SURFACE ACCESS TO INTERNATIONAL AIRPORTS

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INTRODUCTION

Great circle routes are not always as easily understood on flat maps as they are on the globe. On the globe, it is possible to draw a great circle route between Tokyo and Rio de Janeiro as a straight line. This line crosses the United States, entering at about Seattle, Washington, and exiting at Houston, Texas. It is interesting to consider what is going on at the major U.S. cities along this line.

In Denver, an entire new international airport has been built. Houston International Airport sees itself as having the potential to become the second international gateway to the Caribbean and to Central and to South America. An important component of the reasoning in these two cities is that most of South America is located east of North America, making Denver and Houston logical transfer points for traffic to and from the south.

The midpoint of the great circle route between Tokyo and Rio de Janeiro is line is near Seattle. A perpendicular to this line at Seattle leads directly to London and Paris. Those who live in the Pacific Northwest have historically thought of themselves as living in a corner of the country. In realty they are at a potentially important hub in a global air transportation system. Recognition of this advantageous geographic position has led many airports to rethink their role as international gateways.

The topic of this paper is surface access issues at international airports. It begins with a brief review of the history of aviation technology and its relationship to airport design and then addresses how they have influenced access to airports by surface transportation.

AVIATION TECHNOLOGY

The following premise is set forth as a starting point: in air transportation, in fact in all modes historically, the focus has been on vehicle technology. As various forms of transportation technology were invented, entrepreneurs sought to find a transportation problem that the new technology could solve. Each advance in vehicular technology was a solution in search of a problem. The consequence of this approach has been that transportation planners are typically in a catch-up mode. They tried to accommodate pieces of technology that have been invented without a purposeful focus on market demand and need.

Until 1903, no powered aircraft had ever flown. When the first one did, it turned out to be the creation of two bicycle mechanics from Dayton, Ohio, whose primary purpose was to demonstrate that a heavier-than-air object could be held aloft.

Immediately after it was invented, nothing very productive could be found to do with the airplane except its military applications.. It took quite awhile to realize that airplanes could used to carry the mail. It was not until nearly 20 year later that the first airlines were formed, and even then there was no clear perception of a need to move large numbers of people quickly over long distances. Jet-powered airplanes, which first flew in 1939, did not enter commercial service until 1958. When they did, they were a bold gamble on the part of Juan Trippe and Pan American Airlines. Trippe took a military aircraft that the Boeing Company had designed and not been able to sell and put a civil version into commercial service.

AIRPORT DESIGN

What does this tell us about airports? Because of the fascination with vehicle technology, the airport design process — both for the airside and the landside — received relatively little attention. At first, in fact, airplanes were simply landed anywhere that was high, dry, and flat.

In the early years the interface between the surface transportation network and the airplane was pretty simple. Proximity was the principal rule. To this day, there are parts of the United States, like Alaska, where that proximity rule still applies, but they are increasingly few.

What will happen to air travel in the future? From a base of about 450 million enplaned passengers worldwide in 1992, the number of enplanements will increase to about 800 million by 2000. This number will grow to about one billion early in the next century before the normal S-shaped growth curve begins to appear and the air travel industry starts to mature.

Will electronic communication cut into this growth? The S-shaped growth curve suggests that ultimately the answer is yes. But for now electronic communication is actually driving air transportation growth more than it is cutting into it.

If the number of passengers is likely to double within the next decade or two, what will need to be done with airport infrastructure? Will the number of air carrier runways at the world's international airports need to be doubled? The answer is no. Aircraft manufacturers have a plan. They do not intend to double the number of airplanes; they intend to double their size. This is the 600- to 700-passenger airplane that manufacturers like McDonnell Douglas and Boeing are talking about. By doubling aircraft size, the hope is that it will be possible to double the number of passengers and still accommodate them on approximately the same number of runways as today.

What impact will these new large aircraft have on landside transportation at airports? Will they require that the existing infrastructure be doubled in size? The answer to this question, too, is no. A 600- to 700-passenger airplane, to borrow a term from surface transportation planning, is a high-occupancy vehicle. On the landside of airports, the principal vehicle used for access is the private automobile. In most cases these vehicles carry on average only slightly more than one passenger per trip. The result is landside congestion. One reason for this is the large number of airport-bound trips. Another reason is that airport trips tend to coincide with the hours when the roads are busy with other rush-hour traffic.

Clearly at issue is the need to balance the airside and the landside of airports. To do this requires incorporating public ground transportation into airports and encouraging its use.

Airport terminals must be carefully evaluated in terms of their ability to accommodate public transportation. In this evaluation airports can be grouped in two categories: centralized and decentralized. Centralized airport terminals are those that concentrate ticketing and bag claim in one location. Decentralized terminals duplicate and disaggregate these primary passenger processing facilities. Some examples of each follow, decentralized airports first.

Kennedy International Airport is decentralized; each airline has its own terminal. Dallas-Fort Worth (DFW) has a similar design. It consists of a series of unit terminals. Twelve are planned at full build-out. Kansas City has three separate unit terminals. Salt Lake City is slightly different in form from DFW or Kansas City, but it is still decentralized. The terminal has several concourses, each of which is a unit terminal. That is, each structure contains ticketing and bag claim facilities. The terminal at Boston Logan Airport is made up of a series of unit terminals arrayed around a central arc. Auckland, New Zealand, has a similar plan with separate domestic and international facilities.

The following are examples of airports that have centralized terminals. Tampa has a central terminal, a series of airside concourses, and a linkage between them. All baggage claim and ticketing occurs in the central terminal. Orlando has a central terminal complex, adjacent automobile parking, and connecting links to the airside concourses. There is no ticketing or bag claim in the concourses; all these functions are located in the central terminal. Atlanta Hartsfield Airport has a central terminal and a series of concourses. Seattle-Tacoma International, which was built at the same time as Tampa, was really the second airport in the United States to incorporate a centralized design. At Sea-Tac, there is a central terminal, a south and a north satellite, and four concourses. All ticketing and baggage claim is concentrated in the central terminal building. McCarran International Airport in Las Vegas, Nevada, is a centralized airport. Although at present it has only a single concourse, the master plan calls for several more, with all ticketing and baggage claim located in the central terminal.

The new Denver International Airport, follows the same scheme. The central terminal and a series of airside concourses are connected by a people mover. The new Hong Kong airport will have a similar layout. Like Denver and Sea-Tac, Hong Kong will have underground people movers. The new Auckland,New Zealand, airport is moving toward a centralized arrangement. I.M. Pei was working on a new centralized terminal at JFK, but this project fell on hard times as the economy slowed down a few years ago. The project included a massive central passenger processing building that was to be used exclusively for access by public transportation. A series of umbilical people movers were to have been constructed to connect the central passenger processing building to the existing unit terminals.

Washington Dulles International Airport was the first to have a centralized form. Eero Saarinen, the architect who designed the airport, set out to develop a new concept. He came up with the idea of concentrating ticketing and baggage claim in one location, rather than allowing it to be scattered to several buildings. Dulles has often been criticized as a poor design. However it is important to remember that the criticism has not been of the plan itself, but on the rather clumsy form of people mover that was provided at the airport. Once more efficient and effective forms of people movers were developed, the centralization of airport terminals really came of age.

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What differentiates these two airport design schemes with respect to landside access? Both attempt to serve the same fundamental goal: to minimize the distance that a passenger has to walk. The decentralized schemes do this by catering to automobile users. The goal is for passengers to be able to park their cars as close to the airplane as possible. Both Dallas-Fort

Worth (DFW) and Kansas City International accomplished this brilliantly. Until the new Denver airport opened, they were the two newest major air carrier airports in the United States. At the time they were designed and built, they were heavily advertised as the airports where the length of the walk from car to plane was the shortest possible.

The problem at an airport like DFW becomes apparent when trying to devise a way to integrate public transportation into the design. There is actually public transportation at DFW today. Public bus service is available at the airport. The bus stops three times at each of the unit arches,s once at each end and once in the middle. The problem arises as new unit terminals are added. (A total of 12 terminals are planned.) If the bus stops three times at each, 36 stops are required to make a full circuit around the airport. This is where one of Robart's rules comes into play. This rule states that if there are more than three stops, public transportation at an airport will not be used. Therefore, to improve the efficiency of surface access at large airports, terminals need to be centralized.

Over the years TRA*Black & Veatch has studied passengers using public transportation at airports. A pattern is evident. At both Boston Logan and Kennedy International Airports the split between enplaning and deplaning passengers using public transportation is about 70-30. That is, about 70 percent of the passengers who use public transportation are enplaning passengers, and only about 30 percent are deplaning.

The explanation for this imbalance is simple. First, enplaning passengers are generally willing to take whatever time is necessary to get to the airport. Thus, public transportation may seem a reasonable option. Moreover, for the airlines, going to the airport is a many-to-one problem. This means that an airline is happy to collect passenger baggage at some remote location because all bags are going to a central place. The reverse journey is more difficult. As passengers deplane, they are not interested in standing in the cold or heat or rain or, for that matter, standing at all to wait for public transportation. They want to get moving. Consequently, public transportation that is hard to reach, difficult to use, or not easy to understand is not likely to be passengers' first choice.

The lesson is clear. When airport terminal facilities are being designed, it is necessary to make access to public transportation for deplaning passengers one of the highest priorities. This is how to achieve a more balanced ratio of use between arriving and departing passengers.

A general comment about European compared to U.S. airports is in order. At European airports there is much more effective integration of public transportation than in the United States. This is due in large measure to the superior ability of European airports to build public transportation and efficient baggage handling in to the basic design. Also, most European airports have a dominant national carrier, which frequently has more than half of the traffic. This carrier processes traffic for other carriers, and this encourages centralization.

In summary, these three thoughts are important to remember. First, demand is going to continue to grow, and the bulk of this growth is going to be international traffic. Second, the size of airplanes is going to increase in response to this growth. Third, public transportation needs to be integrated into passenger terminals, and this points toward centralization as a principal design orientation.