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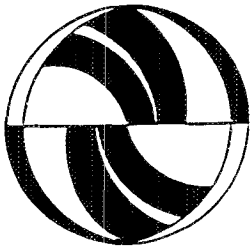
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### Publication Date

1994-03-01



**The Potential Role of Airports as Intermodal  
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Working Paper  
UCTC No. 406

The University of California  
Transportation Center

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Berkeley, CA 94720

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**The Potential Role of Airports as Intermodal Terminals  
Lessons from International and Domestic Experiences**

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*Working Paper  
March 1994*

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## INTRODUCTION

The Intermodal Surface Transportation Efficiency Act of 1991, calls for closer coordination of intermodal transportation as a method to solve many of today's transportation problems. The passage of this Act has prompted many engineers and planners to re-assess the potential benefits of intermodal cooperation. One area that has gained increased attention is the relationship between air and rail transportation. Many intermodal proponents feel that the integration of air and rail travel could help reduce airport congestion and delay. They also believe that it creates additional capacity so that the system is able to meet forecasted demand.

Currently the U.S. airports are behind their European counterparts in establishing rail connections. They are falling even farther behind in the types of services that are being offered to travellers. In the U.S., much of the current debate revolves around extending transit systems from the city center to the airport. In Europe these connections were established during the 1970's and 1980's. Many European cities have moved beyond this step and are now trying to integrate and coordinate their air and rail systems. In Germany, Switzerland, and the Netherlands both state and private carriers are emphasizing the two modes complementarily in an attempt to reduce airport congestion and divert short haul traffic from air to rail. In each of these countries airlines have substituted rail service for air service in at least one market. Even further integration is occurring in France and Germany where there are plans to establish high speed rail service to the major international airports. Both the government and the airport authority feel that this integration will enhance their competitive position giving them an advantage over other airports in Central Europe.

Each of these examples illustrate the evolution of the European air and rail system coordination. As the U.S. begins to consider the cost and benefits of establishing closer intermodal links, it is instructive to consider the European and Asian experiences. The purpose of this paper is to explore both the international and domestic airport rail connections that exist today as well as those that are proposed for the near future. The paper also discusses the existing cooperative efforts that coordinate air and rail travel.

## GERMANY

Germany has a long history of air and rail cooperation. In 1926 the two modes began cooperating to provide rapid freight service. Later the railroad allowed Lufthansa's customers to substitute airline tickets for 1st class rail seats between cities. This strong legacy of cooperation is in part due to the fact that both air and rail service is provided by the state. Under this system competition between the two modes is not a main concern. Even after the recent privatization efforts, Lufthansa is still 51% government owned. The Germany Railroad, the Deutsche Bundesbahn (DB), is also government owned and operated.

Today most major German airports are connected to rail or public transit systems. Table 1 shows the existing and proposed airport rail links. This Table lists only the airports that have direct rail access. Main line service indicates that the airport has direct access to the entire rail network. Local service means that the airport is connected to the local transit network. Several other regional airports are accessible to rail via a bus shuttle service. These airports include Hamburg, Hannover, Koln, Bonn, Nuremberg, Saarbrucken, and Stuttgart. On average 8% to 10% of airport passengers use rail to access German airports. In Frankfurt, the most rail accessible airport, estimates are 25% (Rail/Air Complementarily, 1991).

Table 1. German Airport Rail Links

<i>Airport</i>	<i>Type of Service Link</i>
Berlin - Schonefeld	Local and Main Line Service
Berlin - Tempelhof	Local Metro Service
Bremen	Local Tram
Dusseldorf	Local and Lufthansa Service
Frankfurt	Local, Mainline, & Lufthansa Service
Munich 2	Local Service
<i>PROPOSED</i>	
Dusseldorf	Main Line
Frankfurt	High Speed ICE Link
Hannover	Local S Bahn
Stuttgart	Local Line

SOURCE: Airport International Jan. 1992

Over the past eight years the Deutsche Bundesbahn has been working to establish high speed train service to replace their Intercity network (IC). In 1991 they began operating an IC Express on new tracks between Hannover and Wurzburg as well as Stuttgart and Mannheim. Although the system has not been connected to an airport, there are plans to have high speed service to Frankfurt by the end of the century.

One of the most interesting features of the German experience is Lufthansa's "Airport Express" service. Lufthansa was the first airline to offer rail service as an alternative to air service. The service began in 1982 and is operated at the airline's two largest hubs Frankfurt and Dusseldorf. There are two lines in service today. The North line was established between these two cities and also serves Koln and Bonn. The South line runs between Frankfurt and Stuttgart and also serves Mannheim. Under an existing agreement Lufthansa leases trains from Deutsche Bundesbahn who operates them. Lufthansa provides all other service and determines their schedules.

Lufthansa's primary justification for establishing the service was to reduce its losses on the short distance routes that feed traffic to its hubs. By the end of the 1970's the Frankfurt to Koln and Frankfurt to Dusseldorf routes had lost about 30 million Marks a year (Institute of Air Transport, 1991). A primary cause of these losses was that 95% of the passengers on these routes were passengers making international connections and not paying the full costs of the short haul feed. Another major consideration in the decision to establish the service was that it was becoming difficult for Lufthansa to gain additional takeoff and landing slots at Frankfurt. Entering into this cooperative arrangement with the railroad allowed Lufthansa to increase service frequency without adding additional flights or their associated costs. It also allowed them to reduce the number of existing flights and use the replaced slots on more profitable ventures.

Lufthansa Express Service is available to all Lufthansa customers. Reservations are made through their reservation system using exactly the same method as airline reservations. In the reservation system the rail link is given a flight number and appears as a regular flight. The tickets issued are exactly the same as an airline ticket. The rail fare is equal to the airfare between the two cities. Baggage can be checked through to the destination at either the rail station or

airport. There are four daily trips in each direction on the north line and two daily trips on the south line. Introducing the service has not completely eliminated scheduled flights between the cities however, it has reduced the number of flights between cities. When service on the South line was established, Lufthansa was able to eliminate one set of scheduled flights.

Rail travel is substantially slower than air travel. A flight from Frankfurt to Dusseldorf takes 50 minutes while the train takes 2 hours and 35 minutes. The flight time to Koln/Bonn is 45 minutes as opposed to the two hours the train takes. The difference between the travel times is overstated for trips starting or ending downtown since additional time is needed to get to or from the airport. Even though rail has a longer travel time, its share of passengers increases as the overall trip time becomes comparable. Passenger information for the two routes in 1990 is shown in Table 2. It is interesting to note that for Koln and Bonn rail enjoys a substantial share of the passengers. One possible explanation is that the Koln Bonn Airport is located between the two cities and additional time is required to reach downtown.

TABLE 2  
1990 LUFTHANSA'S AIRPORT EXPRESS MARKET SHARE

MODE	DUSSELDORF	KOLN/BONN
	# PAX (% TOTAL)	# PAX (% TOTAL)
Air Traffic	433,956 (93.4)	122,238 (49.5%)
Airport Express	30,786 (6.6%)	130,036 (51.5%)

Source: Airport International Jan. 1992

Lufthansa offers other cooperative services with Deutsche Bundesbahn. In 1985 they established a "Rail and Fly" program in which travelers to and from Germany are able to use rail service to access the German airport. The service was designed to reduce automobile usage from outlying areas. It has been very well received and both carriers are attempting to increase usage by offering various deviations of the program to attach additional users.

## SWITZERLAND

Switzerland has also been aggressively promoting rail service to their airports. The government of this small and densely populated country, has worked very hard to developed an extensive rail system. They have promoted the use of public transit as an alternative to private vehicles for many years. Both major international airports, Zurich and Geneva, have exceptional rail service. Table 3 illustrates the current and proposed rail access to the Swiss airports.

Table 3 Switzerland Airport Rail Links

<i>Airport</i>	<i>Type of Service Link</i>
Geneva	Local and Mainline
Zurich	Local and Mainline
PROPOSED	
Basel	Local and Mainline

Source: Airport International Jan. 1992

Swiss Air uses rail service to move passengers between its Zurich and Geneva hubs. They also use rail service between Zurich and Bern and Geneva and Bern. The service is similar to Lufthansa's Airport Express. Passengers are issued airline tickets for the entire trip including the rail leg. Swiss Air uses its designator and a flight number to indicate the route in its reservations system.

There are several critical differences between the two companies services. The most notable is that in Switzerland the rail service is provided by the Swiss Federal Railways. Passengers are given reserved seats on regularly scheduled train service between the cities rather than scheduling special trains. Under this system no additional equipment is required, however train service is not coordinated with the airline schedules. This creates greater interline friction but the delay is minimal since there is frequent service between the cities.

Swiss Air does not offer any air service between Bern and Geneva or Zurich but uses the rail system to feed traffic to their hubs for a number of reasons. The cities are located close enough so that rail travel times are comparable to flight times. Rail's level of service exceeds anything that they themselves could offer .

Trains leave every hour during the peak travel times and every two hours otherwise. The Bern market is relatively captive since air passengers do not have many other alternatives. As a result of these conditions there is little cost associated with relying on the railroads to feed traffic to their hubs. Service between Geneva and Zurich is available on both modes, but rail plays a very minor role in connecting air passengers between the two hubs since there is a substantial time disadvantage associated with its use.

Swiss Air purchases all of the rail tickets that they issue from the railway. They are not given any discounts. In order to recover the extra costs associated with the additional baggage handling and computer reservation, they charge a higher fare for this "flying" leg than a passenger would pay when they purchased the ticket directly. On long haul international flights, the fare to Bern is the same as it is to Zurich or Geneva which indicates that Swiss Air pays excess costs of the rail ticket from their yield.

The rail link to Zurich Airport was established in 1980. The link to the Geneva Airport began operating in 1987. Establishing rail service had a major impact on the mode choice decision for passengers using the airport.

Recent estimates shown in Table 4 demonstrate that rail traffic is growing at a faster rate than air traffic at the two airports. The numbers listed in Table 5 over emphasize the amount of rail traffic as a portion of airport traffic since they represent the total number of passengers using the rail link. This aggregate number includes local users and people accompanying passengers to the airport.

TABLE 4 . Air and Rail Traffic at Zurich and Geneva Airports  
(Million Passengers)

Airport / Year	Rail Traffic	Air Traffic
Zurich		
1981	3.8	7.3
1983	4.4	8.7
1985	5.0	9.5
1987	5.6	10.6
1989	6.6	12.2
Geneva		
1988	2.2	5.7
1989	2.4	5.9

Source: OFF and OFAC

Swiss Air and the Federal Railways cooperate to allow passengers to check in and receive boarding passes at 24 railway stations. Baggage can also be checked in at 112 railway stations around the country.

## FRANCE

The French have a long legacy of promoting rail transport. They have a very extensive network which has access to most of their international airports. Table 5 illustrates the existing and proposed rail links. Lyon and Paris airports are both scheduled to be connected to the high speed rail (TGV) system within the next two years.

Table 5. French Airport Rail Links

Airport	Type of Service Link
Paris - Charles de Gaulle	Local Service via Bus
Paris - Orly	People Mover to Mainline
Lyon	Local
Proposed	
Paris - Charles de Gaulle	Mainline and TGV
Lyon	Mainline and TGV

Source: Airports International Jan. 1992

The most interesting intermodal development in Europe is the French attempt to link the TGV network to their airports. A station at Lyon's Staolas International Airport is scheduled to be completed in late 1993. This will be the world's first direct airport link to high speed rail. The airport hopes that establishing a high speed rail link will help them become a major European multimodal facility. Historically the TGV has diverted traffic away from air to rail. The Lyon airport authority feels that the two modes can be complements and that modal competition will not harm their overall market share. They believe that access to high speed rail will provide a competitive advantage over other European airports.

A new high speed rail station is also being constructed at Charles de Gaulle Airport. The station will be located underneath the air terminal and is scheduled to be completed in 1994. It will provide Paris air travelers direct access to the TGV network eliminating the need to connect through central Paris. The Paris airport authority also views access to high speed rail as a competitive advantage that will help them maintain their status as one of the main international European hubs. The project is being financed by both the French Railroads (SNCF) and the Airports of Paris. The project was justified on the basis of providing service to the airport as well as helping to alleviate some congestion at the mainline station in central Paris.

There has been minimal opposition to establishing high speed rail service at the French airports. Most French citizens strongly support the TGV system. The major French Airlines, Air France, and its subsidiary Air Inter, are state owned and operated. Both of the carriers could lose the most traffic as improvements are made to the HSR accessibility. Neither of these airlines have vigorously opposed the new projects. Since both modes are state owned and operated, it could be argued that competition between modes is not a primary concern.

The newly constructed link to Orly Airport represents an innovative financing scheme used by the French Government to establish better public transit service to the airport. In the early 1980's, the Paris Transit Authority (STP) determined that Orly needed direct access to the metro system. All of the proposals were very costly forcing the organization to look at alternative financing. In 1987 they decided that a franchise operation should provide the service. All of the \$352 million needed to establish the service was supplied by private sources. The OrlyVAL company was created to build and operate the system for 30 years under a turnkey agreement. The line was finished and put into operation in 1991. Even though ridership is lower than expected, OrlyVAL is still optimistic about achieving profitability.

Air France and SNCF also offer some cooperative air-rail fare services to downtown Paris using the Metro and Regional Express (RER). They have not announced any agreements to establishing cooperative service with the TGV, however Air France has entered into a marketing agreement with Lufthansa and it is likely that they will use some of Lufthansa's experience in establishing service.

## UNITED KINGDOM

The British also have a high level of rail access to both their international and regional airports. Table 6 lists the current links and proposed links. During the 1980's and 1990's the British concentrated on improving rail service to the major London airports. Current projects include establishing a Heathrow Express Service that will reduce travel time to downtown London from 45 minutes to 16 minutes. Currently the airport is connected to downtown by the Underground. One advantage of having underground service at the airport is that airport passengers have access to the entire London network. This is also the service's primary disadvantage. The privately owned British Airports Authority (BAA) conducted a survey that found that the service suffers from slow transit times and the fact that air passengers must compete with other commuters on the line for space. Both of these conditions limit the attractiveness of the connection. The Underground only accounts for 22% of the airport's users traveling to and from the airport (Airport International, 1990). When the express service is established, it is predicted that rail's share of airport users will increase to 28% (Airport International, 1990).

Table 6. British Airport Rail Links

Airport	Type of Service Link
Birmingham	Mainline and Local via Peoplemover
London - Gatwick	Mainline and Local
London - Heathrow	Local Metro
London - Stansted	Local and Mainline (Nonstop)
Newcastle	Local Metro
Southampton	Mainline and Local
PROPOSED	
Birmingham	Light Rail
London - Heathrow	Nonstop Mainline
Manchester	Local and Mainline

Source: Airports International Jan. 1992

When Gatwick was built in 1958, a conscious decision was made to locate the airline terminal near an existing rail line so that commuter service could be offered. During the 1970's and 1980's, Gatwick began growing as a alternative airport to

Heathrow. In 1980 a new station was built at the airport terminal which established a connection to the commuter rail line. In 1984 the BAA and British railways established the Gatwick Express, a dedicated service to the downtown. The express service became very popular. One survey in 1984 by the Civil Aeronautic Administration, showed that rail's modal share was 32% of all traffic using the airport and 57% for all Central London traffic. British Rail has also introduced baggage service at Paddington Station which allows air passengers check luggage through to their destination Downtown.

As a result of the Gatwick's success, the BAA and the British Railways decided to establish rail service to Stansted Airport. They incorporated much of what they learned in the Gatwick experience. One primary concern during the planning stage was that the two agencies work closely together in developing the service and locating the rail terminal in the airport. One problem with the Gatwick project was that the airport authority never realized the integral part rail played in their access plan and did not make strong enough efforts to integrate the terminal into the airport's design. Another major decision in the project was whether to build a dedicated line rather than use an existing line. They decided to minimize costs and establish dedicated service on an existing lines. Unfortunately this decision lead to unreliable service because of congestion on the line. Table 8 displays the result of a 1986 survey conducted on the Gatwick Express. It is interesting to note that price was of less importance than both frequency or reliability.

Table 7

Gatwick Express Quality of Service Features Ranked in Order of Importance to Travellers
1. Frequency of Service
2. Speed of Journey
3. Reliability of Arrival
4. Price of Journey
5. Ability to get Seat
6. Space for Luggage
7. Seating Comfort
8. Ease of Obtaining Ticket
9. Avoidance of Changes En Route

Source Prideaux, 1988

Using the results from this survey and the relative success of the Gatwick Express, both the airport and railroads worked together to develop the Stansted Express. The service began in 1991 and has slowly increased its share to 17% of airport traffic in December of 1991( Airport International, 1992).

Manchester, Britain's busiest regional airport, is currently planning to establish rail service in 1993. Currently a branch line to the airport terminal is being built. In 1984 Birmingham, another major regional airport, began operating a Maglev feed from the airport to the downtown rail station. This was one of the world's first maglev systems.

The British airlines have not attempted to substitute rail service for air service on any of their routes. In Britain the airlines are deregulated and competitively managed as opposed to other European countries. This may be one reason that there has not been much cooperation or coordination between the modes.

## EUROPE

Many of the other European countries have established rail access to their major international airports. Table 8 lists the existing and proposed links to some larger European Airports. The majority of these airports have local lines providing access to the airport. The majority of proposed projects consist of mainline service that will connect the airports with the entire rail network.

Table 8 European Airport Rail Links

Airport	Type of Service Link
Amsterdam - Schiphol	Mainline and Local
Barcelona	Local Line
Brussels	Local Line
Pisa	Local Line
Rome - Fiumicino	Local Line
Vienna	Local Line
PROPOSED	
Brussels	Mainline
Copenhagen	Mainline

Milan	Local Line
Stockholm - Arlanda	Mainline and Local

Source Airports International Jan. 1992

KLM is the only other European Airline working closely with their rail counterparts to coordinate their services. They have worked to coordinated rail service between Schiphol and Rotterdam. This service is listed in the computer reservation system as a KLM flight however a separate ticket must be purchased. A baggage check in service at Rotterdam and The Hague is also available to make rail travel more convenient for air passengers.

#### JAPAN AND ASIA

Japan has a very high population density and tends to rely heavily on mass transit. It is surprising that until recently they had rather poor rail service to the New Tokyo International Airport at Narita. Prior to 1991, Narita (67 km from Tokyo) had rail service but it required an awkward bus transfer to complete the journey. Only 15% of travelers to the airport used the rail connection which is low for Japan. Recently Japan improved their airport rail access by installing two direct rail lines. One line accesses downtown Tokyo while the other provides transfer service to Haneda, the second Tokyo airport. It is hoped that these new lines will increase rail ridership and help reduce automobile congestion near these airports.

Haneda airport has a dedicated monorail system that provides service to the Hamamatsu cho rail station in Tokyo. As the airport expands into Tokyo Bay, there are plans to extend the monorail to the new terminals. Both of new international airports under construction (Osaka Kansai and Sapporo Chitose) are also scheduled to have rail service. The Japanese Shinkansen, bullet train, which was established in 1964 is not directly connected to any major airports. There are proposals to establish a high speed maglev link to Narita in the future however no firm plans have been made. Table 9 lists the current and proposed rail links at major Asian airports. Currently none of the Asian carriers are promoting cooperative air rail services.

Table 10. Asian Air Rail Links

Airport	Type of Service Link
Tokyo - Narita	Mainline and Local
Tokyo - Haneda	Monorail to Mainline
PROPOSED	
Tokyo - Haneda	Extension of Monorail
Osaka Kansai	Mainline and Local
Sapporo Chitose	Mainline and Local
Chep Lap Kok (Hong Kong)	Mainline and Local

Source: International Railway Journal, March 1991  
 Railway Gazette International, December 1992

Even though the Japanese bullet trains do not access the airport they have had a substantial impact on air travel in Japan. Table 10 illustrates the impact that the establishment of the Tokaido Shinkansen (Toyko-Nagoya-Osaka) had on air travel. Before the train began service in 1964, the Nagoya Komaki Airport was the fifth largest airport in the country with 300,000 users. By 1967 that number had declined to 70,000 (Yamaoka, 1975). Currently there is only one scheduled flight between Toyko and Nagoya.

Annual Change in Airline Passenger Traffic

Year	Toyko-Osaka (500km)	Toyko-Nagoya (300km)
Oct. 1962-Sept 1963	+38.5%	+12.0%
Oct. 1964-Sept 1965	-19.7%	-45.2%
Oct. 1965-Sept 1966	-27.4%	-68.2%

SOURCE: Hirota, 1985

## UNITED STATES

The U.S. has less experience with providing rail service to airports. Currently five airports have some type of direct rail access to the airport. Table 12 lists the current and proposed U.S. airport rail links. An additional seven airports offer shuttle bus service to a nearby rail or rapid transit station. Table 13 lists the airports with shuttle bus service.

Table 11. United States Airport Rail Links

Airport	Type of Service Link
Atlanta	Local via MARTA
Chicago - O'Hare	Local via CTA
Cleveland - Hopkins	Local
Philadelphia	Local
Washington - National	Local via METRO
PROPOSED	
Chicago - Midway	Local via CTA
Dulles	Light Rail System to METRO
Dallas - DFW	Light Rail System Downtown

Source: Crampton, 1989 and Sproule 1992, Jane's 1991

Table 13. Airport Shuttle Bus Service to Rapid Transit

Airport
Baltimore - BWI
Boston - Logan
New York - JFK
Newark
Oakland
San Francisco
Washington - Dulles

Source: Crampton, 1989 and Sproule, 1992

The U.S. experience has concentrated solely on establishing rail access to airports. There has not been any concerted effort to coordinate rail service with existing air service. In many portions of the country, rail service is not a viable alternative. In the Northeast, where there is a regional rail network, the two modes are viewed as competitors for most intercity corridor trips. In this market, Amtrak is able to effectively compete with the airlines for passengers. Throughout the rest of the United States most intercity and regional travel is accounted for by automobile or air travel.

Cleveland was the first U.S. city to establish direct rail service to its airport in 1968. It has consistently carried 15% of the airport's airline passengers (Young, 1981). The rail terminal is located in the domestic terminal which makes it very accessible for passengers. Since it only makes one stop at the airport, many employees working

at other locations are less likely to use it. A ticket downtown cost \$1 one way. The Cleveland Rapid Transit system connects the airport with the downtown as well as some of the outlying areas. The system does not have direct access to the Lakefront Station which is Amtrak's terminal in Cleveland.

Washington's National Airport established a connection to the METRO system in 1977. Originally the METRO terminal was to be located 400 feet from the main airport terminal however cutbacks in the expansion plans resulted in the terminal being located approximately one third of a mile away from the airport. A free shuttle is available however the service is awkward. A ticket costs \$.95 during rush hour and \$.80 at other times. At National rail travel accounts for approximately 15% of airport traffic (Young, 1981). The METRO provides the airport connections to much of the city and regional suburban area. The METRO also connects the Airport with Union Station which is Amtrak's terminal in Washington D.C.

Chicago had originally planned service to O'Hare airport in 1958 when the airport began operation however Chicago and Northwestern Railroad feared that they would loose passengers if the service was established. After successful lobbying, the plans were forgotten until 1974 when the Regional Transit Authority was formed. At this time plans were developed to extend service from downtown to the airport. In 1984 the airport was connected with Chicago's transit system. A ticket downtown costs \$1. Currently rail accounts for only a small percentage of the airport's users traffic. O'Hare now has access to most of downtown as well as regions to the south and west of the city. The north portion of the city is accessible after a transfer downtown. The line connects with Amtrak's terminal at Union Station.

A survey conducted in 1986 attempted to determine the impact that establishing the line had on mode choice and whether there were any changes in travel patterns. The four groups were studied; those who used the line, the airport and airline employees at O'Hare, non-airport employees along the route corridor and travelers who had previously used the Chicago Northwestern line. The results were generally discouraging . Only 16% of the airport employees 28,000 used the system at least once and only 6% regularly used the system (Chicago Area Transportation Study, 1986). Table 14 displays the reasons why the employees didn't use the system. The survey did not explicitly look at airline passengers since the

airport has made little effort to market the rail service to attract airline passengers.

Table 13. Employees Do not Use System

Reasons Why Airport/Airline Employees Don't Use System	Percentage
Inconvenient	75%
Comfort	6%
Safety	5%
Travel Time	5%
Other	5%
Cost	4%

SOURCE: Chicago Area Transportation Study, 1986

In 1984 Philadelphia established a dedicated rail line to the downtown Penn Central Station. The service has been only moderately successful. One reason for the low ridership is that a one-way ticket costs \$5. The line provides access to the local transit system at Penn Station. Penn Station is also Amtrak's terminal in Philadelphia.

In 1988 Atlanta extended MARTA, its local metro system to the airport. The airport which was built in the early 1970's had always planned to have a transit link. The airport actually constructed the terminal while they were building the airport. The facility sat empty until the regional transit authority extended the line. A trip downtown costs \$.85. The MARTA connects the airport with downtown as well as some of the outlying areas.

Currently Chicago's Midway Airport is scheduled to add rail service in 1993. This is rather surprising since Midway Airport recently lost its major tenant with the bankruptcy of Midway Airlines. Even as passenger enplanements drop, construction continues on the local extension of CTA service. Dallas has started construction on a light rail system that would connect the Dallas Ft. Worth Airport with downtown Dallas. Dulles International Airport has also proposed a light rail system that would connect the airport to Washington's METRO system. San Francisco is planning to establish a rail link to their BART network, however no official decision has been made. Denver's new airport also is considering a rail link however no plans have been made at this time.

## CONTRASTING ENVIRONMENT

It is not valid to directly transfer the European and Asian experience to the United States. Much of the international success is contingent upon factors that are not present in the United States. The population demographics are drastically different internationally as are consumer's tastes and preferences. The domestic legal, social and political environment has promoted fundamentally different transportation system. To understand the reasons behind the international success it is necessary to understand the fundamental environment that has fuel this success. It is exceedingly simplistic for the United States to attempt to emulate the European experience.

The starkest contrast between the international and domestic environment is that internationally many state governments own and operate the railways, airlines and airports. This makes it much easier to integrate these components into a cohesive system that is able to address the needs of society rather than the needs of the stock holders. In theory state ownership promotes greater social responsibility. Common ownership promotes closer relationships between various competing modes. It also eliminates some of the opposition that occurs when networks are coordinated and individual components lose market share.

In the United States ownership is a mix of public and private ventures. Traditionally intermodal cooperative efforts have been frowned upon by the government as an infringement of anti-trust laws. Amtrak and most transit systems are publicly owned, while the airlines are all privately held. It can be argued that these public services are supplied for social reasons whereas the private services are provided to maximize profit for the owners of the firm. As a result of these diametrically opposed goals, there is a great deal of opposition to any changes that will inhibit profits (ie market share). A vivid example is Southwest Airline's strong opposition to the Texas High Speed Rail Initiative. Since most airlines perceive rail travel as a competitor, it is difficult to foresee any future cooperative efforts developing between airlines and rail companies under current conditions.

The domestic political and social environment is also much different than is the international environment. Both Europe's and Japan's population are more aware of environmental and energy concerns. European governments are far more

socially minded. In Japan resources have always been scarce and the government has always promoted their efficient use. Both of these facts have led to the creation of extensive public transportation systems. In the United States personal mobility has been implicitly supported through the installation of the interstate highway system. This along with other policies has resulted in a smaller and far less efficient public transit system. Since the Europeans have been successful at promoting mass transit, they have created a viable alternative. In the U.S. both rail and transit are viewed as inferior goods and not as a viable option for a large portion of the population. Therefore rail access to airports is of marginal value to most people unless it can be supported by a stronger public transit system.

### **PROBLEMS WITH U.S. EXPERIENCE**

It is clear that the U.S. airport rail experience has not been an overwhelming success. One fundamental reason for this is that currently systems do not provide sufficient incentives to the public, community, airports authority, or airlines. Until this situation can be remedied these systems will languish in relative obscurity.

All U.S. cities that have rail access to their airports have concentrated on providing service to the city center. Recently the city center has been in decay. It is not the intention of this paper to debate the rationality of promoting the city centers growth, however it is important to determine the markets that are using the airport and the portions of these markets that can be diverted from using automobiles. The city centers represent one major market while the regional areas around the city account for another major market.

Currently the percentage of air passengers using rail to access the airport is relatively minor. Congestion at and around the airport has not been substantially reduced in any of these cities. As a result the general public has not derive much benefit from the system and does not strongly support them. These projects are traditionally very expensive and require extensive subsidies to operate. The five U.S. transit systems discussed receive on average over fifty percent of their operating costs from subsidies (Jane's, 1991).

The airport authorities have not benefitted extensively from these rail systems. Their overall revenue has declined because of lost parking revenues. In

many cases they have had to share some of the facility costs. In return for this, there has not been substantial improvement in landside or airside congestion. Finally these systems have not provided the airports with a competitive advantage over other airports either regionally or nationally.

Airlines have not participated in these systems. They have been indifferent to airports access issues. Since they have relative monopoly on long distance intercity travel, they are not concerned with the mode a passenger uses to arrive at their facility. They traditionally feel that their responsibility begins when a customer arrives in their ticket counter. Prior to that point, it is the airport's responsibility. They feel that these systems have not induced travel or added additional passengers to their system.

## **DIRECTIONS FOR CHANGE**

In order to gain additional rail ridership the catchment area for the airport systems needs to be increased. The Europeans and Japanese have successfully accomplished this by establishing regional rail lines to the airport. In the U.S., communities have been growing away from the city center at an alarming rate. The regional market represents an area that has been largely untapped and accounts for a large portion of the traffic using the airport. The city center, which also accounts for a substantial portion of the market, would obviously be connected to a regional system. A proposed system needs to serve as more than another access mode to the airport. It needs to be developed as an overall transportation alternative with the airport being one stop on the network. In order to compete effectively with automobiles, it is essential that the system offer both convenience and speed advantages. The French, Japanese and Germany high speed rail experience offer some direction as to future rail options.

It is clear that public transit systems within the U.S. are not as developed as their foreign counterparts. In order for a regional system to be successful, the public transit system within the city must be developed to such a level so that users are able to connect to their final destinations in a reasonable amount of time. Without improvements in public transit, it will be difficult for a regional system to divert passengers away from automobile usage. This is more important in urban areas since a park and ride system could be established for the remote areas.

The airlines must also be encourage to participate in this new regional system. In Germany and Switzerland airlines have established rail service because of cost of advantages on short distance routes. As U.S. airlines continue to loss money, they will be looking for ways to reduce costs. A regional rail system maybe one method to achieve this. There is the potential for the two modes to cooperate, if the airlines perceive the rail line as a regional feed for traffic to their facilities. It is even conceivable that an airline may become a partner in a regional system. Currently many airlines have code sharing agreements with regional commuter airlines. In the future, these arrangements could be established with the rail carriers.

Finally the airport authority must be convinced of the benefits of the project. This can be accomplished by demonstrating that real improvements can be made to the landside congestion problems. They must also be convinced that there is the potential to free up airside capacity by substituting regional rail for regional commuter flights. International experience demonstrates that there may be a reduction in flights when a viable alternative exists. Finally the airport authority must be convinced that establishing this service will provide them either a competitive advantage or additional enplanements. The competitive advantage argument can be applied in multiple airport regions where airports actually compete for passengers. It can also be used for hub airports that compete with other regional airports for connecting passengers. In many U.S. cities there is little choice among airports. In these cities the airport authority will need to be convinced that a regional rail system will be able to induce traffic.

## CONCLUSION

The International experience provides some useful insight for the U.S. as it moves to develop new transportation alternatives. In order for airport rail access systems to be successful, they must have the supported of all involved groups. To accomplish this the service must be viewed as part of a larger system that provides high speed travel to an entire region. A regional high speed system must also be supported by a strong urban public transit system. If a regional system is to be implemented in the U.S., it is critical that the airlines accept it as a complement to their own system. If they perceive it as a competitor than they will create an environment in which it will be impossible to rail to effectively compete. Even with

the recent passage of the Intermodal Surface Transportation Efficiency Act of 1991 it is doubtful that intermodal airport operations will become an overnight success. Intermodalism is not a panacea. Greater cooperation between air and rail transportation can provide an option to control airport landside and airside congestion.

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