building , and the mail and express offices . However in the small airports all the above mentioned functions of a terminal can be housed in one single central terminal building .

## F L E X I B I L I T Y

The practice of designing "static" buildings to accomodate the immediate traffic has been the chief cause of inadequacy of airport terminal buildings.

Terminal buildings should be made flexible so that any single part can be expanded without interfering with its functioning .

The above is usually achieved by deviding the building into units according to function , fixing the dimension from front to back (all expansion to occur laterally) , and by designing the building for maximum probable development . This however is not the only possible solution of the problem.

Civil Aeronautics Administration officials and the majority of the more enlightened designers seem to agree that there must be a decentralization of activities to permit sufficient expansion . The interpretation of the word "decentralization" however has led to several schools of thought .

Some have taken decentralization to mean the division of the terminal into units per airline company , and not into units of function . An argument advanced in favour of this system which we will call the "unit terminal" is that the passenger travels a minimum distance from surface transportation to the plane thus eliminating the need for transportation

from the terminal building to remote plane berths . This unfortunately creates unecessary duplication in services , traffic mix-ups and leaves an unfavourable impression upon the visitor , because of the chopped-up effect that is given by the terminal .

The exact opposite of the "unit system" is the "consolidated system". This advocates the consolidation of all activities , concerning the handling of passengers and airlines operations around a central unit°; from the arrival of the plane until its departure .

As both systems have their own advantages a combination of the two is usually applied in the solution of particular cases .

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° In the case of the customs and immigration services and also of mail and express offices , the responsible officials have expressed preference that these facilities be housed in separate buildings if justifiable by the size of the airport .

## C I R C U L A T I O N

In no form of transportation is time such an important element as in air transportation . The real problem of circulation is to cut to the minimum the time the passenger spends in transit . Circulation includes the whole route of the passenger from the point of origin to his ultimate destination .

Part of the time lost is in transit to the airport and part at the airport . Time lost at the airport may be due in part to airline procedure and method of plane loading , or to lack of planned circulation in the terminal group . Difficulty of circulation in the terminal group is often due to the small conception of space in the lobby and concourse , from the entrance to the plane , which is mostly horizontal circulation .

The difficulty with circulation within the building is often due to overcomplicated routing of passengers and baggage, specially vertical circulation . One of the primary decisions to be made when planning this routing is whether the terminal building is to be a one-level or two-level operation . The simplest routing is where traffic flows straight throughthe building with no change of level ; all handling of passengers and baggage being on the ground level .

This is called a "one-level operation". The one-level building is more economical to construct at locations where the apron and the entrance drive are at the same level thus eliminating the need for ramps and elevators .

LOCAL FLIGHTS

INTERNATIONAL FLIGHTS.

Truck parking

loading platform

CIRCULATION

## F L O O R  S P A C E  ( General )

Here again the entire emphasis in planning should be placed on flexibility . The elements which make up the terminal building should be so planned that they can be expanded independantly and in equal proportion .

The elements of floor space are:

a) The passenger units - directly connected with the passenger facilities - lobby , ticket sales , waiting , rest-room and eating facilities .

b) The service units - connected with baggage routing and building service facilities - outgoing baggage , incoming baggage , and building service proper .

In planning the terminal building great care should be taken not to follow the common practice of capping the ends of the building with baggage and cargo at one end , and kitchen and building services at the other end . This type of plan has been responsible for more airport terminal buildings becoming outmoded because of "non-expandability" than any other practice .

## A R R A N G E M E N T  O F  F L O O R  S P A C E

(One-Level-Building)

Entries.

The one element in the original construction which cannot be expanded are the entries (driveway and concourse). Therefore they should be generous in size , and the doors should be as wide as possible . It is advisable that the concourse entrance be separated by a rail thus preventing outgoing and incoming passenger traffic from getting into each others way .

Lobby.

The lobby must be a space free of seats , signs , and all other items that might tend to confusion . The lobby should be a public space which is used exclusively for ticket sales and dispensing information . It should be aesthetically inviting with simple harmonious and soothing lines and colour scheme .

Waiting space.

The waiting space should be made as comfortable as possible without loosing sight of the question of the durability of the furniture , floors and walls . Preferably it should be separated from the lobby . If provision is to be made for a first aid room this should be adjacent to the waiting space

and with an outside entrance .

Ticket sales.

Placing the ticket selling facilities on the drive way side of the building is a bad practice in as much as it leaves the field wall with an open view on the apron , thus encouraging spectators to clog the field side of the building and interfering with the movement of passengers in transit to the plane . It is suggested that the ticket selling facilities be placed along the field wall . In this location they are seen immediately by passengers on entering the building from the main entry ; and are in the logical position in being placed closest to the planes . The "ticket sales space" should include the ticket counter , (which should be five to six feet in length and have a baggage scale) , the passenger agents office ; and facilities for handling outgoing baggage .

Rest-rooms , powder-rooms.

The best location for the rest-rooms is close to the waiting space . In the past it has been the practice to have a single rest-room which was used by the passengers as well as the service staff of the airport . This leads to crowded and usually unsanitary conditions and must therefore be avoided .

Restaurant facilities.

Skyroom restaurant facilities are among the biggest revenue producers at the airport . The best layout for the restaurant is where the maximum number of tables are in proximity to the windows overlooking the landing field . The size of the restaurant is not dependant on the amount of traffic at the airport but on how attractive it is built , decorated and managed , because dining rooms at airports have prooved to be popular meeting places for group from the city and the greater portion of its patrons will probably be visitors rather than passengers . Kitchen , restroom , and checking facilities in an airport restaurant should be the same as for any good restaurant .

Where traffic is not heavy enough to warrant keeping the restaurant open all night it may be good economy to design a coffe shop coupled with a snack bar on the first floor , so that it continues to operate while the restaurant is cloded .

Concessions.

Concessions such as telephones , news and candy stands , insurance sales , souvenir stands , taxi service , individual storage lockers , and also travellers aid (S.E.T.) and information booth , which do not come directly under the heading of concessions , should be placed in the lobby for the

convenience of passengers .

Spectator Facilities.

There should be a special section , reserved for spectators , separate from passenger traffic and waiting space . The best location for this is at the top of the concourse , as it gives a direct view on the loading platforms which are the point of greatest interest to the spectator . It is advisable to have a staircase leading directly to the top of the concourse at one end of the building completely out of the way of passenger traffic.

Tower.

The tower should be high enough to permit the operator to look over adjacent buildings and see the end of the runways . As it is also advisable that the operator see as much of the apron as possible , the face of the tower should be brought flush withthe face of the building , the balcony surrounding it projecting beyond the facade .

Driveway Loading.

Terminal buildings should have covered loadings for surface vehicles , the canopy projecting beyond the curb line to provide weather protection . A small office for the taxi dispatcher is recommended if not provided in the lobby. It is always preferable that the floor level of the building

be elevated slightly to the truckbed level . This facilitates loading , permits a higher and more unfform basement lighting and reduces excavation .

Baggage facilities.

Baggage presents a question centering more in circulation than in floor space . There is little need for storage ; and , because the desire is to speed its transit , there seldom will be a great amount stored at any one time. Outgoing baggage is best placed on the field side of the building . There it has the shortest distance to traverse to the plane and encounters the least amount of cross traffic. The incoming baggage space is best located at the driveway entrance , and should open both to the lobby and to the driveway loading platform .

Building Service Facilities.

The service entrance serves building maintenance facilities and kitchen facilities - a basement floor is advisable in airport buildings where provision is made for mechanical equipment (generators) , storage facilities (kitchen , restaurant , general building storage) , personnel lockers , toilets and lounges .

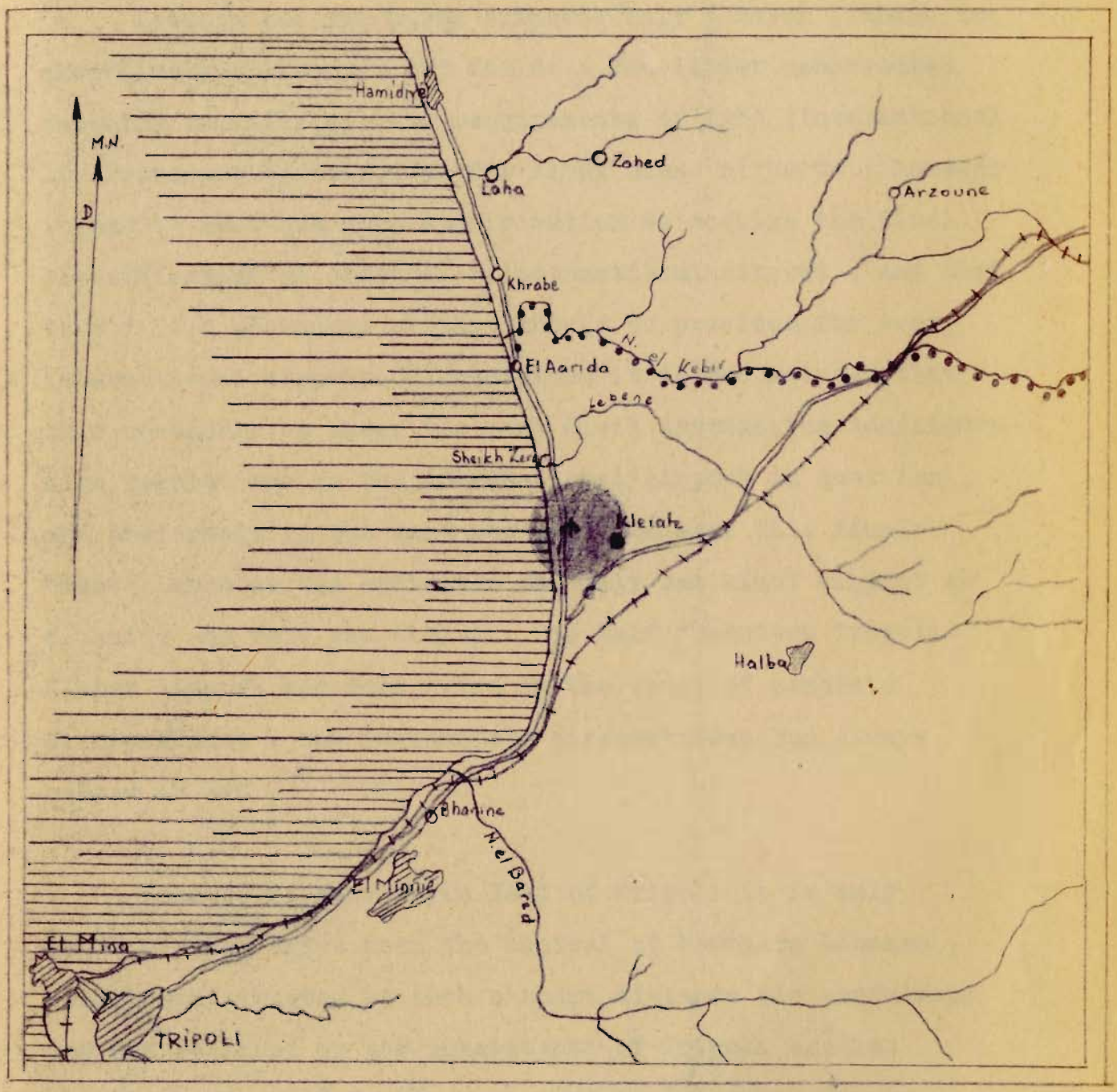
# PART II

# KLEIAT AIRPORT TERMINAL

## A SPECIFIC PROBLEM

From the previous chapter it is evident that to plan a terminal which will fulfill all its aims to the fullest extent and the most economically it is necessary to have a complete knowledge of the particular requirements of the airport in question .

# LOCATION PLAN – KLEIATE.

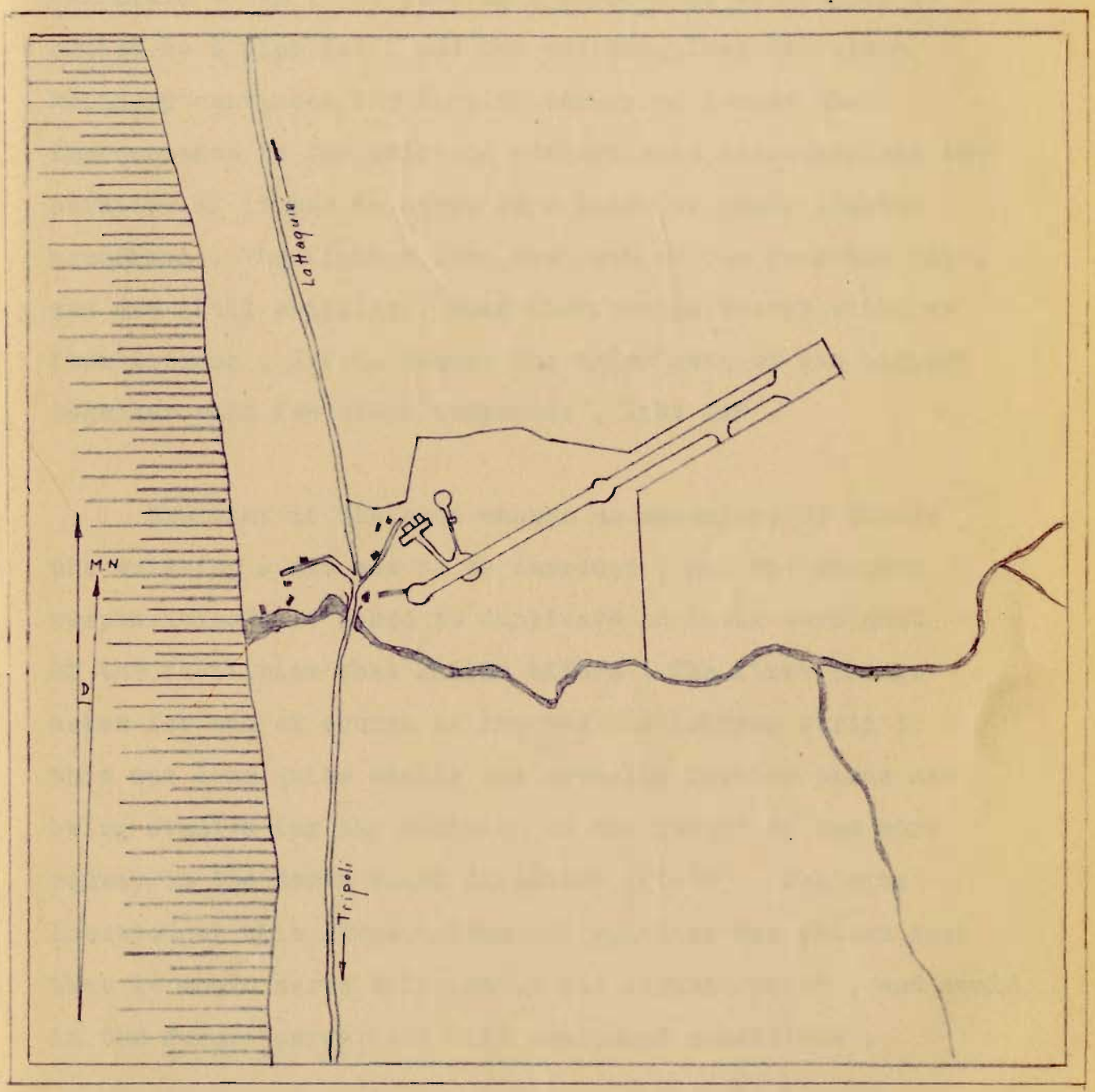



Scale 1/200,000

Lebanon has two major airports only : Rayak , which is exclusively military , and Khalde . The latter constructed recently fulfills all the requirements of IATA (International Air Transport Association) for first class airports ; however it has to meet one more specification to acquire the final classification of class AA - international airport , and that is : "... a secondary airport should be provided for every international airport." Furthermore it is recommended that this secondary be under the same Civil Aeronautics Administration regulations as the international airport in question , and preferably in the same country . To meet this final "must" Lebanese CAA officials had only one minor airport as a choice and this was Kleiat . The half forgotten Tripoli-Kleiat Airport had been twice on the verge of complete disappearance , but fortunately circumstances had always helped it out .

Located 22 kms. North East of Tripoli it is only at I8 minutes drive from the capital of Northern Lebanon , eventhough situated at such a short distance its usefulness was not realized by the inhabitants of Tripoli and its neighborhood . Before the war , due to its short runway , and unsifficient technical skills , it served mostly as an airbase for private plane owners . The income from these few flights and landings was so small that it was running at a loss and was considered as useless by some Public Works

# LOCATION PLAN - AIRPORT.




Scale 1/20,000

Officials . War , the strategic importance of Tripoli as outlet to a pipeline , and the existing Iraq Petroleum Refinery convinced the British occupying forces that improvements to the existing airport were necessary and imperative if it was to serve as a base for their fighter squadrons . The fighter pens are seen on the location plan, and are still existing . When the foreign troops withdrew from Lebanon , I.P.C. bacame the major user of the airport together with few other companies , like CAT .

Now that it has been chosen as secondary to Khalde the existing state was to be improved , and the airport responsibles were asked to duplicate in their work most of the facilities that Khalde offers . The first change asked for was of course to improve the landing strip ; this was done quite easily and actually further plans are being studied for the addition in the future of one more runway in the North South direction (00-18) . The site location of this Airport Terminal Building was chosen such that it would serve efficiently the actual runway , and would in the future serve both with unaltered conditions .

Then a big hangar (30 x 30 m) was constructed in addition to the already existing one owned by the IPC . Next in the series of improvements comes the building , as the existing two shacks which serve simultaneously as

customs , immigration , and waiting rooms are in a very deplorable state .

This project is to be more elaborately studied as it involves a greater investment and will ultimately serve the leading part in publicising the airport which is already gaining fame in Northern Lebanon as a good means for the improvement of the social and ecomomical character of the country .

Actual statistics prove an increase in landings , passenger and cargo traffic since the minor changes were adopted and carried in 1952 . The following figures gathered from official sources might help realise the importance Kleiat Airport is acquiring amongst Tripoli inhabitants .

| October 1 - 31 , I952 | | March I953 |
|---|---|---|
| from 82 landings | to | I33 |
| 373 incoming passengers | | |
| 479 outgoing | | |
| I34 transit | | |
| 986 | to | I774 |
| 4779 tons of incoming cargo | | |
| 11703 tons of outgoing cargo | | |
| I6482 | to | 24400 |

According to CAA officials these figures will still go up due to the growing interest of the population in this fast means of communications , which in turn will sooner or

later promote the keen interest of local and foreign airlines companies in this new "market" for their services .

So Klaiat will not only serve as secondary to Khalde , but also as city airport due to its modern accomodations .

# PART III

# THE TERMINAL BUILDING

"The greatest problem for any airport designer is to remember that a terminal is nothing but a transit shed and that the main object is to get passengers out of the plane and on their way , or vice versa , with as little architectural obstruction as possible .

"Of course everyone who has anything to do with the buildings agrees with that - but they want to except themselves . The airlines want their service counters blocking the way so they can confirm the passenger's return ticket and thus keep other airlines away . The building owner wants the passenger to go through a maze of concessions so that percentage rents go up . The restaurant man can see no reason why the bar cannot be the focus of the entire plan .

"The designer is so blocked from all sides by everyone that in spite of himself he loses sight of the objective, and/if he doesn't lose sight of the objective , someone forces him to ignore it before he is finished ."

- George J. Wimberley, AIA

# I N T R O D U C T I O N

Air-terminal design is difficult , trying and oftentimes frustrating . The difficulty lies partly in bringing together all ingredients of a terminal building - and make them work architecturally .

Part of the trouble of the architect stems from the fluidity of the airline business itself . Result:the program has been - and still is - trying to catch up with demand .

Part of his trouble stems from the rapid change in airline service .

Part of his trouble stems from the fact that public money usuall y pays for an airport and that the public and most well-intentioned officials usually become ill-qualified architectural critics overnight .

Part of his trouble stems from pressures exerted by groups involved directly in the terminal building : the airlines , the manager , the concessionaires .

But unless all these troubles are overcome , the terminal will be what so many of them are today : dull monuments to a misplaced civic pride - instead of handsome buildings designed for the efficient handling of planes , people and baggage.

A successful terminal must answer "yes" to six fundamental questions :

1. Can passengers and baggage move easily from taxi to plane and vice versa ?
2. Is it the correct size for the traffic it will generate ?
3. Can it be expanded economically ?
4. Meanwhile , is interior space flexible enough to meet program changes without costly alterations ?
5. Will the number , size and location of concessions produce maximum profit ?
6. Is its architecture simple and expressive of the building's function .

- Architectural Forum -

From a careful study and comparison of the different facts discussed in the previous pages it was found that the terminal building which will meet most efficiently the requirements of the Kleiat Airport is the "one-level operation" building because it is more economical to construct at locations where the apronand entrance drive are on the same level and also because it is the one that offers the simplest routing of passengers as well as baggage . Structurally the most suitable design is the modular, because it is most flexible and adjustable in case of future expansion .

The building is planned to include all of the following facilities : passenger facilities , space for visitors , restaurant and lunch counter , in flight kitchen , offices for traffic control , immigration , customs , mail and express, bonded whare house , weather bureau , airline offices , administration offices and pilots restrooms .

## G R O U N D  F L O O R

The ground level in this airport was designed to offer efficiently all the facilities that have a direct connection with passenger service .

Entry. Obviously this is the only element in the original

construction which cannot expand . That is why it was made generous in width and having three wide doors of plate glass to give an effect vastness .

Lobby.

This is the public space used exclusively to dispense information ; that is why it was made free of seats , signs and all things which might tend to confuse the passenger . It wasn't even given the monumental character achieved by carrying it two stories high as this was considered to be a waste of space which makes more difficult efficient utilization of the upper floor .

However to enhance the simplicity of this wide hall by an attractive touch , cantilivered stairs were placed in the middle of the lobby .

To this central unit are connected most of the facilities which make up the first floor plan .

Ticket Sales, Waiting Space .

Eventhough some difference of opinion exists as to where ticket selling booths and airline offices are to be located , they were definitely placed along the field wall , where they should be , because in this location they are seen immediately by passengers from the city on entering the building and are in the logical position closest to the planes where baggage is to be directed . (see diagram).

A waiting space was provided for opposite the airline offices , completely separate from the lobby and out of line of main passenger traffic . The size of the waiting space being influenced by very indefinite factors , ample provision was made to accomodate a greater surface in case the need arises .

Immigration and Customs.

The immigration and customs offices fit in next to the ticket selling booths . They were designed as part of the original plan and not in a separate building,as is the practice sometimes , in order to ensure smooth functioning with the rest of the operations .

Normally outgoing passenger have to go through immigration only , whereas incoming passengers should have their passport and baggage checked .

Unlike post office and express , immigration and customs are interdependant , that is why this arrangement is proposed as it the one that serves both purpose efficiently. (see circulation diagram)/. A toilet room was included in the inner waiting space for the use of passengers as well as personnel .

For the benefit of passengers in transit or on short visit to Lebanon a check baggage room was planned next to the customs exit .

Coffee Shop and Snack Bar.

Both the coffee shop and the snack bar were placed adjacent to the lobby and well in evidence for the sake of passengers in a hurry . Their service is done by two dummy waiters in direct connection with the main kitchen on the restaurant floor . This was done in order not to duplicate facilities .

Concessions .

Amongst others for which space is only provided , the "in flight kitchen" is the most important . It serves to provide plane meals packed in ready to use small packages.

Pilots & Hostesses Rest-rooms.

Although these restrooms are not always found in airports , they are very essential in as much as they provide a private resting place to the tired pilots and hostesses aground for a short time . Adjacent to these private toilets and showers are sometimes desirable , specially in a hot climate country like Lebanon .

Mail , Cargo and Bonded Wharehouse.

Last but not least important is the section housing the mail , cargo and bonded wharehouse . This was directly connected to a large storage area below ground level where transit goods and cargo could be stored .

## F I R S T  F L O O R

The two main facilities placed on this floor are the restaurant with its kitchen and the main offices .

Restaurant Facilities.

Because the restaurant is the biggest revenue producer of the airport,it involved much study and careful planning to make it as attractive and efficient as possible , in this plan . The greater portion of its patrons are expected to be visitors rather than passengers , therefore comfort , proper decoration , and efficient management will greatly contribute to its success . A big glass enclosed upper lobby with coat room and toilets was provided in connection to the restaurant .

As to the kitchen facilities they are the same as those provided for in a first class restaurant .

Offices.

The offices placed on this floor are the ones of the commanding officer , or manager , with his assistant's next to him , followed by the CAA and weather offices . The last room of the raw was designed with built in shower and toilet , which makes it possible to be used , when necessary , as a bedroom for the night shift of the control tower .

Spectators Facilities.

Sightseers - "necessary evil" - are a means of stimulating interest in air travel . However they should be kept out of the way of passenger and personnel traffic . This separation was thought to be handled best before they get into the building , and outside attractive stairs were designed for the purpose . They lead directly to a cantilivered concourse overlooking the loading platform , the point of main interest .

From the first floor a private staircase leads directly to the radio communications offices , which are situated for convenience under the control tower .

As Airport Terminals are expected to last for some time , special care was taken not to build something "modern" that would soon become dated . This was obviated by eliminating extraneous "modern" ornament , and by using simple materials .

However it should be kept in mind that planning does not end with the building proper , because "the best planned interiors can be spoiled by bad furnishing."

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