

vehicles. These deficiencies are usually found to exist under the headings of alignment, gradient and sight distance.

A study of a diagram, depicting graphically the roadway elements, clearly indicates the deficient sections most in need of reconstruc-

tion. Such a diagram based on sound factual information is a powerful weapon for highway administrators to use in backing up the need for highway improvements. However, the search for improved methods of appraisal is continuing.

FUNCTIONAL DESIGN FOR GROUND TRANSPORTATION FACILITIES AT AIRPORTS

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SYNOPSIS

Based on recognized principles of traffic operation, the author herein brings out the design of airport ground transportation facilities from a functional standpoint. Roadway and terminal facilities at the LaGuardia and Newark Airports have been fitted within existing physical limitations to operating demands and the more efficient and economical use of land. Experience gained at these facilities and through surveys of probable future demands have been utilized in the planning for the New York International Airport (the largest in the world) in its initial stage as well as the ultimate development.

Facilities for handling the ground transportation vehicles, such as cargo trucks, airport buses, urban buses, taxis and private passenger cars, are discussed and illustrations presented showing the importance in their location and design for greatest utilization of the terminal facilities at the airport. In the rearrangement and future design of these ground transportation facilities, an effort has been made to provide roadways free of parked vehicles, reserving the roadway exclusively for movement, loading and unloading. It is also pointed out that since a great portion of the revenue from an airport must be derived from non-flight sources, the design must be considered economically as well as functionally, thereby eliminating unnecessary overhead.

Construction of New York International Airport was begun by the City of New York in 1942. The Port of New York Authority became responsible for the operation, maintenance and development of this airport, as well as LaGuardia and Newark, under a 50 year lease arrangement in 1947 and 1948. After 18 months operation of LaGuardia Airport, and 9 months operation of Newark Airport, we have gained valuable data and experience in the location, design and arrangement of ground transportation facilities at airports.

One of the first steps in the development of this airport system, was to obtain data on the magnitude of the ground transportation problem. How do people travel to and from the airport? How many use regular buses, taxis, airport buses and limousines, and private passenger cars? What percentage of the people coming to the airport are passengers,

sightseers, or people bidding others good-bye, or are meeting an air passenger? How many trucks, taxis, buses, and passenger cars enter and leave the airport during the day? What is the peak hour and peak day loads in relation to average hours and average days? What are the volumes of traffic entering the various roadways and when do they occur? What facilities do the patrons of an airport desire? How large should these desired facilities be and where should they be placed? These are questions which must be answered before designing an airport. They are, of course, the same questions which generally must be answered in the design of any other transportation facility.

There is one problem which The Port of New York Authority must contend with, not always present in other transportation organizations; that is, its facilities must be so designed that they will pay their way, as the Port Authority is a self-sustaining organization,

having no power of taxation. It is expected that 60 to 70 percent of the revenue at these airports will be obtained from non-flight sources. It is imperative, therefore, that the proper concessions and other non-flight activities be provided, as nearly as possible, where the patrons of an airport desire them.

From an aeronautical standpoint, the more the terminal area is spread out, the easier access and egress of planes. But this spreading out of the terminal area complicates the ground movement of the traveler. The design of this area must consider the walking distance from the terminal and plane loading locations, and from the parking lots to the Terminal Building.

From our short experience in operating

terior portion of the airport, presented a problem of access. The taxiways must, of course, circle the terminal area, which necessitated the entrance roadway underpassing the taxiway, to avoid conflict between ground and air traffic (Fig. 1). It is an extension of Van Wyck Expressway and will absorb the traffic from both the Expressway and Southern State Parkway. The expressway type design was used with an interchange several hundred feet from the entrance to the airport. This interchange, a traffic circle with the expressway passing over the circle, will act as a distributing agent to the service facilities, to be built in this area (Fig. 2). The access road itself now has four lanes with provision made for widening to six lanes.

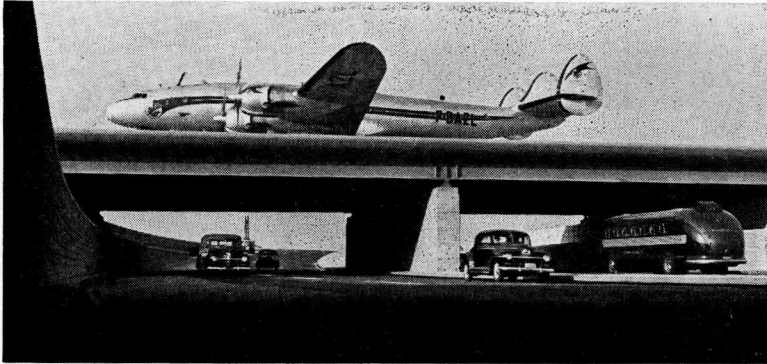


Figure 1. Vehicle Roadway Underpassing Taxiway

LaGuardia and Newark Airports, we found that the ground transportation facilities could be improved and needed additions. The results of this experience are being applied in the development of the design of New York International Airport, even in its temporary stages. Since these facilities must be economical to operate, as well as functional, considerable rearrangement of present layouts, additional services, added capacities and the freeing of movement is essential. They must be attractive, adequate, and easily accessible.

I shall illustrate some of the ground transportation facilities, and what we are doing to make them more functional and economical to operate.

Entrance Road

The tangential system of runway layout, putting the Terminal Building into the in-

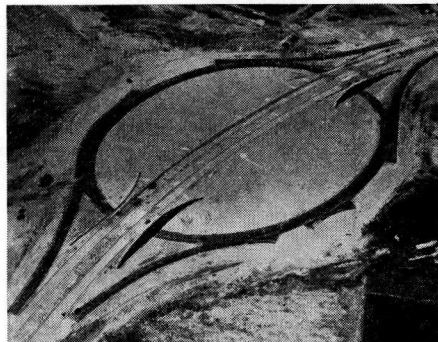


Figure 2. Entrance Expressway Overpassing Traffic Circle—Traffic Circle Will Act as Distributing Agent to Facilities in This Area

The underpass under the taxiway is, in itself, a major engineering feat, since it had to be constructed to withstand pressures from

below sea level and support two bridges capable of handling 300,000-lb. planes. Electric pumps automatically lift all storm water from the underpass.

Cargo Handling

At LaGuardia Airport, in the twelve months ending October 30th 1948, air cargo



Figure 3. Where a Great Portion of Air Cargo is Handled Immediately Adjacent to Passenger Terminal

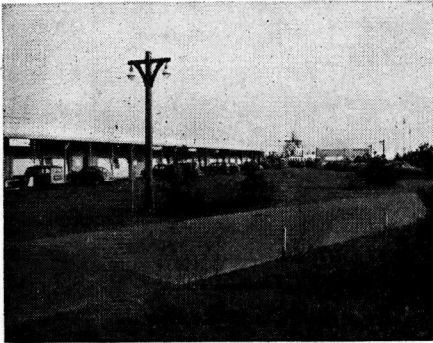


Figure 4. At New York International Airport cargo handling area is segregated from passenger terminal

amounted to 67,858,917 lb. A substantial part of the air cargo is now handled in the immediate vicinity of the passenger terminal. This is a very undesirable feature for several reasons (Fig. 3 and Fig. 4):

- (1) It compels all cargo vehicles to use the same roadways as passenger carrying vehicles.
- (2) It requires space which could be utilized in a much more profitable manner. In the New York area, where many per-

sons other than air passengers visit the airport, as sightseers, the space in and around the terminal building should be reserved for not only airline ticket offices, but also such necessary services as a bank, barber shop, men's and women's furnishings stores, restaurants and small bars, camera shops, drug stores, news stands, telegraph and telephone facilities, post office, and many others.

- (3) Cargo handling facilities are not and cannot be kept neat and orderly in appearance at all times. When located near the passenger terminal, they do not add to the aesthetic features of the airport.



Figure 5. The Initial Public Lot at La Guardia Airport

- (4) The maneuvering of large trucks causes congestion and hazards to other vehicles.
- (5) It necessitates hand cargo trucks to be pushed through crowds of air passengers or sightseers in taking cargo to and from the planes and cargo buildings.

Public Parking Areas

We found that large numbers of people were interested in just coming out to the airport to watch the planes come in and leave. The operations on the loading ramp are intensely interesting to the public. It was, therefore, decided that a public address system would attract people and provide a service very instructive and interesting. We have had as many as 12,000 people on a single weekend afternoon. Of course, this required quite extensive parking space. At LaGuardia, initially, there was only one public parking lot of about 230 vehicle capacity (Fig. 5). It was filled in the first hour.

Other lots reserved for employee parking, in less preferential locations, held about 1,500 vehicles. There is little demand for employee parking on Saturday and Sunday, and holidays, —the days when large sightseeing crowds are attracted. This fact was recognized and it was decided to use all lots as public parking lots, controlled by attendants (Fig. 6). This

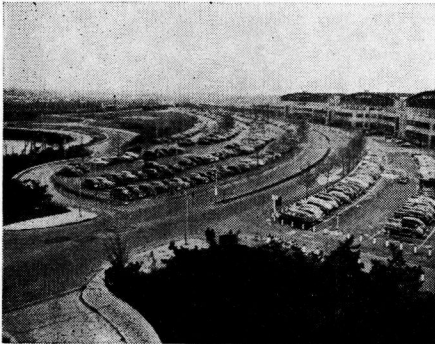


Figure 6. One of the Two Employee Parking Lots, which is Used as a Public Lot on Weekends and Holidays

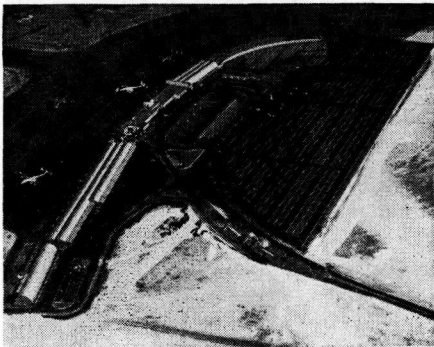


Figure 7. Public and Employee Parking Lot at New York International Airport

arrangement provided about 1,750 parking spaces for the weekend crowds and the few weekend employees. Windshield stickers were provided for employees, who, by their company lease arrangements, were allowed free parking.

At New York International Airport, this idea of consolidating employee and public parking was carried out by the construction of one large lot (Fig. 7). By incorporating all parking in one lot, the cost of operation is cut to one-third the cost of operating the

LaGuardia lots, as only one attendant booth is required against three at LaGuardia, where three lots are operated. This lot at New York International Airport has capacity for 2,300 vehicles, as it is believed that considerable interest would be created by the development of this great airport. Traffic enters the parking lot before reaching the Terminal Building, thereby eliminating a great amount of unnecessary movement in front of the terminal.

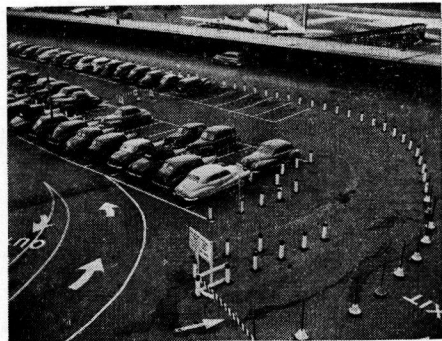


Figure 8. Baggage Pickup Area at La Guardia Airport

Short-Time Parking and Baggage Loading Area

It was found that there is a need for an area devoted entirely to short-time parking. Many people come to the airport to meet or see a passenger off, pick up an airline ticket, do some banking, make a small delivery, etc. We felt that a space for such parking should be provided free in a convenient location, just a few steps from the terminal. If it is not provided, these parkers will park anywhere, thus congesting the areas reserved for movement. Adjacent to this area is parking space for baggage pickup. Since it is necessary to provide a relatively large lot, many vehicles would necessarily be some distance from the Terminal Building, and it would be rather difficult to carry heavy luggage to the vehicle. This area is provided at each airport adjacent to the Terminal Building. No charge is made for the use of these areas, if the vehicle is not parked over 20 min. A charge of 50 cents, per 4 hours, is made when the vehicle remains in the area overtime. This higher rate is made to discourage long-time parking, thereby reserving the lot for what it was intended (Fig. 8).

Taxicabs

Taxis are a very necessary part of the ground transportation system at any airport. About 21 percent of the air passengers use this means of transportation. Taxis must be controlled, however, or they will occupy the most preferential spaces, where movement of vehicles is required. At LaGuardia, taxis, as many as could possibly get in, parked in front of the terminal and remained there until a passenger



Figure 9. Taxi Storage Area—La Guardia Airport

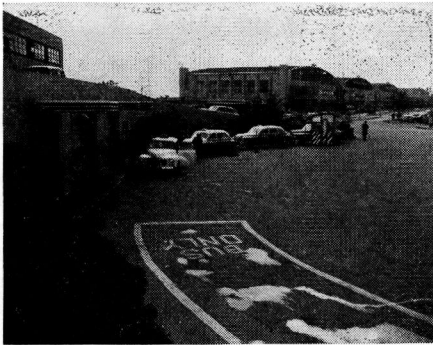


Figure 10. Taxi Lane—La Guardia Airport

was obtained. Those not able to squeeze into this area parked in the next closest place, blocking movement on the roadways and entrances and exits to parking lots. In surveying the possible solution to this problem (Fig. 9), it was decided to eliminate an official car area just across from the terminal, let the taxis park there until needed and permit only two or three in front of the terminal at one time. They are controlled by channeling them into a taxi lane, thereby permitting other traffic access to this area (Fig. 10).

At New York International, this idea was carried out by building an exclusive storage area (Fig. 11). This arrangement not only provided order, but eliminates another attendant. It will be noted that taxis must pass close to the parking lot booths, thereby permitting control of this area by the parking lot attendant. As at LaGuardia, only one or two taxis are allowed to park in front of the terminal, keeping this area free for movement.

Air Line Coaches

Air Line Coaches, operating directly between the Consolidated Air Terminal Building in Manhattan and the airports, also require a parking area as 44.3 percent of the air passengers use this form of transportation at LaGuardia Airport.



Figure 11. Taxi Storage Area—New York International Airport

At LaGuardia, they are rather limited in space, because space is at such a premium. As in the case of taxis, their parking space must be located for call, as required. This necessitates a space in the immediate vicinity of the terminal. At New York International, this space is provided adjacent to the taxi storage area (Fig. 12). The entrance to this area is adjacent to the parking lot attendant, who prohibits any unauthorized vehicles from entering this area. This is another economical arrangement.

Official Parking

It is believed that an official lot for Port Authority cars and cars of other high officials on business at the airport is necessary. If not provided, you can expect them to be parked in undesirable places, where they obstruct

other traffic. If the official lot is conveniently located, we have experienced no difficulty in getting these officials to use it. The parking

the parking lot attendant can govern its use. This also eliminates an extra attendant, who

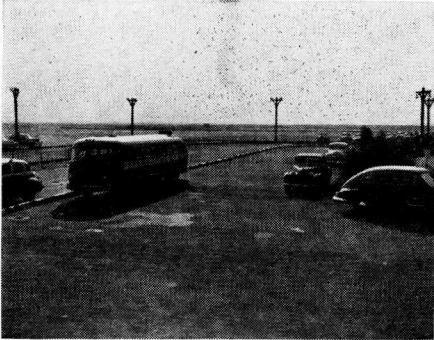


Figure 12. Storage Area for Air Line Coaches
New York International Airport

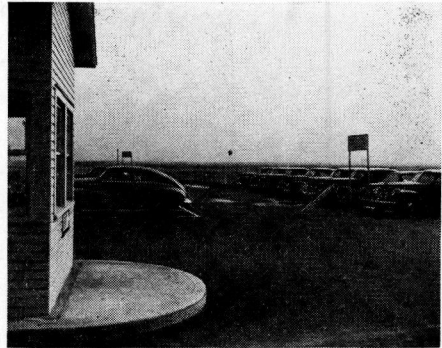


Figure 13. Showing Attendant Booth and
Official Lot to Left of Entrance—New York
International Airport

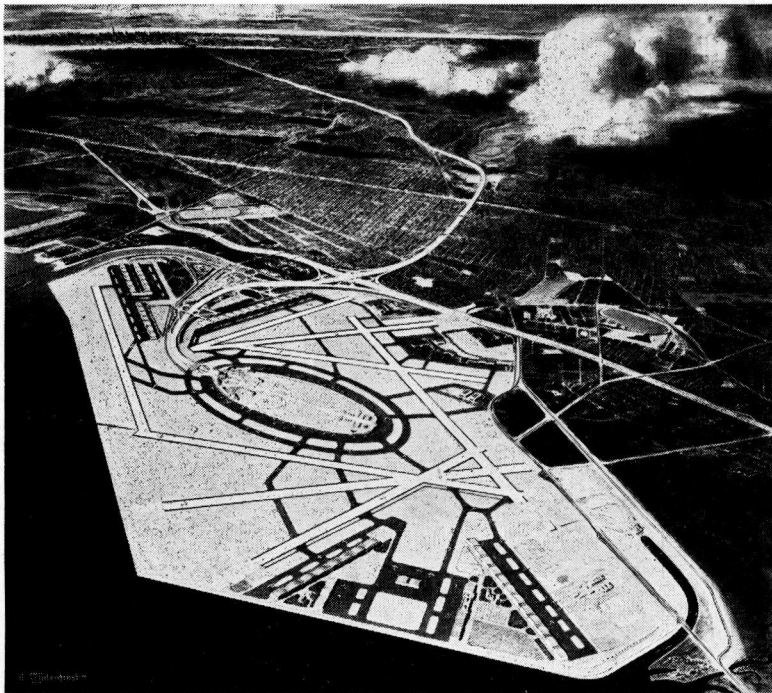


Figure 14. Artist's Conception of the Future New York International Airport

lot at LaGuardia was redesigned to include an Official lot, flexible in nature, so that it can be increased or decreased, as required. By including the official lot within the public lot at New York International Airport (Fig. 13),

would be required if the lot were separated from the public lot.

Public Transportation

One of the most important means of conveyance to and from the airports is provided by

the public buses operating from the subway and railroad terminals. At LaGuardia and Newark Airports, a survey indicated that 55 percent of the employees and 4 percent of the air passengers travel to and from the airport by public transit bus. At LaGuardia and Newark, these buses are routed for the convenience of the passengers unloading and loading in the immediate vicinity of their work area. Shelters are provided for the comfort of these passengers during inclement weather. Air passengers are taken to within a few feet of the Terminal Building. Space must be reserved at these locations for the loading of these buses—another important reason for keeping the area in front of the terminal free for movement. Only one or two buses arrive at the terminal at the same time, and space is set aside for them.

I have illustrated the trend of thinking going on in the Port Authority in expanding the air facilities of the New York area. All these airports will be completely developed to meet the demand of continuing expansion of the air industry.

To give you an idea of what we are planning about in airports, I want to show you an artist's imaginary conception of the future

New York International Airport (Fig. 14). The area shown comprises some 5,000 acres. Runways range from 6,000 ft. to almost 2 miles long and are 200 ft. wide with 50-ft. paved shoulders. The entrance roadway, of limited access, will be six lanes in width, three lanes in each direction.

The airport is so vast, that we are now working on a design for taxiway directional signs for aircraft, similar to illuminated highway signs, to guide taxiing pilots. These signs will be necessary at times of low visibility, in order to guide the pilots to and from the terminal area. The terminal area alone will spread over 300 acres, more than 25 times that of Yankee Stadium. The Terminal Building will be ten times as large as the present terminal at LaGuardia. It is expected that this airport will employ 25,000 people by 1960, as compared to LaGuardia which now employs more than 10,000 people.

It can be seen from these figures that the ground transportation at this airport is going to be tremendous problem. We are gaining valuable experience in operating the existing airports, and feel that we will improve the ground transportation facilities a great deal in the development of these airports from a functional and economical standpoint.