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FOREWORD

This Circular is made up of presentations by speakers at two sessions during the 69th Annual Meeting of the Transportation Research Board. Session 162, Trends and Growth Problems in International Aviation, sponsored by the Committee on Intergovernmental Relations in Aviation, was organized and led by Regina Van Duzee. Session 191, Structural Changes in International Aviation, sponsored by the Committee on Aviation Economics and Forecasting, was organized and led by Vicki L. Golich. Because of the common theme, the proceedings of these two sessions have been combined in a single document and reorganized under four major headings.

In Part 1: Forecasts, Jost projects traffic and capacity growth in Europe up to the end of this century. Mercer presents forecasts of transpacific aviation activity through 2020.

Part 2: Airports contains three assessments of airport capacity needs. Hamiel focuses on U.S. airports serving international traffic. Veldhuis looks at the impact of liberalization on European airports. Kato describes the development of Osaka Kansai International Airport now under construction in Japan.

In Part 3: Air Traffic Control, Mensen analyzes the problems facing Eurocontrol and the European Community in consolidating and rationalizing the fragmented airspace and separate national ATC facilities of Western Europe.

Part 4: The Airline Industry concentrates on the structure of the international airline industry. Golich traces recent changes in the industry here and abroad and identifies the organizational and political issues that confront international aviation. Kasper discusses how deregulation will alter the structure of international aviation. Lovin looks at the forces affecting manufacturers of aircraft used by regional air carriers in Europe.

PART 1: FORECASTS

FORECASTING TRAFFIC AND CAPACITY GROWTH IN EUROPE

Peter Jost, Airbus Industrie

Forecasting is part of the marketing and corporate planning process. It helps to reduce the company's risk by objectively evaluating the demand and supply side of the air transport business.

There are a number of methodologies used to forecast the need for jet aircraft. Traditional time-series analyses assume that the key to predicting future activity of a series lies solely within its historic activity. The method of econometrics tests the relationship between data sets using statistical and economic logic.

These mathematical forecasting methods are often complemented by a judgmental approach which involves the experience of the forecaster, the opinions of the sales and marketing team, and the expectations of the airline industry. In combination, these approaches provide the capability to forecast the long-term trends or short and medium-term cycles. (Figure 1)

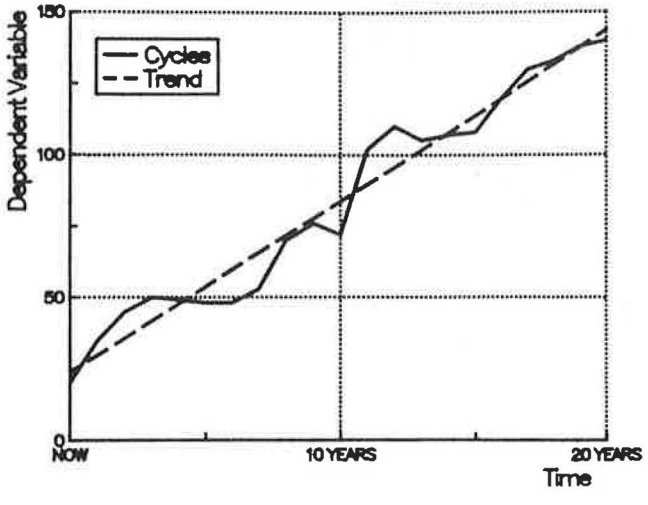

FIGURE 1 Forecast objectives.

AIRBUS INDUSTRIE FORECASTING

The Forecasting Process

To better understand past and future cycles of the industry, Airbus Industrie has developed a unique forecasting procedure that is based on the principle of system dynamics and used in conjunction with the classic long-term forecasting tools. For this purpose a series of mathematical equations has been established to represent the determinants of how much people fly, how the airlines manage their fleets to satisfy this demand, how they order new aircraft, and how their financial condition is affected by internal and external factors. The computer steps through time, simulating these decision processes, and then displays the results. When assumptions are changed, the computer simulates different decisions and results.

The following flow charts (Figures 2-5) provide a simplified overview of the model. With these diagrams, one can begin to see how internal market factors can create and prolong market cycles.

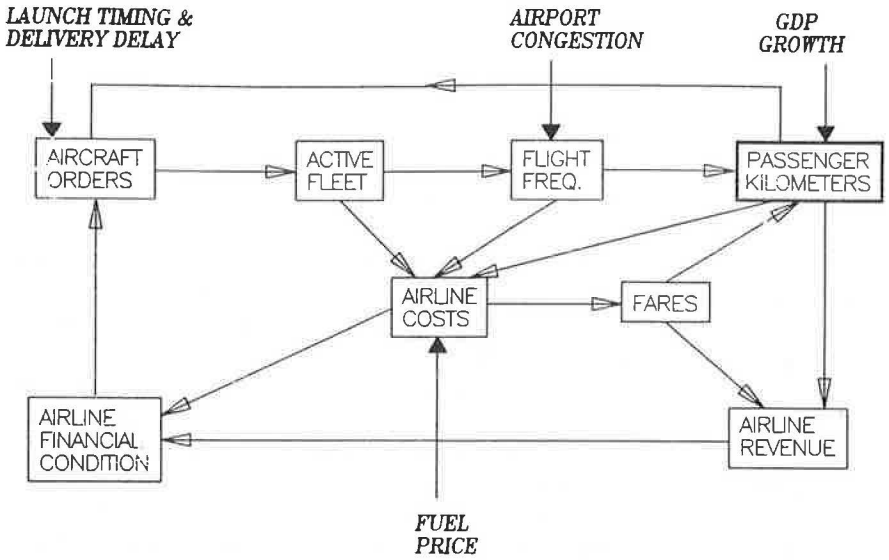

FIGURE 2 Air traffic demand forecasting.

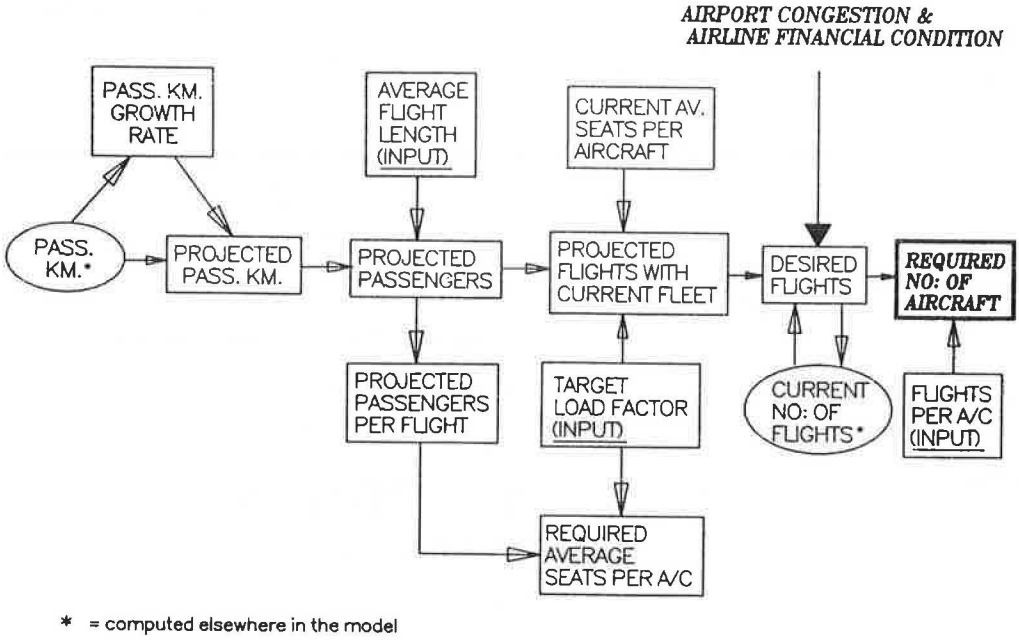

FIGURE 3 Airline planning.

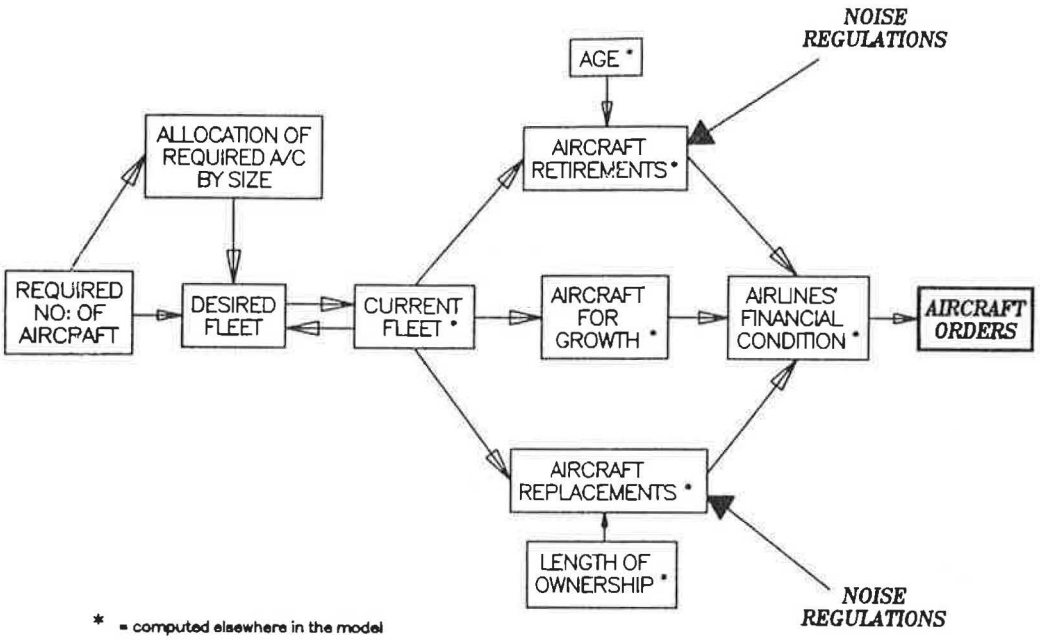

FIGURE 4 Orders for new aircraft.

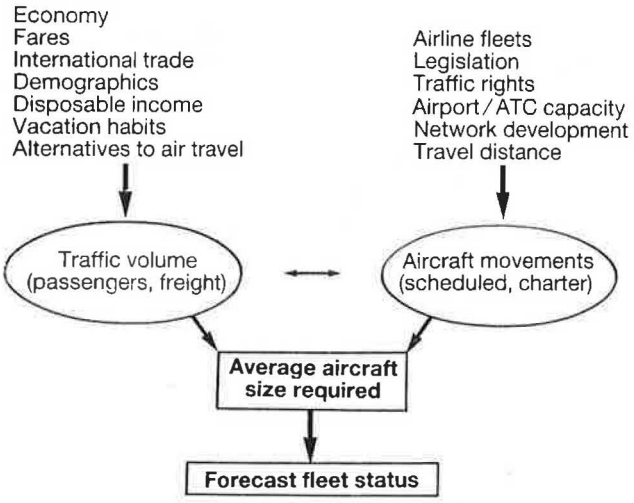

FIGURE 5 Forecast parameters.

The market itself is internally cyclical, but external factors trigger and intensify the severity of these cycles. For instance:

- GDP growth affects demand.
- Airport and air traffic control congestion limit flight frequency and affect aircraft size.
- Fuel price changes affect airline costs.
- The price of new aircraft affects airline costs.
- Launch timing affects aircraft orders.
- Lengthy delays in aircraft delivery stimulate additional orders.

Forecast Parameters

The future demand for new aircraft will remain closely related to the state of the economy. Therefore, as shown in Figure 6, any forecast demand for air travel is predicated on a number of global economic and industry assumptions:

- Economic growth - real increase in GDP on the order of 2.9 percent annually, following a cyclical pattern;
- Fares - a continuing trend of real fare decreases, sustained by liberalization, increased competition, and cost-cutting measures within the airline industry;
- International Trade - influencing primarily long-haul passenger and cargo markets and the creation of direct flights;
- Demographics - European population generally increasing by almost 8 percent over the next 10 years, with people of all age groups gaining air travel experience and increasing their willingness to continue flying;
- Disposable Income - after having satisfied their needs for basic consumer products, a preference turning more and more to leisure activities, many of which include air travel;
- Vacation Habits - people making more shorter excursions in addition to the annual holidays, with 80 percent of the air travellers by the turn of the century making their journeys for reasons not entirely related to business; and

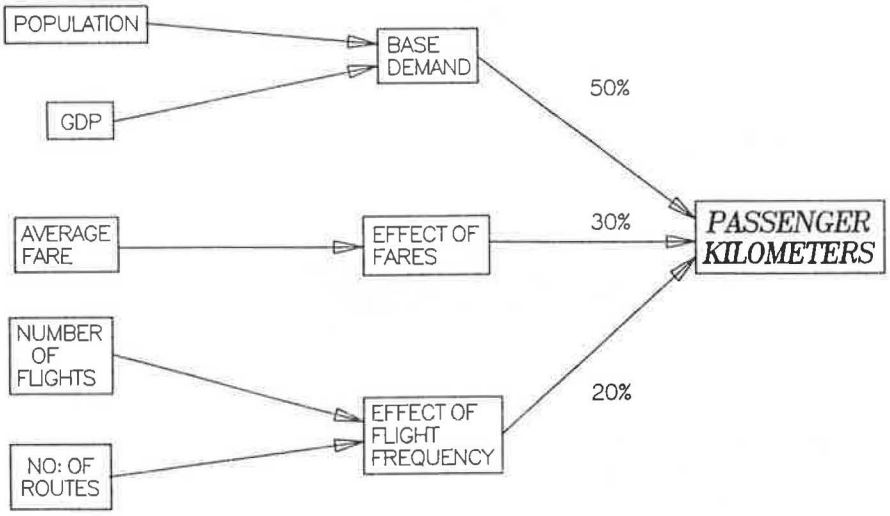

FIGURE 6 Elasticity of demand.

· Alternatives to Air Travel - new means of telecommunication replacing a part of intracorporate travel, and on short-haul distances high-speed trains complementing air transport in a few selected markets allowing airports to allocate slots for more medium and long-haul air services.

The forecast traffic volume may then be transported by a few big aircraft or many small size aircraft. The truth most likely will be somewhere in between, and the resulting fleet mix will depend on the frequency that a given route can sustain. The growth in aircraft movements is influenced by several factors:

· Existing airline fleets will have to be operated irrespectively of whether the combination currently in service is or is not ideal.
· Increased competition resulting from liberalization will support higher frequency levels, with curfews having a depressing effect on aircraft utilization.
· In a regulated environment, pool agreements on traffic rights will enable airlines to fix a market split based on given frequency or capacity offerings. This is not the case in a deregulated market.
· Increasing airport and ATC congestion will put a physical limit on the expansion of aircraft movement growth. (This point will be dealt with more in detail later on.)
· Network structure, such as hub-and-spoke or direct flights, will affect utilization, frequency, and aircraft size.
· The longer the flight distance, the lower the demand for frequency and vice versa.

It should be kept in mind, however, that traffic and frequency growth influence each other. For instance, offering more non-stop flights or opening up new routes will make air travel more attractive. On the contrary, the airlines' inability to increase their departures out of certain airports, coupled with growing delay problems, may have a negative impact on traffic growth potential. Similarly, legislation in the form of air traffic liberalization can result in lower fare levels which, in turn, will stimulate demand.

FACTORS AFFECTING AVIATION FORECASTS FOR EUROPE

European Liberalization

Forecasting for European liberalization also includes assumptions concerning utilization and financial changes within the airlines (Figures 7 and 8). Leading up to 1992 it has been assumed that competition will stimulate the number of flights per aircraft. This has two effects. First, an increase in flight frequency causes an increase in operating costs due to decline in load factors, which in turn reduces operating margins. However, increasing flight frequency also stimulates demand (passenger-km) growth. In order to have fare competition, it has been assumed that the airlines will cut their operating costs.

Lower fares cause a decrease in operating margin but also cause demand to increase. An alternative scenario has also been analyzed in which potential cost and fare reductions could be offset by increasing charges.

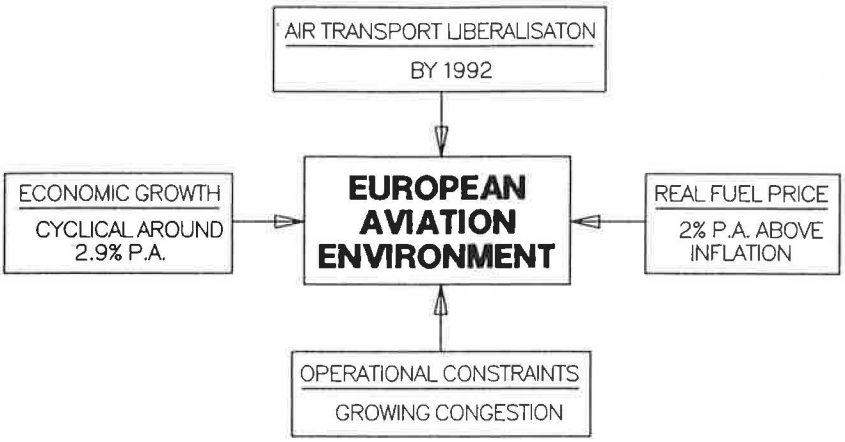

FIGURE 7 European aviation environment.

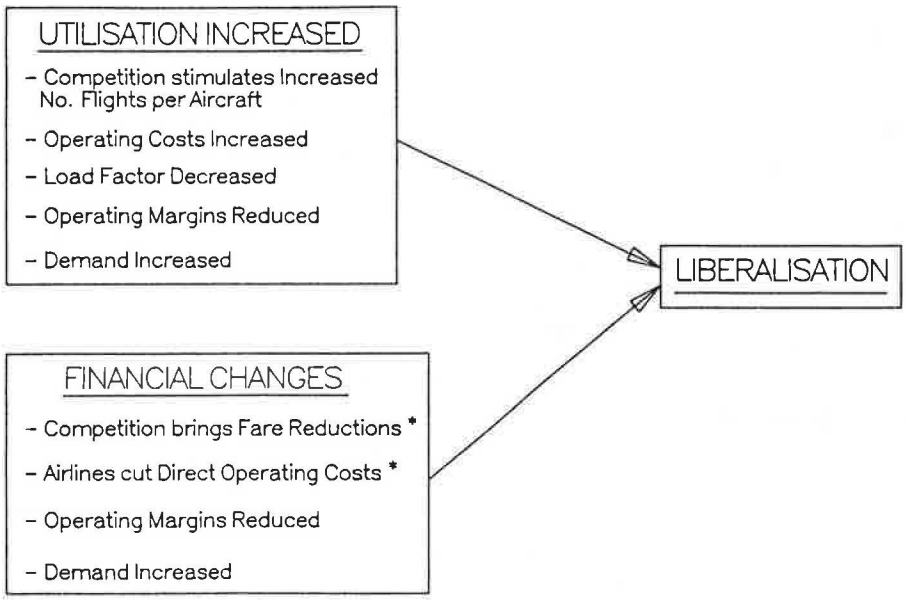

FIGURE 8 European liberalization.

Operating Constraints

The crucial point in all traffic and capacity forecasts is to find the most likely split between the number of flights (frequency) and the corresponding seat capacity.

Under today's conditions more flights mean more aircraft in service; this automatically leads to more airport and airspace congestion. On the other hand, marginal increases in frequency mean bigger capacity aircraft with corresponding needs for investment in enlarged landside and passenger handling facilities.

Airbus Industrie is the only manufacturer that has studied the influence of airport and airspace congestion in recent years; and this has been taken into account, not only for the aircraft capacity forecast displayed in Figure 9 but also in the decision to build the latest additions to the Airbus product range -- the A330 and A340.

Airport Capacity Use

Airports are only part of the total air transport system which, by itself, is of no use if it does not respond to the needs of the demand side, i.e. to provide fast, safe, and on-time transportation to the passengers and cargo shippers. It has become evident that many airports have reached the limits of their capacity to handle more aircraft movements, along with the fact that the construction of new airports or the extension of existing ones is often a task impossible to accomplish over the short to medium term.

Airport capacity is a scarce resource; its best economic use can be measured by the number of passengers handled with existing facilities, e.g. passenger throughput per hour or day.

A comparison of five movement-limited airports in

Europe reveals that, although traffic rose on average by around 60 percent in the course of the last 10 years, there was a noticeable trend toward more passengers per aircraft movement at Paris Orly and the London airports. (Figure 10) Only a relatively small increase in the number of passengers per flight has been recorded in Frankfurt. Almost the entire growth in traffic volume in Munich has been absorbed by an increase in aircraft movements, thus adding considerably to congestion and delay problems.

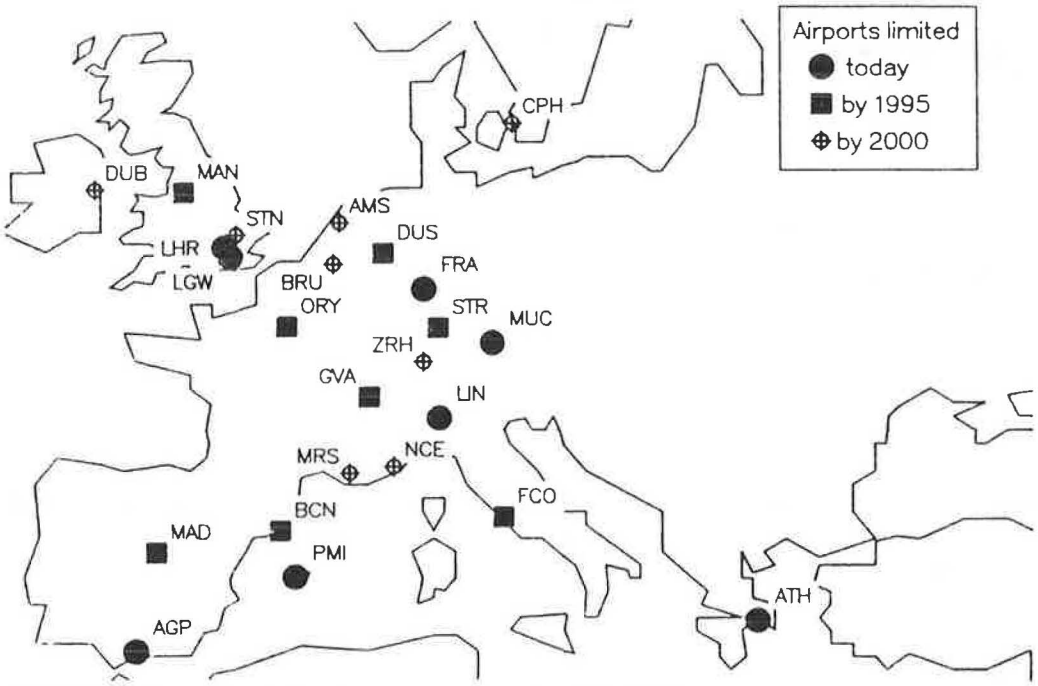

FIGURE 9 Capacity-limited European airports, 1990-2000.

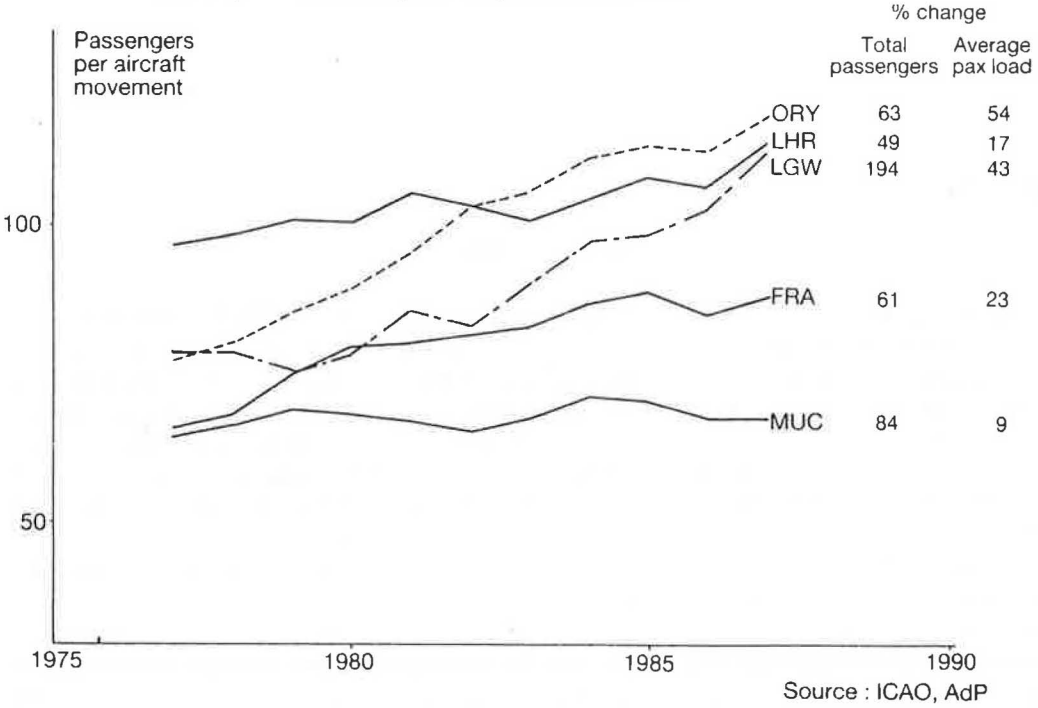

FIGURE 10 Throughput at Selected European Airports, 1977-1987.

Airport Capacity: Terms and Definitions

A variety of terms and definitions is used today to determine the capacity of a given airport, depending on methodology and specific purpose. (See Figure 11.) The absence of agreed standard measures makes it impossible to define existing and future limits of system capacity.

· Capacity service rate	· Practical capacity
· Processing rate	· Runway system capacity
· Movement rate	· Declared capacity
· Max. throughput rate	· Sustained capacity
· Service rate	· Peak capacity
· Acceptance rate	· Maximum capacity
· Demand rate	· Ultimate capacity
· Runway capacity	· Saturation capacity

(All terms in movements per hour) Source: Swissair

FIGURE 11 Examples of Airport Capacity Measures Commonly Used

Airport Congestion in Europe

In Europe 24 airports risk becoming frequency-limited by the turn of the century. These airports today handle 55 percent of all commercial air transport movements in Europe. Their self-declared present maximum runway capacity is on the order of 4.6 million movements per year. In 1988 these airports handled almost 4 million movements. This leaves only marginal opportunities for future growth in flight frequency. Assuming a 20-percent capacity improvement by early in the next century, achieved by a better organization of resources, frequency could increase 1.9 percent annually.

Passenger-Kilometer Growth Rate

Charter passenger-kilometers (pkm) represent approximately 25-28 percent of scheduled pkm. Charter pkm growth is higher than scheduled growth, but it is more sensitive and reacts quicker to economic downturns.

Air traffic liberalization in Europe, along with growing congestion problems will result in a "most likely" traffic expansion in the order of 4.9 percent per year. If these conditions did not exist and air traffic in Europe could develop as in the past, annual pkm growth would be 4.8 percent in the "business-as-usual" case.

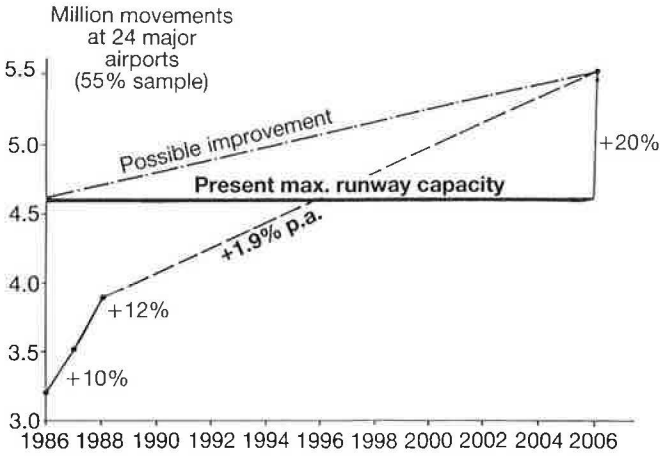

FIGURE 12 Airport congestion in Europe.

Air Travel Maturity

Air travel has not yet reached a point of saturation, even within those countries that enjoy a high level of economic development. (Figure 17) Rising national wealth stimulates demand for air travel -- a trend which is supported by factors outside pure economic relationships. For instance, the absence of public surface transport alternatives plus deregulation resulted in every US citizen statistically making more than one trip per year. If, on the other hand, the Japanese population changes its spending, the future traffic growth potential to and from this country would be tremendous.

Air traffic liberalization means increased competition between the airlines, with fare reductions and a higher level of flight frequency attracting the travelling public. These were the underlying assumptions for the "most likely" case shown above.

There exists, however, the possibility that from 1992 onwards intra-European air travel may be defined as domestic travel. Air travel may then become subject to a value added tax with ticket prices going up correspondingly. In addition, airports will see revenues from tax-free sales decreasing sharply. Authorities may then look for other sources of revenue (e.g. increased handling fees) which will undoubtedly be passed on to the passenger in the form of higher ticket prices. Monopolistic pricing of prime slots at hub or congested airports is also likely to push landing fees up.

It is therefore possible that potential cost and fare reductions may be compensated for by increases in taxes and fees. The effect of this has been analyzed in a third scenario, the "no fare reduction" case shown in Figures 18 and 19.

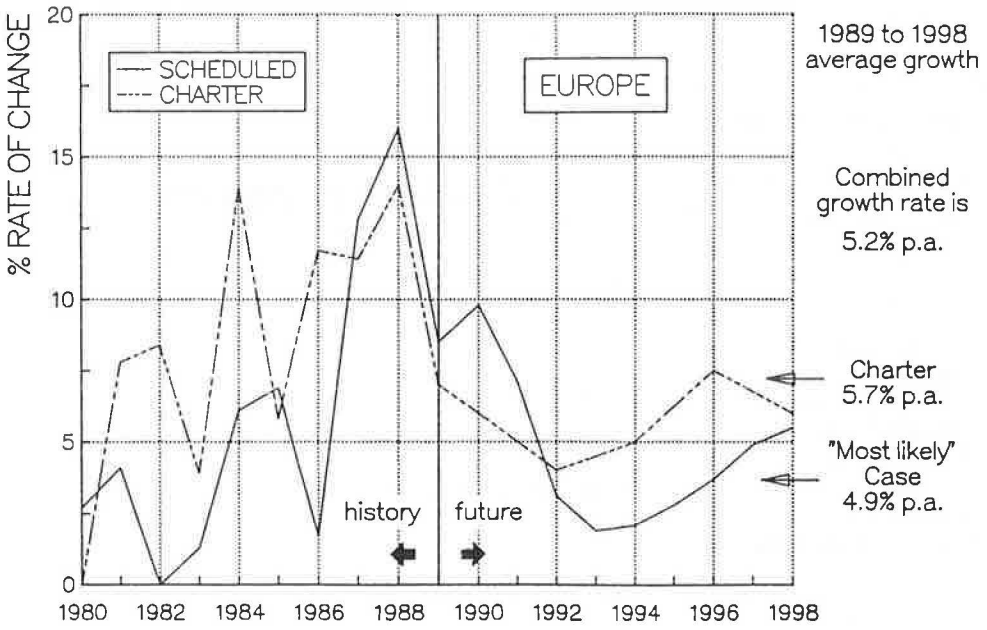

FIGURE 13 Growth rate of annual passenger kilometers (most likely case).

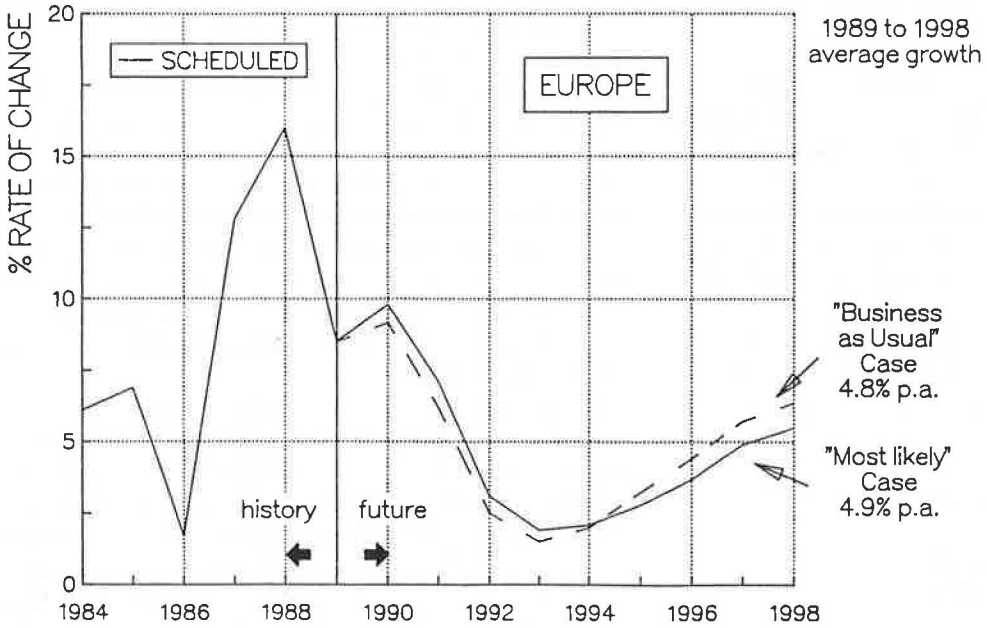

FIGURE 14 Growth rate of annual passenger kilometers (business as usual case).

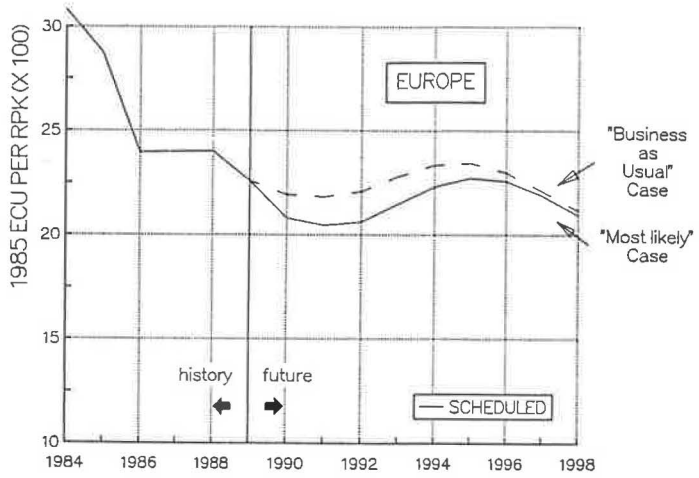

FIGURE 15 Real air fares in Europe (domestic plus intra-European).

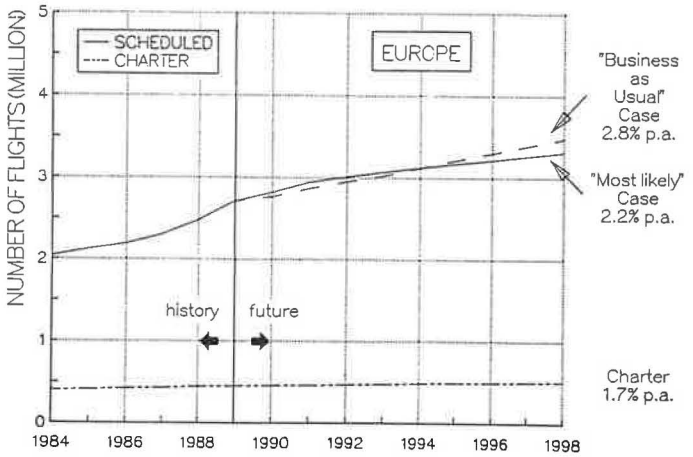

FIGURE 16 Annual flights (domestic plus intra-European), 1984-1998.

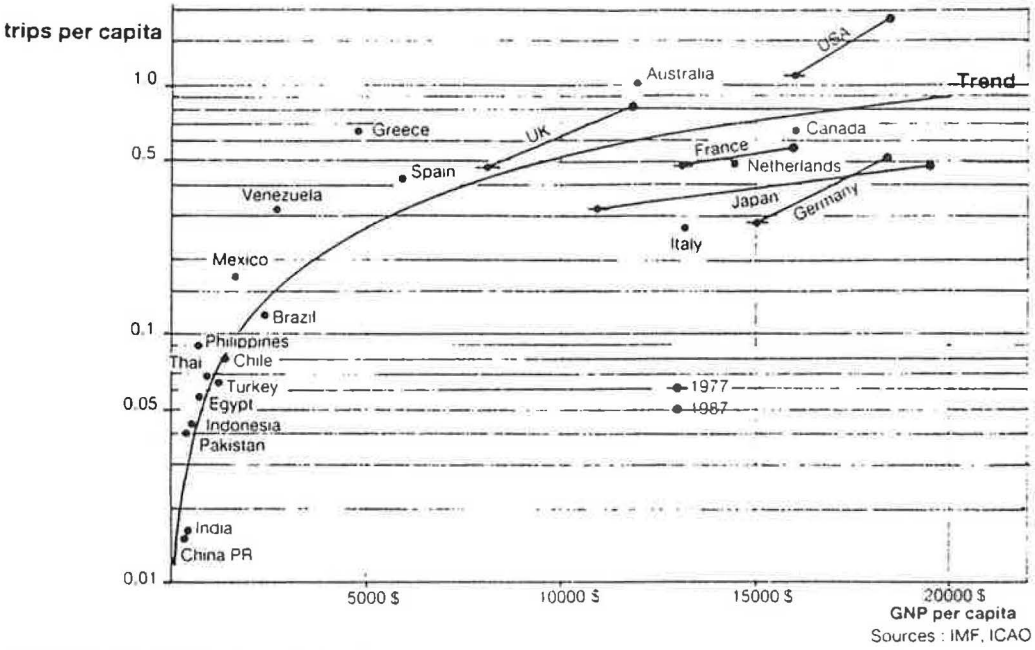

FIGURE 17 Maturity of air travel market, selected countries.

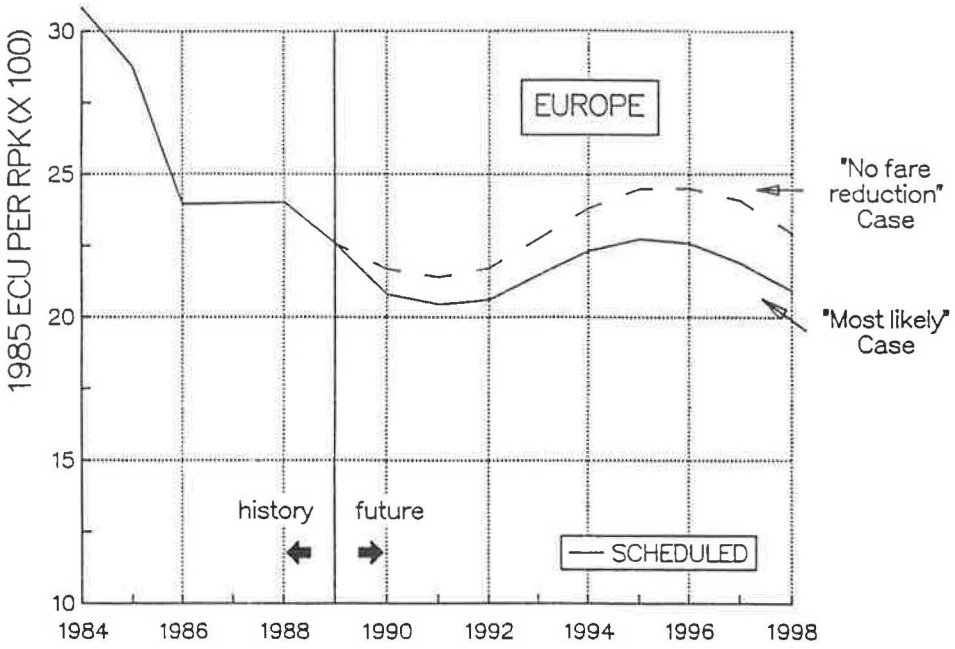

FIGURE 18 Real air fares in Europe (domestic plus intra-European) under the no-fare-reduction scenario.

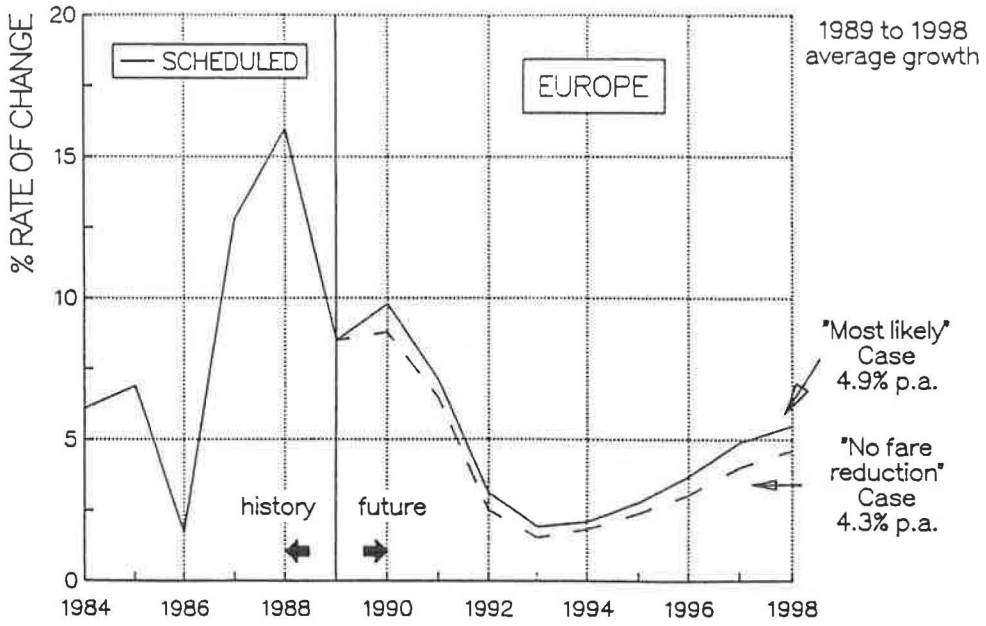

FIGURE 19 Growth rate of annual passenger kilometers (no fare reduction case).

Compared to the "most likely" case, which forecasts 4.9 percent traffic growth per year, the traffic expansion expected in the "no fare reduction" case is on the order of 4.3 percent annually.

Despite these growth-constraining factors, airlines still have considerable opportunity to economize, especially in the area of indirect operating cost. Therefore the "no fare reduction" case represents a hypothetical scenario.

SOLUTIONS TO CONGESTION PROBLEMS

Airport Solutions

· separation between jets and turboprop aircraft in the approach areas with dedicated runways for each
· transfer of general aviation and commuters to secondary airfields,

· frequency restrictions on charter flights,
· priority for bigger capacity aircraft in slot allocation,
· market-oriented pricing policies such as maximum passenger throughput per slot or a revised system of navigation charges, and
· relaxed curfews for "silent" aircraft.

Surface Transport Alternatives

Air traffic is part of the basic economic infrastructure, providing transport over medium and long-haul routes which cannot be provided by traditional surface modes.

Re-emerging rail technology and improved train services are not necessarily competitive to air traffic, but in many cases should be considered as a complement to it. High-speed rail service could enable airlines to reduce jet operations on some loss-generating, short-haul routes, thereby permitting an airport to handle more medium and long-haul flights. (Figure 20)

The growing number of airports linked to intercity train services is an indication of the trend to combine operational and economical advantages of rail and air services into an integrated transport system to maximize the macroeconomic benefits.

Improved Aircraft Technology

Aircraft manufacturers could help relieve congestion problems by the following improvements in aircraft characteristics:

· product lines offering choice of sizes and ranges,
· good airfield and climb performance,
· off-optimum cruise capability,
· incorporation of latest navigation and communications equipment,
· ease of ground handling for fast turnarounds, and
· environmental acceptability

Air Transport Development, 1989-2008

Figures 21 and 22 summarize the Airbus Industrie forecasts for Europe over the coming 20-year period. Two scenarios are presented: Scenario 1 -Potential Growth, and Scenario 2 - Constrained Growth.

Figure 21 describes the basic conditions and assumptions for each scenario and indicates the outcomes in terms of growth in traffic (pkm) and service frequency. Figure 22 shows the effects on aircraft fleet size and characteristics.

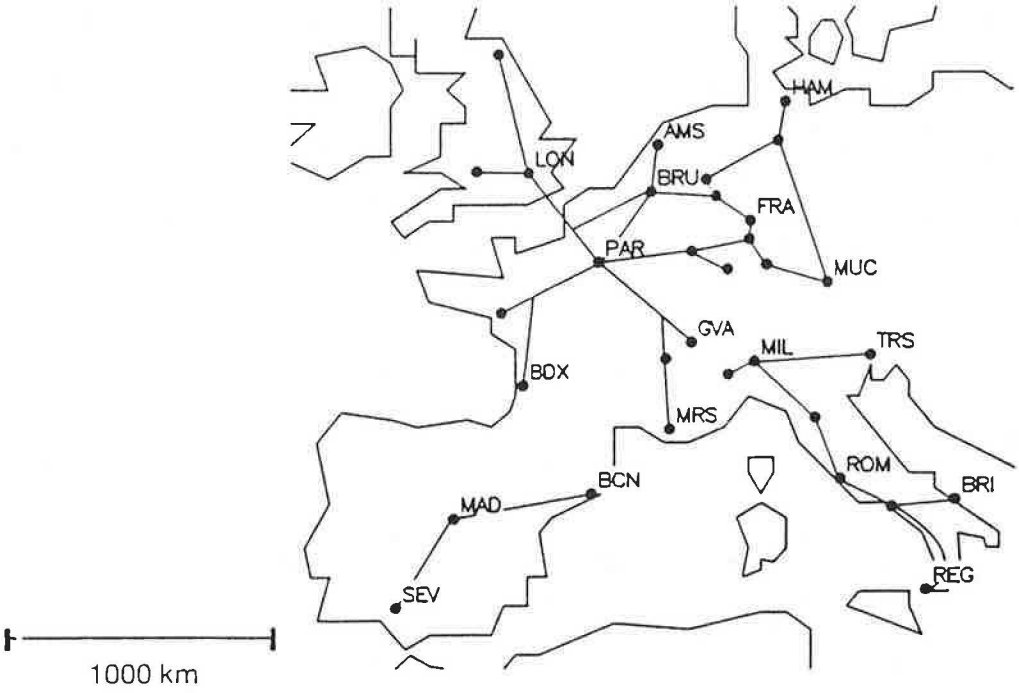

FIGURE 20 European high-speed rail network (existing and by 2000).

Scenario 1: Potential Growth	Scenario 2: Constrained Growth
Liberalization effects	No real fare reductions
· Fare reductions in real terms · Route and frequency expansion	· Increase in cost and fees (e.g. VAT, airport charges,...) · Monopolistic pricing
Functioning infrastructure	Constrained frequency development
· Airport capacity · Air traffic control capacity	· Congested infrastructure · Reduced attractiveness
Pkm growth 4.9% p.a. Frequency growth 2.8% p.a.	**Pkm growth 3.8-4.0% p.a.** Frequency growth 1.9-2.2% p.a.

FIGURE 21 European air transport development, 1989-2008.

	Potential Growth	Constrained Growth
Pkm growth	4.9%p.a.	4.0%p.a.
Seat growth	4.4%p.a.	3.5%p.a.
Frequency growth	2.8%p.a.	2.0%p.a.
Fleet size 1989	**1800**	**1800**
Total deliveries/ retirements by a/c size category	+2700/-1350	+2350/1500
≥130 seats	+ 350/-640	+ 250/700
131-170 seat	+ 700/-300	+ 600/38
171-230 seats	+ 500/- 80	+ 400/-100
231-340 seats	+ 900/-200	+ 850/-200
≤341 seats	+ 250/-130	+ 250/-120
Fleet size 2008	**3150**	**2650**
Avg.seat cap. 1989	164	164
Avg.seat cap. 2008	220	230

FIGURE 22 European jet fleet, 1989-2008.

FORECASTS OF TRANSPACIFIC AVIATION ACTIVITY, 1989-2020

Gene S. Mercer, Federal Aviation Administration

There are challenging times ahead for the aviation community--particularly with respect to transpacific travel which has been growing at double digit rates during recent years. This paper presents forecasts of transpacific aviation activity through the year 2020 and discusses the factors which will be driving demand for aviation services, the evolving structure of the aviation industry, and FAA's assumptions concerning fleets, schedules, and fares.

FORECAST BACKGROUND

Forecasting air traffic to the year 2020--three decades into the future--is even more hazardous than a forecast of the present traffic would have been had it been made in 1960, just prior to the dramatic changes brought on by the advent of jet air travel followed by the U.S. deregulation experience. With an accelerating rate of change in technology, social values, and economic development, no one can predict with confidence 30 years into the future. Still, it is necessary to have some sense of future air travel demand in order to plan an air traffic system to serve the needs of future generations. With some trepidation, therefore, my presentation today will be a general picture of how future air travel across the pacific might develop. The underlying economic and social reasons--economic growth, shifting demographic patterns, changing life-styles, and increasing reliance on air as the predominant mode of travel--will continue to stimulate air traffic demand well into the next century. This is especially true for the Pacific Rim. It is imperative, therefore, that the aviation community review the current status of transpacific travel and the future impact of traffic growth due to the movement toward worldwide deregulation and the growing interdependence of world economies.

Deregulation in the United States

Following deregulation in the United States in 1978, there was a boom in U.S. domestic airline passenger traffic--from 250 million enplanements in 1978 to 442 million in 1988. Many factors contributed to this unprecedented growth including lower fares, a wider variety of routes and types of service, and special incentives offered by airlines. The U.S. deregulation experience has become a model for the rest of the world and, as we witness the gradual spread of airline deregulation throughout a large part of the free world,

we anticipate that the aviation community will see a boom in international passenger traffic that will challenge the air traffic control systems and place severe strains on the world's airports.

Market Impacts

This paper will consider the marketing impact of new aircraft, such as the B-747-400 and the MD-11, which provide carriers with the ability to serve new direct transpacific routes. With the continued strong traffic growth being projected through 2020, we foresee not only more direct nonstop service to Pacific Rim airports but also that these airports will be served from many new North American and European gateways. By 2020, for example, nonstop service across the Pacific might be available from cities such as Denver, Las Vegas, Nashville, and Cincinnati to cities such as Tokyo and Sydney. The airline passengers of the future will have a wide selection of alternative routes, schedules, and fares in planning their transportation needs.

Major U.S. carriers are expanding internationally. With increasing penetration of foreign markets by deregulated major carriers of the United States and Canada, there is a strong incentive for European and Pacific Rim national carriers to compete on equal terms. The development of strong multinational carriers in Europe is considered likely as a result of the denationalization and privatization of government-owned carriers in major European countries to take advantage of the European market with 350 million people. Once started, such consolidations are expected to move rapidly, as they have done in the United States. Also, these new multinational carriers will seek intercontinental mergers or consolidations with North American and Pacific Rim carriers, thereby forming "megacarriers" that will compete for traffic on a worldwide scale. The implications of these emerging trends and the forecasts represent significant challenges to each of us in aviation. The growth in congestion and delay that has occurred in the U.S. travel network since airline deregulation is a harbinger of problems facing the world of the future. With literally millions of passengers depending on commercial aviation for their transpacific travel needs, planning must be undertaken now in order to ensure that the system will not be overwhelmed and will function without intolerable delays and inconveniences. The world does face a challenging future in aviation. Planners of the future will have to assure that tomorrow's air transportation system is an efficient and as safe as it is in today's world.

FORECASTS FOR 2020

My presentation this morning relies heavily on work done by the FAA Office of Aviation Policy and Plans. In May 1988, we prepared a report, Transpacific Commercial Air Carrier Passenger and Operation Forecasts 1988-2000, as part of a cooperative study effort to determine FAA's operational and representational roles in the rapidly expanding Asian and Pacific Rim nations. Thus, in preparing my presentation for this morning, it was expedient to update that report using latest available data and to extend the forecasts to the year 2020 -- the time horizon of interest to this audience. Copies of this report will be made available following my presentation.

Forecast Assumptions

The basic economic and aviation assumptions underlying the forecasts of aviation activity are the following:

Gross National/Domestic Product
U.S. Gross National Product will reach 7.4 trillion dollars by the year 2020, 118 percent above the 1988 level of 3.4 trillion dollars. Pacific region gross domestic product will grow to 7.9 trillion dollars, surpassing U.S. GNP. Japan will continue to account for the lion's share of Pacific region gross domestic product (57.6 percent in 2020 compared to 67.2 percent in 1988.)

Passenger Yields
Real yield (defined as revenue per passenger per mile adjusted for inflation) is expected to decline from 11.6 cents in 1988 to 8.6 cents in 2020.

Number of Seats per Aircraft
With the addition of two new U.S. carriers to transpacific service in 1987, it appears that the number of U.S. flag carriers serving the transpacific has about reached its limit. Therefore, it is reasonable to expect that these carriers would begin to replace the smaller 3-engine widebody aircraft (DC-10 and L-1011) with the larger MD-11 and B-747-400 aircraft. For these reasons, we assume that the average seating capacity of U.S. flag carrier aircraft will increase by approximately three to four seats a year between 1988 and 2000, and by two seats annually between 2000 and 2020.

Similarly, we have assumed that the average size of the foreign flag carrier aircraft will increase by two and one-half seats annually as they begin to replace their older B-747 aircraft with the newer, larger seating capacity B-747-400 and MD-11 aircraft.

We may also anticipate that early in the next century there could be a viable supersonic transport aircraft (SST) competing in these markets. The best information available on the probable size of an SST is approximately 250 seats. This is significantly smaller than the average number of seats per aircraft assumed in our forecasts. Direct service by the smaller extended range 2-engine aircraft (such as the B-767 and the A-310) from Hawaii to Pacific Rim points and significant market penetration by a viable SST could also alter out projections of average aircraft size in these markets. Alternative scenarios of long-term transpacific air carrier aircraft operations, therefore, could be significantly higher than the outlook presented in our baseline forecasts.

Load factors

Historically, average load factors much higher than 69.0 percent have not been maintained consistently on transpacific routes. Nevertheless, we have assumed a gradual increase in load factors reaching 72.5 percent by the year 2010. We assume, further, that this load factor is attainable and maintainable because of improved marketing strategies which industry representatives have indicated they are striving to obtain. For example, development of certain Pacific areas as vacation resorts and the increasing number of immigrants from these regions will supplement the growing number of business travellers. Such high load factors will be attainable if carriers promote the market and attempt to fill seats that are added through capacity increases.

Total Passenger Demand

Total passenger demand in U.S. transpacific markets reached 11.8 million in 1988, nearly three and one-half times the 3.5 million passengers recorded in 1975.

During the last three years transpacific traffic has surged, increasing by an average of 14.2 percent a year between 1985 and 1988.

The relatively high growth is expected to continue in 1989 approximating 12.6 percent -- due, in large part, to an increase in the number of U.S. Pacific gateways and the large increase in capacity which has already taken place during the first six months of 1989.

Total transpacific passenger demand is expected to reach 29.2 million passengers by 2000 and to approximate 82.0 million by 2020. This represents and average annual growth rate of 6.2 percent over the 1988-2020 time frame. As might be expected, we anticipate slightly higher growth rates during the earlier time frame, for example, 7.6 percent during the 1990-2000 decade and slowing to 4.4 percent during the 2010-2020 time frame.

TABLE 1 TRANSPACIFIC PASSENGER DEMAND, 1975-2020

	Passengers		
	U.S. Total (000)	U.S. Citizens (000)	U.S. Citizens (%)
Historical			
1975	3,508	1,091	31.1
1980	5,648	1,611	28.5
1985	7,923	3,378	42.6
1987	10,225	4,240	38.5
1988	11,807	4,550	38.5
Forecast			
2000	29,200	12,250	42.0
2020	82,000	37,700	46.0

United States Citizens

In 1988, U.S. citizens accounted for 4.6 million passengers, representing 38.5 percent of the total U.S. transpacific passenger demand. Based on data presented in Table 1, the proportion of U.S. citizens in transpacific travel has fluctuated between 28.5 percent in 1980 and 43.9 percent in 1986. The number of U.S. citizens travelling abroad is influenced, to some extent, by changes in the exchange rate of the U.S. dollar with other currencies. Currently, the exchange rate for the Japanese yen, for example, is unfavorable to U.S. citizens travelling to Japan.

The number of U.S. citizens participating in transpacific travel is expected to reach 12.3 million by 2000 and to climb to 37.7 million by the end of the forecast period.

After a slight decrease in the proportion of U.S. citizens to 37 percent in the short term, we anticipate that the proportion of U.S. citizens in transpacific travel will increase to 42 percent in 2000 and will continue increasing to 46 percent by 2020.

Geographic Distribution of Passenger Demand

In 1988, travel to and from Japan accounted for 7.3 million passengers, 62 percent of the total transpacific commercial travel market. South Korea had about 947,000; Australia and Hong Kong had 852,000 and 630,000, respectively. The shares of total passengers were 8.0 percent for South Korea, 7.2 percent for Australia, and 5.3 percent for Hong Kong.

It is important to note that the geographic distribution of the passengers indicated herein does not represent the final destinations of the travellers. The source of the data is the U.S. Department of Commerce, Immigration and Naturalization Service. For incoming passengers, the country of record is the last foreign departure airport prior to the aircraft's arrival in the United States or its territories. Similarly, for aircraft leaving the United States the country of the first port of entry where the aircraft lands is considered the destination point.

This "accounting" procedure implies that Japan will get credit for many passengers whose final destination is another foreign country, thereby overstating Japan's share of true origin-destination traffic. It is conceivable that Japan's share of the total traffic could decline as other countries develop "gateway" airports and the carrier's fleets include a greater proportion of long-range aircraft capable of overflying Japan and smaller aircraft to serve leaner markets directly.

Alternative Scenarios of Passenger Demand

Forecasting is an art as well as a science. Trying to predict all of the rapidly changing technology occurring in the world as well as changing social values requires us to place greater emphasis on the forecasting art rather than the mathematical models that purport to explaining future trends in aviation. As shown in Figure 23, we have hedged our bets on 2020 passenger demand to reflect a range of possible outcomes over the longer term.

However, even in our most pessimistic alternative, we are still projecting significant growth to 58 million passengers by the end of the forecast period.

Total Aircraft Operations

The transpacific market is currently served by 30 commercial air carriers: seven U.S. flag carriers and 23 foreign flag carriers. These 23 foreign flag carriers offer nonstop service from 12 U.S. international gateways. About three-quarters of all transpacific flights from the United States originate at four airports: Honolulu, Anchorage, Los Angeles, and San Francisco. In 1988, the 30 air carriers provided nonstop service to 12 Asian and Pacific countries from these 12 U.S. gateways. The vast majority of flights (over 86 percent) were destined for four countries: Japan, Australia, South Korea, and New Zealand.

Based on aircraft operations data developed from the *Official Airline Guide (OAG)*, commercial aircraft operations in the transpacific totaled nearly 51,700 in 1988. This level of activity represented an increase of 38.6 percent in just the last three years. (Table 2)

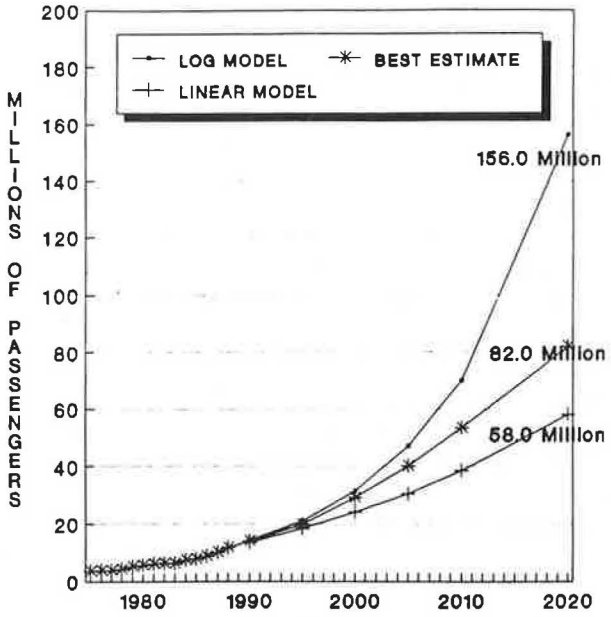

FIGURE 23 Transpacific passenger demand scenarios, 1975-2020.

TABLE 2 TRANSPACIFIC AIR CARRIER OPERATIONS, 1984 to 2020

	Operations		
	Total	U.S. Carriers Number	Percent
Historical			
1984	36,462	16,630	45.6
1985	37,298	17,162	46.0
1986	43,196	19,796	45.8
1987	47,222	21,906	46.4
1988	51,688	24,942	48.3
Forecast			
2000	113,600	53,400	47.0
2020	276,700	130,000	47.0

Based on the forecasts of transpacific passenger demand presented earlier and on the assumptions enumerated before, total commercial aircraft operations are expected to increase to 113,600 by 2000 and to grow to 276,700 by 2020. Overall, commercial aircraft operations are expected to increase at an average annual rate of 5.4 percent. The increase in total aircraft operations is only slightly less than the increase forecast for total transpacific passenger demand (6.2 percent) due largely to the fact that few efficiency gains will be realized from increased capacity or load factors. Overall, average aircraft seating capacity is expected to increase by only 1.0 percent annually.

U.S. Flag Carriers

In 1988, U.S. flag carriers had 24,900 aircraft operation in transpacific routes. This represented 48.3 percent of total commercial aircraft transpacific operations. The proportion of U.S. flag carrier aircraft operations has increased to over 50 percent during the first six months of 1989.

By 2000, the number of aircraft operations flown transport sector is relatively large (some 7 percent policy the importance of the two main ports by U.S. flag carriers in transpacific service is of GNP), issued a major policy document on infrastructure planning to the year 2015. In this 2020, represent an average annual increase of 5.3 percent over the 32-year forecast period, virtually the same as the average annual increase in the total transpacific service. Although, the U.S. flag expected to increase to 53,400. By 2020, the U.S. flag aircraft operations will reach 130,000, or 47 carrier's share of total operations is expected to reach as high as 51 percent in the short term, we anticipate that bilateral agreements will eventually reduce this percentage to around 47 percent.

CONCLUSION

This paper has shown that economic growth in the Pacific Rim nations is expected to continue to outperform the rate of growth in the United States. Similarly, transpacific commercial passenger activity and commercial aircraft operations which have been growing at double-digit rates in recent years are expected to continue to increase at relatively high rates well into the forecast period.

Introduction of new long-range aircraft into the transpacific fleet, the incorporation of new gateways on both sides of the Pacific, and the possible introduction of supersonic transport aircraft in transpacific service are expected to cause changes in the geographic route patterns across the Pacific. Further the possible development of megacarriers through mergers and agreements will influence the route structures which will emerge. In short, the anticipated growth and expected changes would put severe strain on the existing network of airports and airway facilities.

Whether or not the pictures sketched in this presentation for 2020 and the intervening years develop as forecast, one thing is certain. There will be considerable growth and substantial changes in transpacific aviation during the next 32 years. While our crystal ball might be hazy, perhaps even opaque, when focusing on 2020, it is still imperative that we in aviation consider the emerging developments and possible alternative scenarios. Further, we are obligated to plan for accommodating and managing the growth and the changes lest they overwhelm both us and future generations of aviators and the flying public. The safety and efficiency of the system demand nothing less.

PART 2: AIRPORTS

CHANGING TRENDS AT U.S. AIRPORTS AS A PART OF THE INTERNATIONAL SCENE

Jeffrey Hamiel, Minneapolis-St. Paul
Metropolitan Airports Commission

My responsibility today is to talk about the United States airport system and its impact on international air transportation activities and future developments on the international scene.

Let me start by stating two fundamental beliefs that I have regarding international air transportation. First, air transportation and, more specifically airports, today find themselves in a continually changing environment that is and will continue to be unpredictable. Second, airports around the world today are the mainstay of dependable, safe, and efficient air transportation. With this as a basic understanding, let me suggest that there is good news and bad news in our air transportation future.

The good news is that air transportation is healthy. It is growing. It is dynamic. The bad news is that the airports in the United States and around the world are not meeting the challenge. In fact, capacity constraints and inability to respond to this very dynamic situation are going to cause serious problems throughout the 1990s and beyond.

J. Donald Reilly, former Executive Director of the Airport Operators Council International, has said that during the 1990s airports will become the Achilles heel of air transportation, and I happen to agree with him. As the demands placed upon the air transportation system continue to grow, we in the airport management and administration find ourselves continually frustrated with an inability to meet the demand of the international air transportation system.

RECENT TRENDS

Let me reflect for a few moments on what has happened. I will do this quickly because most of us are very much aware of U.S. trends. Airports historically have been dependable. They have been stable. They are predictable. They are accommodating, and they have always been there. This, I suggest, is going to change.

Historically, airports have directed most of their attention to technological improvements -- moving from non-precision to precision approach systems and now to highly precise Category II. Technological enhancement and advancements have met our needs and helped us get by over the years. In addition to technological developments, we have also seen changes in equipment.

The advent of the wide-body, high-capacity DC-10 and B-747 significantly relieved the pressures that were building during the early to mid-1970s due to increased traffic demand.

Also we have seen regulatory change. We have seen the demise of the Civil Aeronautics Board. We have seen regulations put in place that basically helped us accommodate to new and changing needs. The regulatory processes accommodated instrument and VFR flight improvements to ease growing demand. I n 1978, the United States Congress passed the Airline Deregulation Act that changed the rules under which we all operate. What has happened since 1978? In the spirit of increasing competition in the United States, and as a result reducing fares to make air travel affordable for more people, Congress has also created one of the most rapidly growing, dynamic industries in the last ten years.

In 1978 250 million passengers in the United States traveled by air. By 1989, last year, the number of passengers had nearly doubled, reaching 445 million.

Looking at aircraft fleet, average passenger capacity was 106 seats per aircraft in 1969. By 1978 average passenger capacity had grown to 162 seats, and by 1989 it had grown to 181 seats per aircraft.

The worldwide airline fleet in 1975-1978 was somewhere in the vicinity of 3,500 to 4,000 airplanes. By 1989 the fleet had grown to 7,441 aircraft as estimated by Boeing and Avmark, two companies that carefully study the aircraft fleets of world carriers.

In 1978 we had 19 major or trunk airline companies in the United States serving all destinations. As of 1989, we were down to nine major trunk carriers, and I would suggest to you that the number will continue to decline. As a result of deregulation, names that were familiar such as Braniff, Texas International, Frontier, Western, North Central, Southern, Hughes, National, Ozark, and People's Express no longer exist.

The changes have been dramatic. The impact of deregulation in the United States has been substantial. It has changed the way we think about air transportation and the way we manage airports. What has happened in the United States as a result of deregulation is only an introduction to what is going to happen around the world as we face liberalization in Europe in 1992 and witness dramatic traffic growth in the North Pacific routes.

A LOOK AHEAD

Where are we going in the future is even more interesting. Looking again at the passenger activity by 2001 it is anticipated that there will be 750 million travelers in the United States annually. By 2018 the 1989 figure of 445 million passengers will double to almost 900 million passengers a year.

The Boeing Company believes there will be 12,430 commercial airlines in the world fleet by early in the next century, a 67 percent increase over what we have today. Avmark has a more conservative prediction. Based on the assumption of more seats per aircraft than Boeing anticipates, Avmark forecasts that the fleet will reach the 10,000 aircraft by 2005, 34-percent increase in the world airline fleet. The bottom line is that airplanes are being delivered. By every measure -- whether it is seat capacity, passengers carried, or fleet size -- the industry is healthy and will continue to grow significantly. As it grows, more and more demands will be placed upon airports, both domestically and internationally.

Let us take a look for a moment at what airlines will probably do during the 1990s. This is important because what the airlines do will ultimately determine what the airports do in response.

Specifically, two major events are occurring within the airline industry are going to have a dramatic impact. First, we are seeing for the first time -- and this seems to be a settling effect of deregulation -- marketing pacts and equity agreements being formed by international airline companies. We are beginning to see globalization of air transportation.

Minneapolis and St. Paul is the home base of Northwest Airlines. We were surprised, to say the least, a few months ago when Alfred Checchi purchased Northwest Airlines, making it a private company. What was equally surprising was that KLM Royal Dutch Airlines was involved as an investment partner in the acquisition of Northwest Airlines. Because of federal restrictions and limitations on investment, their ownership percentage is limited to approximately ten percent; but it points to a significant trend. KLM is part owner of Northwest Airlines in Minneapolis and St. Paul, Minnesota. KLM also owns 14.9 percent of Air United Kingdom. They are currently involved in financial arrangements with British Airways, and they own 20 percent of Sabena.

KLM is not unique. SAS owns a 9.9-percent interest in Texas Air Corporation, which is the conglomerate that operates Eastern and Continental Airlines. Delta has a 5-percent investment interest in Swiss Air and 5-percent investment interest in Singapore Airlines. American Airlines has a 7.5-percent interest in Air New Zealand. Through various marketing pacts, equity agreements, and financial arrangements, airline companies are becoming partners on a global front.

The second major event occurring in the industry is a dramatic increase in the order and delivery of new aircraft from manufacturers. Airlines are buying new airplanes at record levels. It is projected that between now and 2000, 600 to 700 airplanes will be delivered to the world market. The giants will grow larger. We are going to see the development of the megacarrier that will serve worldwide markets at a level that far exceeds the efficiencies we find today. As a result, we are also going to see stabilization and slow fare increases. The fare increase will have a direct impact on airports around the world. As the fares increase, the ability of the travelers to utilize airline services will decline. We have seen this with deregulation of the U.S. airline industry, and we will see it as Europe moves toward liberalization.

We are also going to find the airlines faced with substantial debt burden that is going to cause concern for some major carriers in the competitive environment. Those new airplanes are expensive, and the burden is the debt incurred for purchase of new competitive equipment that they must operate. We are going to see an increase in foreign flag carriers operating in the United States, and in a moment I will discuss the specifics as they relate to airport operators.

Who will dominate the markets of the future? In the United States, 90 percent of the service will be provided by six carriers: United, American, Delta, USAir, Texas Air Corporation, and Northwest Airlines. Further, these carriers will also provide air transportation services worldwide. Today they are the dominant carriers in the United States. In the future they will become dominant carriers throughout the world. Why? First, they are purchasing huge fleets. I do not have the specifics on the orders for all of these carriers, but I do know that Northwest Airlines at the present time has firm orders or options for $13.8 billion of new equipment to be delivered between now and 1997.

When an airline combines these huge purchases of new aircraft with an already large fleet and then adds a computer reservation system, frequent flyer programs, and control over the management and operation of regional airlines, you can see the development trend of the future. Finally, airline companies are negotiating new leases with airports in the United States that will secure their positions and permit continuation of market dominance.

This domination by these megacarriers will result in additional trends. Let me share with you my personal observations about these trends. First, the industry is

going to stabilize. We have gone through 10 to 12 years of substantial turmoil. We are going to see a stabilization within the industry as the number of competing companies declines and the survivors begin to carve out particular niches in the market. Secondly, airlines are going to be much more predictable regarding their earnings structure. They will have a much better handle on their overall financial situation as this stabilization occurs. The financial earnings will grow modestly as a result of increased air fares worldwide. As U.S. carriers introduce themselves into European and Asian markets, we are going to continue to see fares increase, but at a very slow and gradual rate.

There will be less competition throughout the world and perhaps failures by at least two international carriers. Whether these companies file bankruptcy or find themselves acquired or merged with other carriers remains to be seen. If you look at a chart of the top 15 major carriers of the world today, eight of them are U.S. airlines. Of the remaining seven, six are foreign international carriers that have current financial investment arrangements with U.S. carriers. What this tells me as an airport operator is that in the future I will be dealing on a regular basis with carriers having both domestic and international economic interests. I anticipate meeting individuals from other parts of the world and negotiating gate and lease arrangements with them on behalf of megacarriers.

U.S. AIRPORT CAPACITY

Let me turn to trends at United States airports that are going to have impact on the international scene. First of all, the single biggest problem that all of us must deal with, both within the United States and internationally, is that of airport capacity.

Airport capacity today in the United States is reaching a critical point. When the United States airport system becomes crippled by its capacity constraints, there will be significant impact on countries throughout the world. Currently in the United States, 22 airports have some type of capacity constraint and experience 20,000 hours or more of annual delay in operations. By 1997 that delay will grow to 50,000 hours annually at many of these airports unless something significant takes place. Today the cost of delay is 3 billion dollars. Your arithmetic is as good as mine in predicting the economic disbenefit of 50,000 hours of delay at an airport in the future. The situation is not unique to the United States; it is an international phenomenon. In Europe today, it is determined that 35 airports face some sort of constrained operation and two airports in Europe need specific priority action today to alleviate severe problems for the economies in the countries involved.

The United States must solve the airport capacity problem, and we must do so in three ways. First, technological improvements must continue. We must learn how to handle IFR traffic better, and we must learn how to manage VFR traffic better. We must examine air traffic control procedures, and we must take a look at separation criteria currently being used. Second, we must resolve the aircraft noise problem. Somehow, one way or another, we must deal with aircraft noise as an impediment on the system. Every single major airport and many of the medium hub airports in the United States -- and the same is true throughout the world -- face severe restrictions and constraints because of environmental impact. Earlier, Senator Kato described the situation and part of the decision-making process in building the new airport in Osaka, Japan, which will be placed off-shore to avoid environmental impacts.

Finally, we must find ways to finance the future growth of the international transportation system. The historical methods of paying for airports and airport improvements probably will not work because the dollars simply are not there for the improvements. We need new major airports in the United States, and we need major improvements to existing facilities. A new airport in this country today runs in the vicinity of $2.5 to 3 billion. There are estimates of $7.5 billion for new airports elsewhere in the world. Money must come from somewhere; and citizen taxpayers, airport authorities, and airlines simply cannot meet all of the demand. We have to be creative and innovative. The same situation and same issues exist in Europe, and we will begin to see significant movement and additional demand as we approach liberalization throughout all of Europe in 1992.

I am pleased to tell you that airports are taking action. Things are happening worldwide. In the United States, for example, international air transportation has significantly changed the way we have operated over the last 10 years. If we go back to 1973, there were only 10 U.S. cities that were gateways for nonstop service between the United States and Europe. By 1978 the number had grown to 12. The number is now 22.

Turning toward Asia, there were five gateways to Asian nations from the United States in 1973; in 1978 there were six. Since deregulation the number has grown to 11. Basically international traffic from U.S. gateways to international and foreign markets is significantly changing and dramatically increasing.

Finally, let me discuss for a moment a newly formed organization known as USABIAS, which stands for United States Airports for Better International Air Service. Today some 20 U.S. airports are members of USABIAS. It is an organization that believes that airports need additional international service. The group consists primarily of U.S. airports that have not enjoyed traditional gateway status and quite frankly believe that the current policy of the United States government prohibits or limits their ability to enjoy international direct flight service.

USABIAS is seeking to change U.S. policy in two ways. First, they wish to have international negotiators from the United States consider the needs and the views of the local communities as part of bilateral negotiations. Second, if a U.S. carrier does not wish to serve a particular international market, then the United States government ought to be more liberal and permit foreign flag carriers the opportunity to provide direct service. USABIAS is having some significant impact. Secretary of Transportation Skinner is giving substantial consideration and time to the issues of international air service needs and permitting expansion of gateway status to communities that historically have not enjoyed such status.

SUMMARY

Let me summarize a few key points. First, growth is dramatic, and it will continue, not only in the United States, but in Europe. As we learned earlier today, capacity congestion in Europe and in the Orient is a continuing and growing problem.

Second, Boeing, McDonnell-Douglas, and Airbus will continue to produce new aircraft to meet the growing needs of the world marketplace. They will do so by producing approximately 600 to 700 airframes per year from now until the turn of the century. We in the airport business must learn how to absorb this additional traffic and handle the new aircraft that are being placed into service.

Third, major U.S. carriers will become much more international. Through financial agreements and operational arrangements carriers will expand their influence throughout the world. The megacarriers of the future will take necessary measures to provide needed air transportation.

Fourth, airport capacity will haunt us through the 1990's and beyond as we struggle with trying to increase the ability of airports to handle increased traffic demand. Major hubs will continue to grow but they will grow at a slower rate simply because they are already approaching capacity. Medium hub airports in the United States will grow more quickly because they have the ability to meet expansion demands. With the work of USABIAS, it may very well be that medium hub airports of this country will begin to enjoy nonstop international service through various arrangements with foreign carriers.

Finally, airports must prepare for substantial delivery of new airplanes, with higher seating capacity. More and more airports plan to have international air transportation services, and to do so they will have to be able to handle wide-body airplanes with seating capacities of between 350 and 500 seats.

In summary, I have painted a picture that basically says we are going to grow. As we grow, we are going to have continued demands placed upon us. It is no longer a U.S. viewpoint alone. It is a viewpoint that must be shared by airports around the world.

IMPACT OF LIBERALIZATION ON EUROPEAN AIRPORTS

Jan Veldhuis, Amsterdam Schiphol Airport

The world air transport industry is growing very rapidly. Between 1979 and 1988 world air traffic in terms of passenger kilometers grew annually at the rate of 5.5 percent. The number of freight kilometers grew even more, almost 7.5 percent annually. In the OECD area in the same period the annual growth of GNP was only about 2.5 percent and international trade 4 percent. (Figure 24)

Compared with the growth figures of sea transport these figures become even more pronounced. To and from the Netherlands sea transport of freight grew between 1977 and 1987 at 0.2 percent annually, while air transport of freight showed a growth percentage of about 6.5 percent. (Figure 25)

These figures reflect the trend of an increasing share of air transport in the total of economic and transport activity.

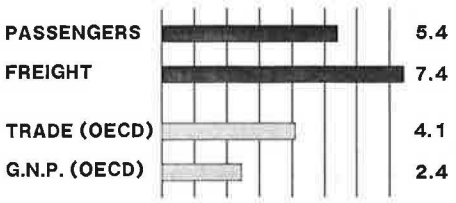

FIGURE 24 Yearly growth of world air transport, trade, and GNP, 1979-1987.

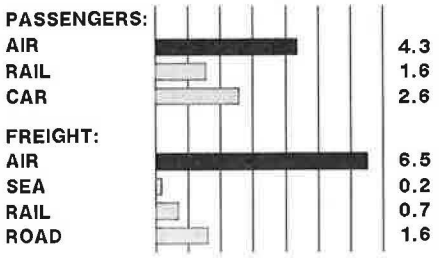

FIGURE 25 Yearly growth of transport indicators, the Netherlands, 1977-1987.

	U.S.A.	EUROPE	FAR EAST
INCOME LEVEL	++	+	-
INCOME GROWTH	+	+	++
MATURITY OF MARKET	+	0	-
GROWTH-PERSPECTIVES	+	++	+++
MARKET SIZE	+	+	+++++

FIGURE 26 Economic trends: disposable income.

TRENDS AND DEVELOPMENTS

Economic Trends

These impressive growth figures are of course a reflection of economic trends. Increasing disposable income is one of the main driving forces behind the growth of passenger kilometers, particularly in the "leisure segment". Especially in highly developed regions where the need for basic necessities is more and more satisfied, additional income can be spent in luxury consumer goods and services. (Figure 26)

Air transport is such a luxury good and, as a consequence, has to compete with other consumer goods and services. Preferences of the consumer play an important role in this respect. Assuming these preferences are unchanged, the growth of this leisure segment will be faster than the growth of disposable income. Elasticities vary -- depending on the market segment -- from about 1.5 to 2.5. These elasticities may, however, decrease in the long run when air transport is -- as it may already be in the United States -- a normal part of lifestyle, and discretionary income will be spent to obtain more exclusive goods and services. In Europe, however, the propensity to fly compared with the United States is still very low, such high growth potentials still exist. In this context the Pacific Basin is of special interest. With a low penetration of air transport in the total consumption, but with big increases in disposable income and massive population potential, the outlook for this region is booming.

International trade is also contributing to the growth of air transport -- to some extent in the passenger segment but, most of all, in the freight segment. World trade is increasing rapidly. The ongoing process of economic integration leads to a development, where an increasing share of our needs will be imported and an increasing share of the production will be exported. This trend is reflected in the above-mentioned GNP growth of 2.5 percent and growth of trade of 4 percent in the OECD area. Parts of the production process will take place where one can produce cheaper and more efficiently. This process of international specialization leads to cost reductions and therefore further economic growth and to a strong development of the transport industry. Transport costs -- as part of the value of the goods -- have to be low enough to justify production at distant locations. Decrease of real transport costs as a result of productivity increases and increasing values per volume unit further contribute to this process.

Trends in Air Transport Industry.

The European air transport industry has also benefitted from these factors. Since 1977, however, European air carriers recorded the slowest growth relative to the non-european carriers. Average growth of European carriers in the passenger market reached only 4.3 percent yearly, while North American carriers -- despite an already more mature market -- reached 5.3 percent on average. The best performance was by the Asian Pacific carriers who experienced a growth rate of 8.6 percent in that period. (Figure 27)

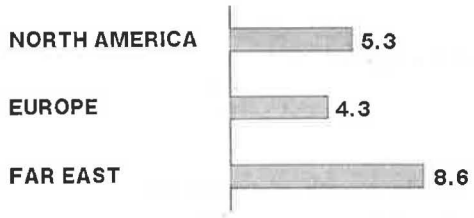

FIGURE 27 Trends in yearly growth of passenger traffic by region of carrier registration, 1979-1988,

The environments in the several regions were quite different. In the Pacific Basin economic conditions were booming, and this may explain the high growth. More interesting is the considerable growth in North America. The last ten years were characterized by turbulent developments. Deregulation led to heavier competition, considerable price reductions, and finally to a small number of relatively cost-efficient major carriers. In Europe, however, the environment through 1988 was still regulated, with few incentives for carriers to compete in the intraeuropean air transport market. One of the lessons from these figures is that deregulation has contributed to a considerable growth in passenger kilometers.

Regulated Environment for Airports

The position of the main European airports has been a protected one. Most member states have their own, often state-owned, home carrier. Scheduled traffic between the states is regulated in pooling agreements, mostly on the basis of equal share for the respective home carriers operating from their home bases. Hub-and-spoke systems have always existed in Europe, but with little competition, except in the hinterland, where accessibility to airports may affect airport choice. In the case of Amsterdam airport, this hub is used by KLM to carry fifth-freedom transport with a transfer in Amsterdam. The only markets where competition exists to a certain extent are the charter and the intercontinental market, where European carriers -- and so airports -- are competing among themselves and with their intercontinental partners. Because the scheduled European transport of Schipol makes up about 50 percent of the total (and for most European airports even more), competition is limited.

The basis on which these European hubs existed was quite different compared to that in the United States after 1978. European hubs have evolved for political reasons with no competitive justification and are protected by a bilaterally guaranteed market of the home carrier. U.S. hubs, however, have proven to be competitive after ten years of heavy competition.

Environment After Liberalization

A liberalization process is now going on in Europe, and the first major steps have already been made. In 1988 a first-step liberalization package was adopted. It provided some flexibility in fares, some limiting of the guaranteed passenger capacity, and a modest start with so-called fifth-freedom transport. In December 1989 the so-called "Package 2" was adopted, where guaranteed capacities will decrease further and eventually disappearby 1993. The process will be much slower than in the United States, where many restrictions were lifted from one day to another in the Deregulation Act of 1978.

Many political and cultural problems have to be overcome. The position of the European carriers will no longer be guaranteed, and step by step a more competitive climate will be introduced in the European markets. One of the very likely impacts will be lower prices in the very high priced intraeuropean air transport market. This will force European carriers to seek cost reductions in order to meet market requirements. Cost reductions can be attained by larger scale, either by using larger planes or by cooperation -- in whatever form -- with other airlines. The use of larger planes will lead to considerable economies of scale, but new technology, where small aircraft have economies roughly equal to big ones, afford another option. Cooperation with other airlines is more likely. Whatever form is chosen, a rearranging of the suboptimal network structure is likely. Another factor is important in this context. The process of international specialization makes high demands upon the reliability and efficiency of transport and particularly air transport. Hub-and-spoke systems enable airlines to reach cost reductions as well as the necessary economies of scope for meeting

the requirements of the just-in-time concept of many industrial companies. As stated before, hubs have always existed in Europe. The question, however, is whether these hubs are optimally located in this new environment. Intraeuropean liberalization is only one aspect, and a location in the heart of Europe is not the only important factor. Maybe even more important for an airline is a location where it can successfully compete with other carriers for global transport flows.

For airports these developments have great import. The position of the airports in the future networks will partly depend upon the strategy of the airlines operating at those airports, but other factors -- to be discussed in the section below -- are important as well. Options vary between a central position in an intercontinental network, with adequate feed from and to the immediate region and the continent as a whole (a hub airport) to a position outside the main intercontinental flow with some feed to other main airports (a spoke airport). These options are extremes, and intermediate positions may exist for airports. Increasing competition between airlines (and thus also between airports), where every spoke in the network contributes to the force of the network as a whole, will be a strong determinant of the choice between an intermediate position and a position outside the main intercontinental flow.

THE FUTURE OF SCHIPHOL AIRPORT

Goals

Amsterdam Schiphol Airport already has a substantial share of the global transport flow. Intraeuropean scheduled traffic in 1988 reached 7.8 million passengers and intercontinental scheduled traffic about 4.1 million. Together with charter traffic (2.7 million) the total number of passengers was 14.6 million, of which 99.5 percent consisted of international traffic. In Europe only London, Paris, Frankfurt, and Rome (all airports with considerable domestic flows) reached higher volumes. (Figure 28) Freight turnover was 575,000 tonnes and aircraft movements 187,000. In the same year there were about 31,000 jobs at the airport and about 54,000 airport-related jobs outside the airport.

For Schiphol Airport this environment will change. The airport is not centrally located in Europe, but this disadvantage is not too serious with respect to the intercontinental transport flow.

The objectives of Schiphol Airport are twofold. First, as a private company, profitability must be high enough to finance future expansions and to earn an adequate return on investments. But, second, there is also a public objective, which is to offer the home market a suitable and high-quality transport product with many destinations and high departure frequencies. high quality transport product with connectivity to all parts of the world is often a critical factor for the success of plant location decisions. In the Europe of the 1990s, where multinational companies will be very mobile, such factors will be of critical importance in regional economic development. Therefore, in 1988 the Government of the Netherlands, where the transport sector is relatively large (some 7 percent of GNP), issued a major policy document on infrastructure planning to the year 2015. In this policy the importance of the two main ports (Rotterdam as a seaport and Amsterdam as an airport) is emphasized.

Those two objectives -- private and public -- are met by one Schiphol objective: maintaining and even improving the position of Schiphol as a main international distribution center by means of the so-called "main port strategy".

However, the home market for Schiphol is, like other big airports in its neighborhood, too small to justify such a high-quality transport product. Additional transfer traffic must be attracted to build up to a critical level. This has been the policy of KLM for a long time, and it will be sustained in the future. As an example, in the late 1970s Schiphol was promoted as "London's third airport".

Transfer Markets

As a process, transfer is suboptimal. Passengers prefer direct connections, rather than having to transfer at busy airports with all the risks of missed connections. Moreover, the big European cities generate enough traffic volume to justify direct connections with sufficient frequencies. (Figure 29) Even between big and smaller cities direct connections will be possible using new technology. It is only between smaller cities in Europe, where direct connections are not feasible, that possibilities exist to attract transfer traffic, but the volumes are relatively small. So, in the long run, intraeuropean transfer markets will be small, but in the short run -- especially in the period following liberalization in Europe when heavy competition may result in low prices in the market -- they may have some attractive prospects.

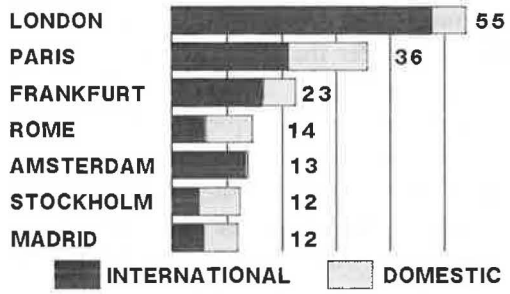

FIGURE 28 Passenger traffic at main European airports, millions, 1987.

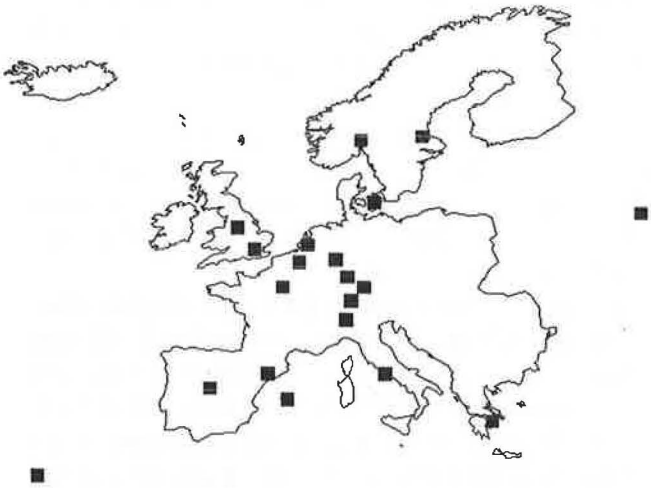

FIGURE 29 Positioning of 20 largest European airports, 1987.

However, intercontinental transfer markets (connection between overseas points and European cities) have a larger potential. Between many such city pairs direct connections are not feasible, and European airports can compete by means of their home carriers for shares in those markets. For Schiphol these markets will be attractive, and intraeuropean transfer markets cannot be neglected because they can be used as instruments to improve synergy with intercontinental markets.

Benefits and Risks of the Main Port Strategy

A high-quality transport product is an instrument to improve the economic structure of the region surrounding the airport. As already stated, indirect airport-related employment in 1988 was estimated at about 54,000 jobs. These indirect jobs are partly suppliers of the airport, but many are also found at enterprises for which location near a major airport is an important business factor. Thus, the main port strategy of an airport can be an important contributor to the economic development in the airport region. This strategy however requires a high-capacity airport.

For the convenience of airport users, transfer traffic involves many aircraft movements in short time periods. However, many aircraft movements with a high percentage of transfer traffic implies smaller destinations and so smaller planes, thereby consuming a great amount of runway capacity per passenger. There is also a market risk. Home-market traffic is relatively captive, but transfer traffic is not. Large investments have to be made for a relatively unstable market segment, and this will have a negative impact on profitability.

Finally there is an environmental risk. The main port strategy involves high environmental costs. These costs must be -- and can be -- controlled. The replacement of noisy aircraft with Stage 3 aircraft is ongoing and will contribute in great amount to control of noise around the airport.

Despite all these risks Schiphol continues to follow the main port strategy because it contributes in an optimal way to the airport's objectives. The possibilities of realizing this strategy will be outlined in the section below, where some critical success factors for airports in the 1990s are discussed.

FACTORS AFFECTING AIRPORT DEVELOPMENT

Several general economic trends and their effects on the air transport industry have already been discussed. In Europe economic trends have been -- and will remain -- the main, if not the determining, factors for development of airports. In the 1990s, however, developments in the air transport industry will be of increasing importance, not only for airlines but also for airports. The important question is how to realize airport-specific objectives in this new environment. Some of the important determining factors for airports are outlined below.

Home Carrier

A strong and competitive home carrier is one of the most important factors in realizing the main port strategy. Here it is necessary to distinguish between a main port and an "empty hub". An empty hub is an airport that is not the home base of a major airline but serves as an operational hub for a major carrier based elsewhere. Examples in the United States are Nashville and Raleigh-Durham, secondary hubs for American Airlines which has its home base in Dallas. The transport product at such empty hubs may be of high quality, but their chances to successfully pursue a main port strategy may be somewhat lower.

Home carriers at an airport like Schiphol provide about 55 percent of direct airport employment in the region. Non-home carriers with about 35 percent of the passenger volume provide only 5 percent of direct employment. Moreover, hub operations by non-home carriers are much more footloose, which gives the traffic base at an empty hub a somewhat unstable character that makes the airport less attractive for potential business development in the surrounding area.

In the long run, however, there is a certain risk in putting too much emphasis on a single home carrier. Experience in the United States teaches that home carriers with a substantial market share at a hub obtain higher than average yields in origin-destination traffic flow at that hub. (Figure 30) This can lead to a monopoly situation with high barriers for new entrants.

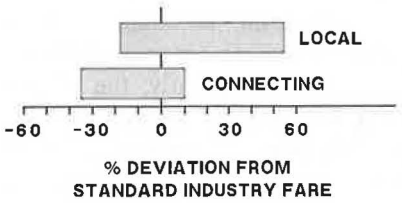

FIGURE 30 Average yields for local and connecting passengers at hubs, first quarter 1987.

Infrastructure

Accessibility is a crucial factor. Airports advertising themselves as main distribution centers must have good landside accessibility. In Europe congestion around cities and airports has increased in the 1980s. New solutions must be found to deal with these congestion problems. Around Schiphol many landside movements by passengers and airport employees are by private car. In both categories only 20 percent is by public transport. Policies are now being considered to increase the share of public transport for passengers and employees to about 40 percent by 2000. Many investments in new rail infrastructure are expected, but incentives for using public transport also have to be reviewed.

A special aspect of the landside access problem is the labor market. Housing for employees too close to the airport is not desirable because of noise problems. On the other hand, especially for parttime employees, locations too far from the airport are undesirable not only because of landside congestion, but also because it increases inflexibility of the labor market. Creative planning of new housing locations in close cooperation with local and national housing and public transport authorities is essential.

Airport Capacity and Quality

For the air transport market a yearly growth of 5 to 6 percent is forecast through the year 2000, with growth at a somewhat lower level afterwards. For airports choosing a main port strategy, enormous investments are required. Except in Munich, new airports in Europe will probably not be built in the coming decade, and the required capacity must be found at the existing airports. The environmental issue makes expansion of capacity at existing airports difficult. The availability of capacity that can be exploited without unacceptable environmental impact will become a very important strategic factor for European airports during the next decade. More crucial, however, is the European air traffic control system. Airspace capacity in Europe is inefficiently utilized by the existing ATC system, but the solutions depend more on political than technical factors.

Airport quality also is an important factor. Travelling from Amsterdam to Washington requires a transfer at another airport, and many choices may be open. Other variables (such as travel time and costs) being more or less equal, the choice depends upon rather subtle variables, such as connecting time, comfort, reliability, and availability of tax-free shopping.

Policy of The European Commission

The policy of the European Commission will have great impact. Proposals for the "point of entry" concept, where passengers originating from outside Europe and transferring to a final destination at an European airport have to check in again, will reduce the "transfer quality" of these hub airports. Moreover, these airports will have to split their capacity into a "European" and a "noneuropean" terminal, with resulting decreases in efficiency and financial losses. Proposals to abolish duty-free sales for intraeuropean flights will have further negative financial consequences for airports.

Other Transport Modes

Development of a high-speed rail network in Europe will have a strong impact on airports. In 1981 the first high-speed rail line was opened between Paris and Lyon, resulting in a 50-percent reduction of air traffic between those cities. New lines from Paris to Bordeaux, Brussels, Amsterdam, London and Cologne/Frankfurt are planned, with further extensions expected in the long

run. Although loss in air traffic between these main cities is likely, it may also contribute to the solution of the capacity problem. If high-speed rail networks have connections at airports, they can be excellent feeders for intercontinental air transport flows, and the competitive position of airports and the airlines serving them may even improve. Further integration of rail and air, with respect to price and unification of the travel product, may improve the quality of transportation. If so, the high-speed rail network may not be a competitor, but a complement to the air transport system.

CONCLUSION

European airports will find themselves in a challenging position in the 1990s, much more than during the last two decades. Liberalization and increased competition is only one aspect. Capacity developments will not be easy, and environmental problems may be severe. Close cooperation between airlines, airports, other transport modes, and public authorities is necessary to further airport development and give new impulses to regional economic development.

OSAKA KANSAI INTERNATIONAL AIRPORT

Senator Hoei Kato,
Osaka Prefectural Government, Japan

BACKGROUND

I have been involved in local politics for 25 years. For the last 10 years I have focused my activities on the development of the plan for the Kansai International Airport and related regional development. What I am going to tell you today is not the government's position, but my personal view.

Until now, the Atlantic Ocean has been the center of activities for people, goods, and information. But, the Pacific region is becoming very important, and indeed it may have surpassed the Atlantic in some activities. This trend is going to continue. This was reflected in the US-Japan aviation negotiations which took place toward the end of the 1980s where a major issue was landing rights in the Asian-Pacific region.

Japan has been often mentioned as a major economic power in the Asian-Pacific region. While we have 43 airports which allow takeoffs and landings of jet airplanes, only three international airports, namely New Tokyo Airport, Tokyo Narita Airport, and Osaka Airport, can currently accommodate a jumbo jet. Even these three airports have very strict curfews which prohibit flying in and out at certain nighttime hours. At the moment we have requests from 37 countries to land in Japan, but we cannot accommodate their requests because of limited airport capacity.

Osaka was built in 400 AD and therefore historically precedes Tokyo by 1200 years. Osaka is in the center of Kansai area that includes Osaka, Kyoto, Kobe, and Nara. In a residential area of 9.2 million acres, we have a population of 23 million and a GNP of $400 billion. This is equivalent to the GNP of Canada.

Our goal to develop Osaka as a truly international city of the 21st century. To that end, we must have an airport with the capacity to provide for movement of people, goods and information. Currently, the Osaka airport operates under very stringent conditions, such as time constraints between the hours of 7:00 a.m. and 9:00 p.m. Additionally, there is a limit on the number of operations. We can accommodate only 370 flights per day, and of these only 250 jet flights. The Osaka airport is overused. It handles about 135,000 flights per year. Because of the location in a highly populated area, we cannot expand the area of the airport any further.

This is the background for the planning of the new Kansai International Airport.

PLANNING FOR KANSAI INTERNATIONAL AIRPORT

The plan for the new airport came into being because we have a very difficult from noise pollution problem at the present Osaka Airport. In 1966, it became clear that a totally new airport was necessary. At the same time we wanted to pursue this project as a strategy for revitalizing the Kansai area. By 1974 we had about 10 candidate locations. Finally we chose a current site, which is offshore of the southern part of Osaka Bay.

Planning for the airport did not begin until 1981. Why did it take so long time to start? Two reasons: First, because of the two oil crises, the government's fiscal situation was very tight. Second, in 1971, a candidate from the communist party won the governorship of Osaka with support of the anti-pollution movement. He had two terms as governor and for eight years, the Osaka economy worsened continuously. Although the government and the business world were very much aware of the need for construction of the new airport, no one could do anything.

By 1979, the public all became aware of the gravity of the matter and voted the communist administration out of power. Under the new governor, the plan for the airport was revived. In 1981, a concrete plan was devised and progress has been made ever since.

After three years of preliminary studies, the Kansai International Airport Company Limited was established in 1984. Planning was completed by January 1987, and we were able to start the first phase of construction. At present we have about 150 acres of reclaimed island above the surface of the water.

The Kansai International Airport is 3.1 miles offshore in the Osaka Bay, where the water depth is 66 feet. The first phase of construction is to reclaim an area of 1,262 acres. This will be a totally man-made island, on which there will be a runway, 3,500 meters long. This will make it possible to handle non-stop flights from Osaka to New York.

The runway will be opened for operation in 1993 and can accommodate a maximum of 160,000 takeoffs and landings per year. To provide access from downtown Osaka about 25 miles away, we will have two railways and two highways. We are also planning water access very high speed boats connecting to various other cities in the Kansai region.

Let me tell you about some of the important features of the Kansai International Airport. First of all, this is the world's very first, full-fledged offshore airport. Because of the dense population, and the need to limit noise pollution and yet remain close to the metropolitan area, we could only choose an offshore site. This meant that we had to face very adverse conditions such as salt water, soil conditions of the sea bottom, as well as very high construction costs.

In order to keep the man-made island to a minimum size, Osaka prefecture decided on its own to develop a coastal area just across the bay. This development covers 784 acres. This area, currently being land-filled, will be used for a cargo depot and food preparation facilities for in-flight service. Hotels and other supportive facilities will also be built in a coastal town just across the bay from the airport.

In short, Kansai International Airport will have two major parts. One will be a man-made island connected to the mainland by an access bridge; the other will be a coastal development to provide airport support facilities.

The second important feature of this airport is the fact that it will the very first airport in Japan that can operate around the clock, providing 24 hour service.

The third feature is the company we have formed to carry out construction. This is a very new idea for Japan. At the time this airport was planned, the national government's fiscal condition was so dire that we had to have private money to supplement the public funds available for construction. The Osaka Prefecture negotiated a joint public-private funding agreement with the national government.

Let me tell you the breakdown of funding. The total cost of the first phase of construction is estimated to be $6.9 billion. One-third of this amount, roughly $2.3 billion will be direct capital investment; the remainder ($4.6 billion) will be financed by long-term loans. Of the $2.3 billion in inital capital investment, the national government will supply $1.5 billion. The Osaka Prefecture will put up 190 million dollars, which will be matched by other local governments in the Kansai region. Private capital will make up the rest, about $380 million.

Another significant feature of the project is that it involves more than airport development. We are going to coordinate our efforts to develop adjacent areas as part of a total regional redevelopment plan.

Adjacent to the airport, but across the bay, we are planning to have a town that will be able to exploit the transportation and communication possibilities offered by the airport. Second, we will use the Kansai Airport complex to stimulate development of other areas of Osaka Bay. Third, we hope to develop a Kansai cultural and academic city. We also plan to develop an area in the hills near Osaka to attract bio-science research facilities. There are two specific objectives that we seek for the Kansai International Airport. One is that we wish to become a hub airport for the Asia-Pacific region. There is at present in Asia a movement to deepen international cooperation, and many of our cities are interested in developing a network for international aviation. For that purpose, Kansai Airport can act as a hub airport because of its advantageous location in the Asia-Pacific region, equidistant from the United States and Europe. We have a diligent staff, very good security, and geographical, historical and cultural ties to people of the Asia and Pacific regions.

The second objective is to become the central depot for air cargo. As you know, air cargo is becoming very important. Japan has a huge trade surplus, and many countries want us to expand our imports. Air freight is becoming very important within our country as well. Fortunately, cargo does not ask whether it is nighttime or daytime, so we can handle it anytime we wish. Kansai International Airport will be the only airport in Japan that can operate on a 24-hour schedule, and we can exploit this benefit to the utmost and distribution center for both domestic and international air cargo.

REMAINING ISSUES

There are several issues still outstanding that need to be tackled. One of the biggest issues, is whether we will be able to realize the overall regional plan after the first phase of airport construction is finished. We conducted a survey last fall asking how many foreign and domestic companies would like to utilize this new airport. We found 36 companies who were interested. The total number of flights that these companies would need amounts to 202,000 flights per year, which is far above the airport capacity during the first phase of the construction. The first phase of construction allows only 160,000 flights per year. With that in mind, we believe we would need to complete overall plan originally of devised in 1981 -- that is, to have two main runways 4,000 meters long and one auxiliary runway 3,500 meters long, which would provide capacity for 260,000 flights per year. Therefore, it is indispensable that we go ahead with the overall plan. Yet, in order to do so, we have to be assured economic feasibility and profitability. We are very much aware that this airport will have a substantial this prospect seriously.

The second issue is international cooperation and how we can enhance it. Many companies want us to open our markets, and this is true with the airport construction, too. For the terminal construction we have chosen a design by a French designer, Mr. Diano. We are also cooperating with the French Airport Corporation. We are trying our best to have not just a limited cooperation, but a true worldwide cooperation.

However, because the technology required to build Kansai Airport was of an uncharted nature and it took Japanese scientists and engineers a long timeto develop it, and because the landfill and the reclamation work had to be done within such a limited time, we could not contract out the construction to any overseas companies. A related problem is that, we have some difficulties with proposals from overseas firms because they do not take into consideration the Japanese basic standard for loans and regulations pertaining to construction. We would ask you understanding in this regard.

The third issue is to now attract overseas research institutions and universities. Together with the plan for the new airport, we want to make Osaka a city that can contribute to the world. Our country does not have abundant natural resources, so our contribution to the world and society as a whole must be in the area of technology and science. That being the case, the many new towns and cities in the Kansai region are being planned to attract educational institutions and their research arms. We hope you will consider coming to Japan and establishing cooperative agreements with Osaka. We welcome you and believe that together we can make Osaka a center for research that can contribute to the world. To that end, I hope the Kansai International Airport will be useful as well.

PART 3: AIR TRAFFIC CONTROL

THE CRISIS OF EUROPEAN AIR TRAFFIC CONTROL

Heinrich Mensen, Lufthansa Germany

THE PRESENT SITUATION

Today's air transport system is characterized by a rapidly increasing traffic volume which in certain areas is approaching or has already exceeded the capacity of the air navigation infrastructure, especially the capacities of airports and the air traffic control system. This is particularly true for Western Europe. To understand the current problem and the shortcomings Europe's air traffic control has to cope with, it is necessary to consider the particular conditions which prevail in this part of the world. The possible ways and means to resolve these problems must be seen in the same way.

To underline the complexity of the problem it should be born in mind that air traffic control itself is only one element of the air transport system and that it is influenced by other elements of the system. (Figure 31)

The rapid growth of the air traffic in Europe was unexpected. All traffic forecasts in recent years have been considerably lower than the actual growth rates experienced. The forecast for 1985 to 1990 showed an average increase in aircraft movements of 2.4 percent. The actual increases in total aircraft movements were 5.2 percent in 1986, 7.8 percent in 1987 and 8.5 percent in 1988. (Figure 32)

To handle this traffic demand requires that the capacities of the most important elements of the air transport system -- the airport capacity, the airspace capacity, and last but not least the air traffic control capacity -- should be increased accordingly.

What does it mean for Europe? The 24 major airports in Europe risk becoming capacity-limited by the turn of the century. (Figure 33) These airports today handle 55 percent of all commercial air transport movements in Europe. Their present maximum runway capacity is on the order of 4.6 million movements per year. In 1988 these airports already handled almost 4 million movements. This leaves only marginal opportunities for future increases in aircraft movements with the present airport infrastructure.

Assuming a 20-percent capacity improvement by early next century, achieved through better use and organization of resources, movements could increase 1.9 percent annually. (Figure 34)

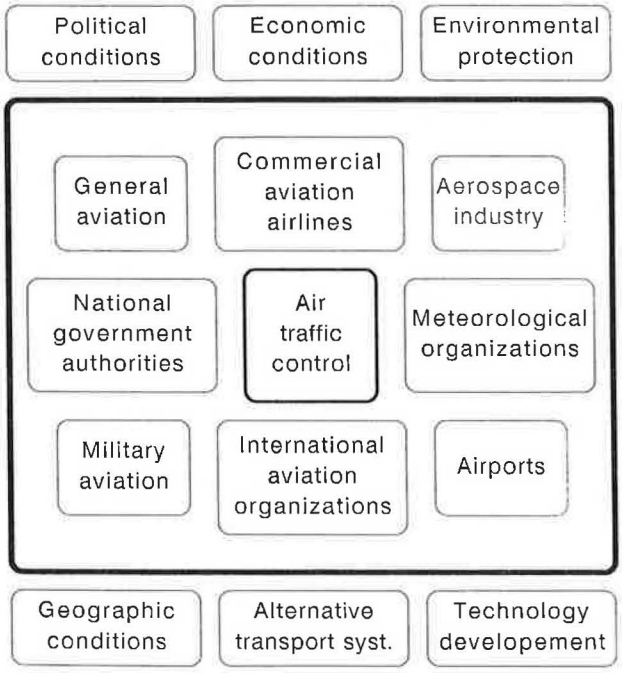

FIGURE 31 The air transport system.

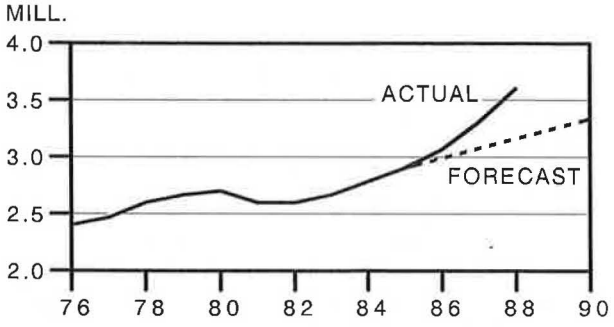

FIGURE 32 Today's air traffic situation in Europe.

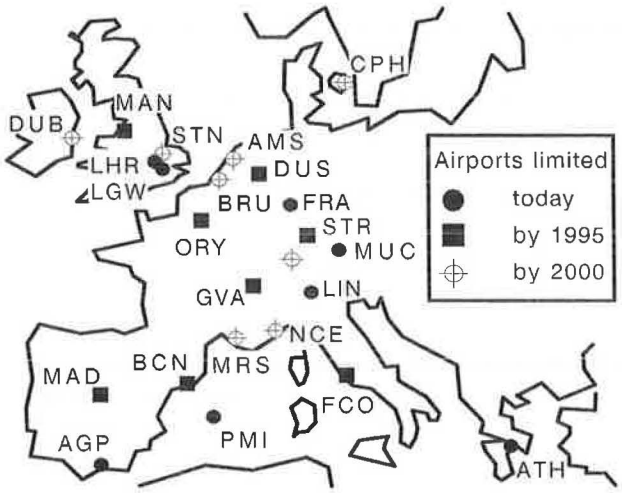

FIGURE 33 Airports and their problems.

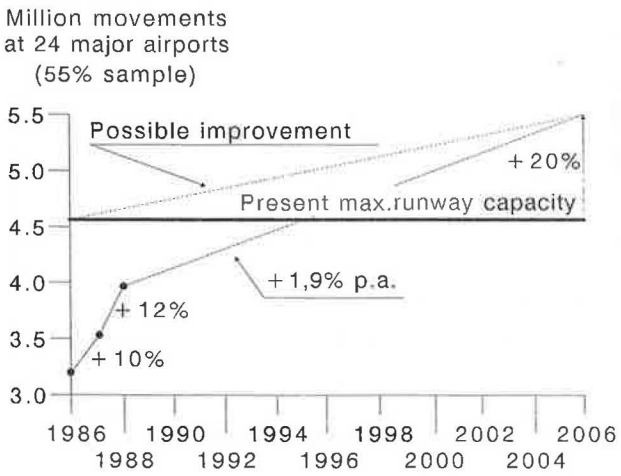

FIGURE 34 Airport congestion in Europe.

EUROPEAN AIR TRAFFIC CONTROL

Europe's airspace is divided horizontally into flight information regions along national rather than functional lines.(Figure 35) The airways structure is not designed for optimum regional traffic flow. Its alignment results in unnecessary additional mileage and flight times, which reduce the capacity of the available airspace. (Figure 36)

For example, a flight from Amsterdam to Frankfurt is about 40 percent longer than it needs to be. A flight from Brussels to Zurich requires 45 percent more miles than it would if it could be flown directly from point to point.

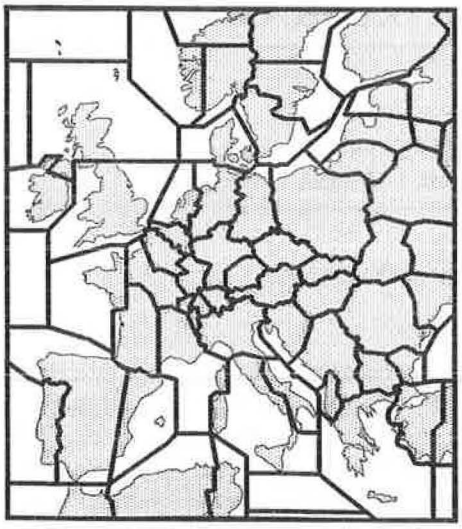

FIGURE 35 Structure of upper European airspace.

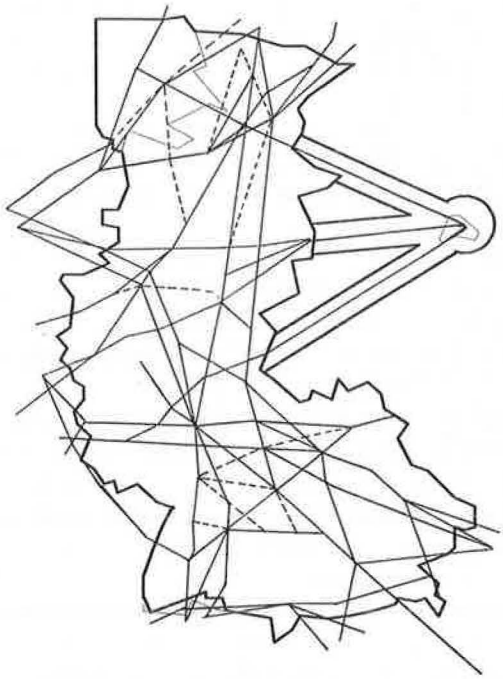

FIGURE 36 Route structure in the lower airspace of Germany.

Europe does not have a unified air traffic control system designed to serve it as a region. Instead, the Western European air traffic control system is a patchwork of 22 different systems. (Figure 37) Each of the 22 European States that form the European Civil Aviation Conference (ECAC) has individually and independently developed its own ATC system according to national rather than international needs. This is another basic reason for the difficulties encountered today.

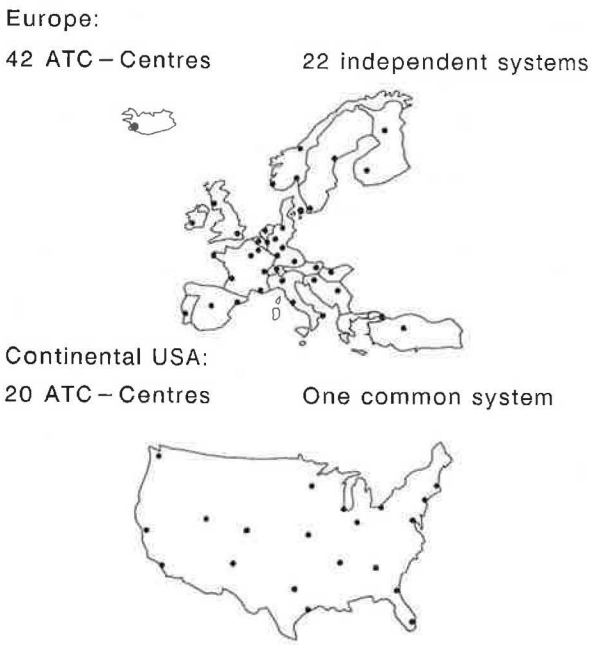

FIGURE 37 The patchwork of the European ATC system.

The ECAC member states cover a total of 4,643,000 square kilometers. This relatively small area is served by 42 air traffic control centers which comprise 22 separate and independent systems. Differences in methods, procedures, and functions call for cumbersome ATC coordination, which limit air traffic controllers productivity in handling traffic. The full potential of automation often cannot be exploited because of incompatibilities between the various systems in use. On the whole, the overall capacity is less than its potential, and a lot of resources are wasted. By contrast, the continental United States controls nearly twice the airspace of Europe with a single system consisting of only 20 ATC centers.

What are the consequences of the division of airspace and of different methods and procedures in daily airline operation? For example, during a flight from Boston to Chicago (distance: 751 nm) the pilot of an aircraft has to contact three ATC centers; from Frankfurt to Madrid (distance 767 nm) he has to contact seven. This example serves to illustrate that the physical organization of the European airspace is outdated.

Another example is ATC sectorization. The airspace of the Federal Republic of Germany (lower and upper airspace) is divided into 52 radar sectors. (Figure 38) The flight time through a sector is approximately 5 to 10 minutes, depending on the aircraft type, flight level, etc. The principles on which the European airspace is organized were established to cope with the problems that arose 30 years ago with the introduction of jet aircraft. Already at that time the need was seen for creation of an upper airspace structure that would be served by a limited number of ATC centers, with sector boundaries determined solely by operational and technical considerations.

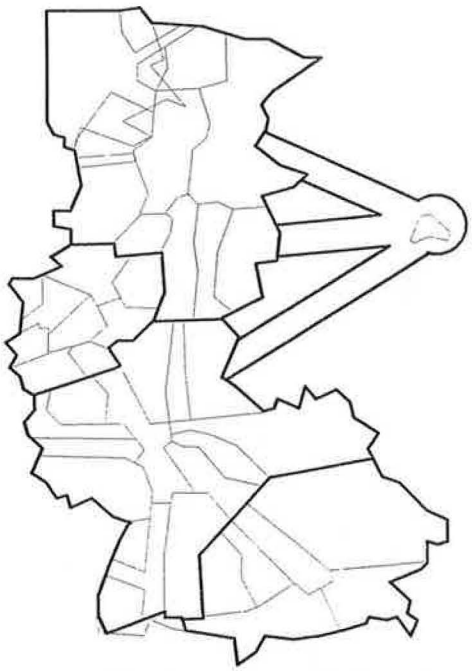

FIGURE 38 Physical organization of European airspace.

While the planned vertical division of the airspace was accomplished, national boundaries have been retained to define the horizontal division. Political rather than operational factors determine boundaries between ATC centers, thus preventing the optimum use of resources, i.e, equipment, workforce and the airspace itself.

Large parts of European airspace are reserved for military use. (Figure 39) This is not only a problem of airspace utilization, it is also a problem of air traffic control. The division between military and civil airspace

is at times ambiguous. Therefore, a concrete quantification of airspace reserved for military and civil use is impossible. The large parts of reserved military airspace (and in many places the division of airspace) places considerable constraints on civil air traffic.

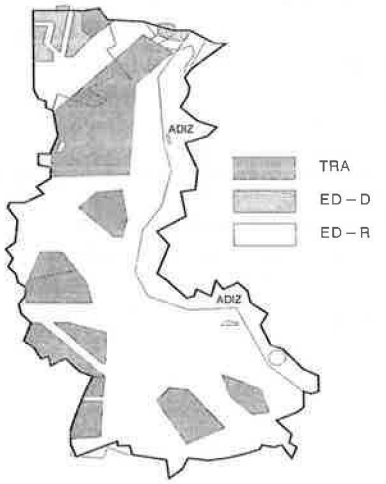

FIGURE 39 Restricted military areas in the upper airspace of Germany.

In the Federal Republic of Germany approximately 20 percent of the airspace is reserved for exclusive use by the airforces of NATO Member States. The involvement of such a large number of airspace users renders civil-military cooperation and coordination extremely difficult.

DEVELOPMENT OF EUROCONTROL

The idea of transferring ATC functions from national authorities to an international European agency was born 30 years ago. It was an important part of the first Eurocontrol Convention in 1960,which charged Eurocontrol with the common organization of air traffic services in the upper airspace. The second Convention called for coordination of national plans in order to establish a common, medium-term plan, for both upper and lower airspace.

Success has been slow in this area; the first edition of the Common Medium-Term Plan was adopted by the Euro-control Permanent Commission in November 1988, 28 years after the establishment of the agency. Some national authorities have refused to coordinate their ATC plans with Eurocontrol. Eurocontrol has, by itself, no final authority. The board, the Permanent Commission, is composed of the Transport Ministers of the Member States and has not proved to be the vehicle for coordination and harmonization it was set up to be. (Figure 40) Most of the deficiencies of the today's system are based on the way, decisions are made in Europe.

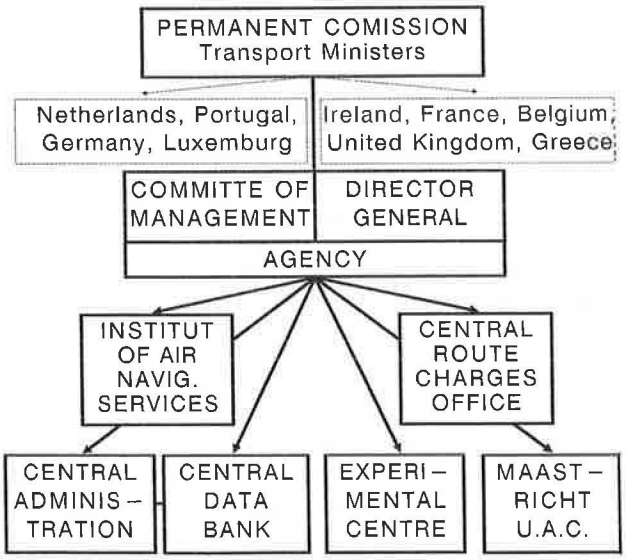

FIGURE 40 Eurocontrol organization.

The European Air Navigation Planning Group (EANPG) works under the auspices of ICAO. The Future European Air Traffic Services System Concept (FEATS) group set up by EANPG was to develop the framework for a common air traffic management system for the European Region taking into account the results of the ICAO Future Air Navigation Systems (FANS) Communique and work undertaken in this field by Eurocontrol. Both these groups however have no executive powers.

The European Civil Aviation Conference (ECAC) is the Conference of the Directors General of Civil Aviation of 22 Western European States. The conference as such has not involved itself in ATC matters in order not to duplicate ICAO work. However, in 1988 the Conference established a task force to monitor ATC developments in Europe. ECAC also has no executive powers, and the decision to follow the recommendations of the Conference is at the discretion of each of its Member States.

Last but not least, the European Parliament adopted a resolution in the summer of 1988 calling for the centralization of ATC in the European Community.

Past experience has shown that the advice and recommendations of ATC experts have so far not been followed by most of the national administrations.

KEY PROBLEMS AND ISSUES

Major traffic flows over Europe necessitate that all European States provide the same high level of air traffic services. They cannot do so, because of the various ATC systems are independent, the area they serve is relatively small, and bottlenecks can have repercussions throughout the whole area. (Figure 41) In some cases these bottlenecks can only be of such a nature that they can only be removed by installing expensive equipment. In others they can be removed by changing ATC procedures or opening up new routes, including the use of area navigation.

Seasonality in traffic volume is an inherent feature of air transport. The peaking of traffic, whether during a day or a year, is not caused by airlines' eccentricities but by customers' demands. Airlines accommodate these fluctuations by flexible use of their resources. The same should apply to the air navigation infrastructure.

In any commercial enterprise investment decisions are usually based on rate of return, which can be expressed in either quantitative or qualitative terms. The odds are that an enterprise that does not know its present capacity will either over-or-under invest. In the case of ATC systems in Europe the latter has been the case. It must be a prerequisite for the present and future management of European air traffic control that its capacity is accurately assessed. Only by comparing capacity and demand can present and future bottlenecks be identified and measures taken to resolve any imbalance. Efficient future planning also depends on knowing the capacity of today.

Another bottleneck is caused by the inadequate radar coverage. (Figure 42) Radar coverage is an important element in deciding the capacity of air traffic control. Minimum en route separation in a radar covered area is 30 nm. In areas where there is no radar surveillance, as is the case in parts of Southern and Eastern Europe, the separation is doubled and equals approximately 60 nm. Where radar coverage is adequate aircraft can be spaced as close as 5 nm. Lack of adequate radar coverage results in different separation minima being applied in daily operation, with these minima generally the increasing from the north to the south of Europe.

Air traffic control is, to a large extent, dependent on the availability of qualified air traffic controllers. Some European countries are experiencing a serious lack of controllers. A qualified air traffic controller can work at full capacity only after 4 to 5 years training. A speed-up in recruitment and training is therefore necessary both to make up for the shortage of today and to prevent a more serious shortage in the future.

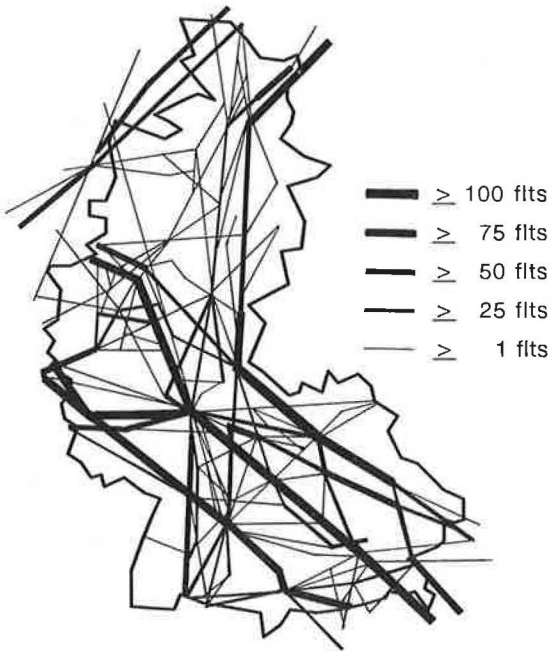

FIGURE 41 European air traffic control system bottlenecks.

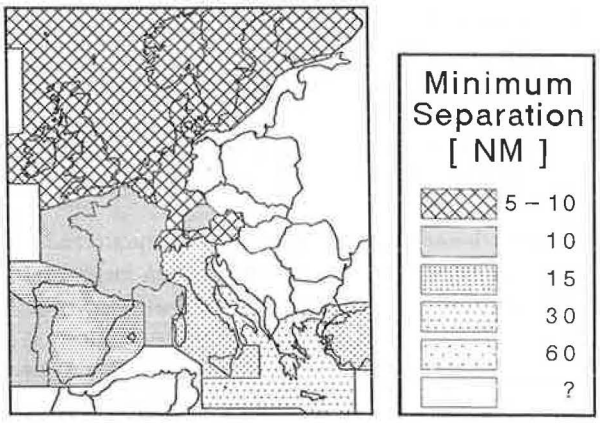

FIGURE 42 Separation minima in European airspace.

The technical standards of the different European air traffic control systems vary, and an important element missing in Europe is the setting of standards for equipment and procedures. The setting of standards has been recommended but not realized. The European Community, which has set standards in many other fields to prepare their Member States for the single market, has not touched on the subject of aviation. Common standards for equipment and procedures are essential for the future of European air traffic control. Standards for equipment and software should be based on the most up-to-date technology and automation.

Air Traffic Flow Management (ATFM) in Europe is today operated by 12 independent centers (11 in Western Europe, 1 in Moscow). It has been decided to set up a centralized ATFM system consisting of two self-contained ATFM units responsible for executive functions in Eastern and Western Europe, respectively. Today's ATFM is a slot system that at times causes underutilization of the airspace instead of optimal utilization.

Political decisions will form the basis for capacity improvement and overcoming the ATC crisis. The fact that air traffic control is part of national budgets does not facilitate these decisions. Air traffic control is low on the priority lists of most Governments and may be even more so in those European countries where the air traffic problem is most acute. The removal of air traffic control funding from national budgets, therefore, merits further examination. In the Federal Republic of Germany interested parties have proposed a semi-privatization of the air traffic control system.

A Eurocontrol feasibility study made in 1981 compared the upgrading of the national ATC systems of Belgium/Luxembourg, The Netherlands and the northern part of West Germany individually with the alternative of upgrading them to one system and one center to control all en route traffic. The cost advantage of the centralized alternative was around 30 percent. Therefore, long-term savings in a system consisting of a few large centers would be considerable in comparison with the cost of today's system of many small centers.

What are the consequences of the air traffic control crisis in daily airline operations? 1986 was the last year with a reasonably punctual performance record. The trend reversed in 1987, and the delays during 1988 reached a level far above the poor performance in the early 1980s. (Figure 43)

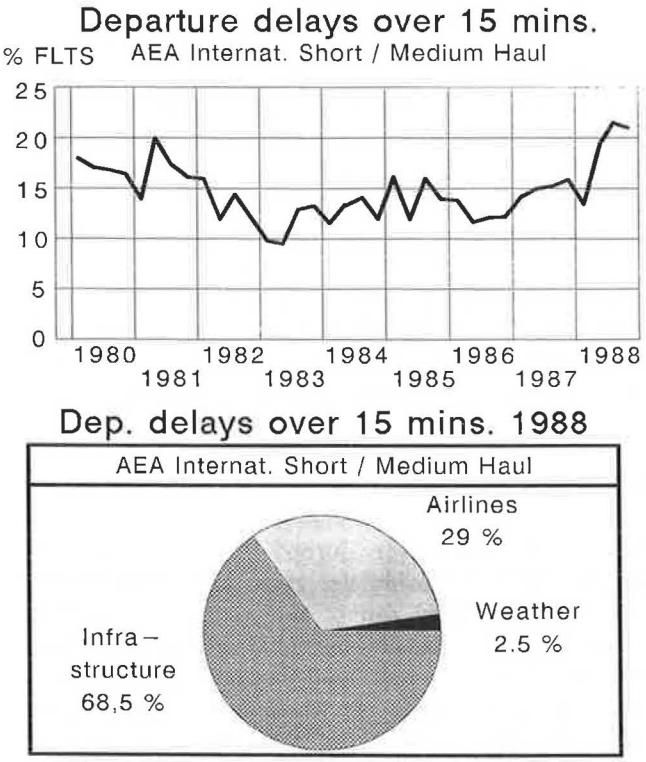

FIGURE 43 Consequences of the ATC crisis in Europe.

In 1988 68.5 percent of delays were due to inadequate infrastructure, 29 percent were caused by the airlines themselves, and 2.5 percent were due to adverse weather conditions. The present delay situation is costly both to passengers and to airlines. In 1988, some 4.6 million passenger-hours and almost 70,000 aircraft-hours (the annual workload of 28 aircraft) were lost on international short- and medium-haul routes and on departure delays exceeding 15 minutes. In 1988 members of the Association of European Airlines lost a total of around 150,000 aircraft-hours due to insufficient infrastructure capacity and an inefficient route system.

This equals the annual productivity of 60 aircraft, or the entire fleet of airlines like Alitalia, KLM or Swissair.

What do the airlines do to counter delays? Airlines have changed their schedule block times to attain better on-time performance; additional aircraft are being operated; crew scheduling has been changed; and airlines are accepting lower flight levels and longer routings. The total cost of this lost productivity was $200-300 million (US) in 1989.

FUTURE STEPS

The measures required to resolve the air traffic control crisis in Europe can be summarized as follows:

1.The Heads of State or Government should make the political decision to integrate Europe's fragmented air traffic control systems. Europe's new air traffic control entity should be a mixed public-private system with government and industry sharing in decision-making.

2. A flexible, coordinated reorganization scheme for Europe on airspace should be developed and implemented by the Transport and Defense Ministers of European countries.

3. Basic common air traffic control standards should be adopted for:
- operating procedures and performance
- software and equipment compatibility
- qualification and training of controllers.

4. The European Community should arrange financing to achieve the European wide computer compatibility and adequate radar coverage needed in the short run.

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PART 4: THE AIRLINE INDUSTRY

STRUCTURAL CHANGES IN INTERNATIONAL AVIATION

Vicki L. Golich, The Pennsylvania State University

To some, liberalization, deregulation, and privatization were new buzzwords of the 1980s. However, as the old saying goes, "The more things change, the more they remain the same." Throughout the history of attempts to create management schemes for international air transport, someone has always been an advocate of an "open skies" principle. As early as 1910, at a meeting of international lawyers, such a policy was proposed, only to be thwarted by the United Kingdom's recognition that air vehicles were useful to the conduct of war. Parliament passed the British Aerial Navigation Act, which gave the Home Secretary complete power to regulate the entry of foreign aircraft and to proscribe zones over which foreign aircraft were not allowed to fly. The European continent followed suit, and the principle of airspace sovereignty was firmly established.

Following the Second World War, the United States sought a more market-oriented air transport system. However, then, as I suspect now, most of the world distrusted America's motives. As Christer Jönsson, a Swedish international relations scholar wrote in an article entitled "Sphere of Flying,"

'Survival of the fittest' in international aviation inevitably entails 'survival of the fattest,' and there [was] widespread apprehension that the American preaching of laissez-faire really [meant] 'laissez-nous-faire.'[1]

Historical and theoretical perspective suggests three salient factors should be considered when implementing economic liberalization policies at either the domestic or international level.[2] First, the market economy guru, Adam Smith, argued that one of government's primary functions was to provide the infrastructure that would facilitate trade.[3] He specifically mentioned transportation systems, namely roads, canals, harbors, and safety on the high seas. Second, government intervention has often been the facilitator of economic development. This is more clearly the case in Europe and Japan than in the United States. Third, aviation has always been subject to government control because of its perceived synergy with national security and usefulness in achieving other national interest goals. Some aspects of air transport will always be subject to government control, e.g., safety and environmental regulations, and, at least for the short- to medium-term, airport and air traffic control capacity. It is probably safe to say nations will only reluctantly yield sovereignty where they still exercise it.[4]

Nevertheless, in 1978, the United States adopted a new, competitive international aviation policy with the goal of liberalizing the air services market.[5] The policy involved a three part strategy. First, domestic deregulation to create financially sound and competitive airlines. Although the promise to the American people was for more perfect competition fostered by the entry of several new airlines, the result has been the development of a relatively small number of large carriers with extensive national and international air transportation networks.[6] The market share of the five largest U.S. airlines has grown from 63.5 percent in 1978 to 85.9 percent in 1988.[7] Of the world's top 25 airlines, nine are American; three are in the top four. The remainder are spread fairly evenly across the globe, except for the African and South American continents.[8] As U.S. carriers have expanded their own international networks, they have ceased to provide connections to and from gateway points in the United States for foreign airlines, decreasing the potential competitiveness of the latter.[9] Europeans are concerned not only about the direct negative effects they have felt as a result of this policy, but also about the potential indirect effects of transnational rationalization of air transport services, congestion on high density routes and at airports, and loss of service to small cities or otherwise less desirable locations.[10]

Second, the United States signed liberal agreements with The Netherlands, Belgium, the United Kingdom, and the Federal Republic of Germany in an effort to divert price-sensitive traffic away from restrictive countries and their national flag carriers.[11] This tactic was particularly effective because of the efficient surface transportation network available in Europe. It also undermined IATA's role as the forum for developing fare structures "that minimized the threat of traffic diversion based on price competition."[12]

Third, in a more direct attack on IATA authority, the Civil Aeronautics Board initiated a review of IATA's antitrust immunity in June 1978 in spite of protest from the Departments of State and Transportation as well as virtually every foreign country. Eventually, the prohibition on IATA rate-setting was restricted to North Atlantic routes.

Although the United States initially encountered stiff opposition to liberalizing air transport services, OECD states now seem more willing to adopt the market-oriented strategy for dividing traffic in order to benefit from the comparative advantage each holds in the industry sector, based on market size and desirability, technological sophistication, management

skills, and so forth. In 1982, nine European countries agreed to placing wider fare bands around IATA reference fares for North Atlantic routes in exchange for a U.S. agreement to extend the antitrust waiver for IATA participation.[13] This was followed more recently by a more restrictive policy announced in December 1989 by the European Community Council of Transport Ministers, which outlined the following principles: double disapproval pricing, liberalization of capacity sharing arrangements, and cabotage.

The United States may have opened Pandora's Box when it began liberalizing international air transport. While world traffic is expected to grow at an average rate of 6 percent through the 1990s, the U.S. market is expected to grow only 4.8 percent. The largest growth is expected to take place in the Pacific region, including a 9.1 percent increase in traffic between Europe and the Orient.[14] In 1978, Pan Am and TWA carried 64.2 percent of U.S. international passengers; in 1988, these venerable, but now vulnerable, flagship carriers transported only 43 percent. During that same decade, U.S. carriers increased their passenger payload by only 2 percent, although international traffic was growing by 6 percent.

The European market will be dynamic during its adjustment to 1992 and could hold three significant bargaining chips at the negotiation table with the United States. First, its airlines already have more extensive route systems in Asia and Africa, where traffic is expected to expand the most dramatically, if not in Latin America where U.S. airlines dominate. Second, once unified into a single market, Europeans may claim intra-European Community travel as domestic and demand to trade cabotage rights for similar privileges in the United States. Third, the melting of the Iron Curtain will likely result in expanded air transportation needs within the European continent. Close ties remain among the peoples within these previously artificially separated blocs.

Several barriers remain to block the implementation of a liberal air transport market, ranging from intangibles like political prestige and national pride to the logistical nightmares involved in integrating disparate regulatory (viz., air traffic control systems or safety certification standards) and legal (viz., anti-trust laws) systems, and restrictions in ancillary domestic markets (ie., food service, maintenance, computer reservations systems).

My comments have concentrated on changes in international air transport services. The ramifications of these changes spread far and wide. Aircraft manufacturers are ultimately dependent on their airline consumers for purchases and profits. Airports and air traffic control systems must accommodate changes in air transport patterns. Governments must coordinate efforts to ensure safety and efficiency.

The following papers by four experts in international aviation who can shed light on some of these issues. They represent both the public and private sectors as well as different elements of the international air transport picture.

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2) Of course, economists recognize that since the eighteenth and nineteenth centuries economic theories have been used "to explain and justify a market system." Alfred E. Kahn, "Surprises of Deregulation," *The American Economic Review*, Volume 78 Number 2, May 1988, p. 317; emphasis is his.

3) Charles P. Kindleberger, "Government and International Trade," Princeton Essays in International Finance, No. 129, Camden, NJ: International Finance Section, Princeton University Press, July 1978, pp. 3, 12; Stephen D. Krasner, "Structural Causes and Regime Consequences: Regimes as Intervening Variables," *International Organization*, Volume 36 Number 2, Spring 1982, p. 198.

4) B. Wilkins appropriately points out that "analyses supporting deregulation have not addressed the industry as a whole ....The airline industry, indeed the entire aerospace industry, so intermingles the 'public' and 'private' that while the industry is not 'socialist,' it is not 'private enterprise' either"; "Airline Deregulation: Neoclassical Theory as Public Policy," *Journal of Economic Issues*, Volume 18, Number 2, June 1984, pp. 424-5. As I have noted elsewhere, the synergy among state political, military, and economic goals makes it difficult to leave the industry open to the vagaries of the market. See Vicki L. Golich, *The Political Economy of International Air Safety: Design for Disaster?* (London, England: Macmillan Press, Ltd., 1989).

5) Daniel M. Kasper, *Deregulation and Globalization: Liberalizing International Trade in Air Services* (Cambridge, MA: Ballinger Publishing Co., 1988), p. 75.

6) Kasper, p. 37. See also Melvin A. Brenner, "Airline Deregulation -- A Case Study in Public Policy Failure," *Transporation Law Journal*, Volume 16, 1988, pp. 182-3; Michael Levine, "Airline Competition in Deregulated Markets: Theory, Firm Strategy, and Public Policy," *Yale Journal on Regulation*, April 1987, p. 423; and Kahn, "Airline Deregulation -- A Mixed Bag," *Transportation Law Journal*, Volume 16, 1988, pp. 230-1.

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8) *Air Transport World*, "The World's Top 25 Airlines," June 1988, p. 54.

9) Kasper, p. 88.

10) *Economist*, "Pricing Open Closed Skies," November 3, 1984, p. 73; Kahn, "Surprises of Deregulation," pp. 316-22. For a particularly poignant statement of these concerns see Jonsson, p. 288.

11) Kasper, p. 76.

12) Kasper, p. 77.

13) Kasper, p. 207.

14) "New Routes Will Develop to Meet Demand for International Service," *Aviation Week and Space Technology*, March 20, 1989, p. 26.

HOW DEREGULATION WILL CHANGE THE STRUCTURE OF THE INTERNATIONAL AIRLINE INDUSTRY

Daniel Kasper, Harbridge House

Some of the things I am going to say would have been controversial when I first started saying them three or four years ago. They are substantially less so today; and I suspect, if this meeting were to reconvene three years from now, they would be viewed as pretty much ho-hum. I will leave that, however, to our collective judgments three years hence.

By way of introduction, I served as Director of International Aviation at the United States Civil Aeronautics Board and was one of the architects of the U.S. strategy for liberalizing international aviation. Therefore many of the things that I will describe today were either initiatives that we took or the results of those initiatives. I am both an insider and outsider. As an insider, I am looking at the subject both from my days at the Civil Aeronautics Board and from my current position where I consult with major international airlines on questions such as the "impact of 1992" and what the structure of the industry is going to be in a few years. As an outsider, I look at the subject from the time when I taught at universities and studied the airline industry. So I come to this with some 20 years of both academic and hands-on experience.

Because of the time limitations, I am going to eliminate some of the detail in my presentation. I will make some assertions that I ask you to accept, at least for purposes of argument. I would be more than happy to give as much detail as you would like, either in the question and answer period or after the presentation.

THE RISE OF MULTINATIONAL AIRLINES

By 2000, and perhaps substantially sooner, most of the world's scheduled airline services will be provided by a score or fewer of major multinational airlines. In short, ten years from now the world's commercial airline industry will be made up of fewer, larger airlines that will have global on-line service or something very much akin to it. Furthermore, these carriers, unlike the carriers today, will be multinational. They will be owned and operated as multinational firms are in other industries.

For an industry that until quite recently could be accurately described as a series of local monopolies connected by a series of equally protected international routes, this is a striking transformation. I submit to you that transformation is already well under way.

The reasons for the change are really quite clear. The economic forces unleashed by U.S. domestic airline deregulation and the companion policy on competitive

international aviation, both instituted over a decade ago, have transformed the U.S. industry in ways that have not been and could not have been contained within the boundaries of the United States. These effects, both economic and political, have spilled over into the international market forcing carriers and countries around the world to accept and adopt more liberal aviation policies than many -- perhaps most -- would have accepted voluntarily. Ironically, the same is happening in the United States after a period that constituted at least the latter half and probably fully two-thirds of the Reagan administration. That administration pursued nothing that could be even charitably described as an international aviation policy, but a policy designed to meet whatever objections carriers raised the loudest. The United States is now being forced to face once again the issue of what are we to do when our carriers want to expand abroad. As a result we are being forced by self-interest to come back to a more consistent international aviation policy.

EFFECTS OF DEREGULATION ON U.S. CARRIERS

What has deregulation set off that is leading to the effects broadly outlined above? A long exegesis on the economics of deregulation in the transportation industry is not necessary. There is not much distinction between the deregulated air transportation industry and the deregulated trucking industry. As transportation economists, you are familiar with the similarities. If I held up a diagram of an airline hub-and-spoke system but changed the title, it could just as well describe the route system of a less-than-truckload carrier. There are many other economic similarities between transportation modes. Suffice it to say that deregulation in the U.S. airline industry has demonstrated several others that should be kept firmly in mind.

First, contrary to much of the earlier economic studies of the air transportation industry in a regulated environment, we have discovered in the last 10 or 12 years that there are, indeed, very significant economies of scale in the airline industry.

Second, and probably more importantly, there are economies of scope. Hence, we see substantial networks emerging with economies that cannot really be captured in the traditional or classic sense of economies of scale, but represent economies of scope. Indeed, some of them fall into the area of purely customer convenience. An example of the latter would be the advantages of a carrier who provides service to a variety of destinations from a single point such as say, United operating out of Chicago. There is a tremendous marketing advantage to being able to offer this kind of service. A travel agent or an individual traveler can simply pick up the phone in Chicago and call United. The chances are very good (which is to say somewhere in excess of 90 percent) that if it is a domestic market, United will fly there from Chicago, and there is no need to call any farther.

The result has been the emergence of a series of substantial national and increasingly international route networks. For those of you who followed the airline industry prior to deregulation, you may recall that in the original Civil Aviation Act of 1938 and subsequent amendments there was discussion of something called the National Air Transportation System. The theory was that this transportation system would be set up and managed by the Federal Government. What emerged was a three-level system made up of what we used to call trunk carriers, second-tier or regional carriers, and commuter or third-tier carriers. These levels were integrated, interestingly enough, by the route authority allocated by the Civil Aeronautics Board, such that there was "a national air transportation system" that provided service to many places. You could get there from here, but how you did it was not determined by airline management decisions about where the traffic was going to flow and how they wanted to serve it. Rather, airline managers could tell you where the traffic might want to flow, but each then had to figure out how to get a share of the traffic and hand off no more than necessary to other carriers.

Since deregulation we now have a national air transportation system. In fact, we probably have six or seven. They are the large, multihub, networks run by single carriers. These networks, as we fairly quickly discovered, can also serve international operations. I say fairly quickly because it took the domestic airlines about five or six years from the time the industry was officially deregulated to get their domestic hubbing situation under control -- to get the bugs out, to get through a very severe recession, and to notice that the same reasons a hub-and-spoke network centered in New York or Chicago was attractive for domestic service also made it attractive for international operations. There was no reason that an airline, which could build a strong hub and provide service to domestic points that would not otherwise justify such service without the hub, could not use the same leverage to build strong international service.

On the U.S. side of the industry, where the market shares of Pan Am and TWA have dropped by roughly a third in the last 10 or 11 years, you don't have to look very far to see what has happened. American is on a growth spurt--Dallas, Raleigh-Durham, Chicago, Kennedy--and now is in the process of purchasing route

rights from Eastern at Miami to Europe and from Miami to Central and South America. Delta has shown a similar growth in service--first at Atlanta, some from Dallas, then from Cincinnati. Even U.S. Air has belatedly gotten into the act, first picking up the Piedmont authority from Charlotte and later this year, in fact in a couple of months, instituting non-stop service from Pittsburgh to Frankfurt. In other words, we are seeing international spokes being added to domestic hubs with the same kind of leverage or ability to draw traffic.

There is another effect of deregulation that we ought not lose sight of, and it really goes directly against what, in my view, is the very wrong-headed notion of "survival of the fattest". In fact, it has turned out to be exactly the opposite. It *is* survival of the fittest. One element of fitness that has become very, very important is the ability to handle affairs in financial and capital markets. Under the old regulated system, capital costs were fairly well controlled. The way you financed capital investment was controlled, and route structures were controlled. When the industry was deregulated, it was not deregulated solely in the product marketplace. Deregulation opened up a wealth of opportunities to compete in financial marketplaces. Indeed, some of the more successful carriers are those who have shown themselves more adept in financial and capital transactions. The U.S. airlines that have survived the deregulation process are a lean and efficient set of carriers, certainly in comparison to carriers from most other places in the world. In the United States we have seen the emergence of six or seven large national, increasingly international, and soon to be global systems serving a huge domestic market, both geographically and in terms of passengers, traffic, and revenue.

LIBERALIZATION ABROAD

In contrast, the rest of the world basically is characterized by small domestic markets, a high degree of regulation, and restrictive international agreements -- all making it exceedingly hard for national carriers to achieve the kinds of efficiencies required to undertake cost-cutting and service expansion to match U.S. carriers. Lo and behold, starting in the early 1980s, instead of just competing with TWA and Pan Am (and remember the latter was without a U.S. domestic system by regulatory design), foreign carriers found themselves head-to-head with carriers that used to feed them traffic at U.S. gateways--Kennedy on the east coast and San Francisco and occasionally Los Angeles on the west coast. U.S. carriers did not have a great incentive, if they were going to fly to London themselves, to hand off a passenger at Dallas to British Airways or British Caledonian. Obviously, if you pick up a passenger in Austin and he wants to go to London, you want to take him to London. It is to your economic advantage to do so. This created pressures, both inside foreign governments and foreign carriers and externally in their relationships with the United States.

If you look at the change in domestic aviation regulation around the world in the last decade, it is staggering. You have markets ranging from the United Kingdom to the People's Republic of China and Australia, all of which have undertaken either complete or substantial opening up of their domestic markets to increased competition. Even Japan, which has been a classic example of a regulated market, is increasingly opening up its markets.

Moreover, these same countries, for many of the same reasons, are looking to liberalize their international arrangements. Whether they like the idea or not, they need bigger markets with freer access and more liberal provisions so they can put together effective, efficient, competitive route networks. A classic case is the Scandinavians, the first country I ever had to deal with at the CAB. In 1978 you could not possibly interest them in a liberal aviation agreement -- absolutely off the radar screen, no way. In the mid-1980s, a complete reversal. They concluded that a small nation or a set of small nations on the periphery of Europe, without an assured access to a European market, and indeed without any assurance that the European market would turn out to be a European market, they needed to have a better set of route agreements and more access if they were going to survive. They came back to the United States and proposed a liberal agreement, at which point the United States said, "My God, we can't do that!, We have got to go back and think about it", which is basically where things stand right now.

But the pressure is on. Foreign governments have mounted pressure against the U.S. to try to get their bilateral agreements changed. They have discovered that as U.S. feed evaporates because U.S. carriers are hubbing at interior gateways and taking traffic abroad directly, European and other foreign carriers need access to these internal points. How do they get it? They try to get more gateways in the United States so they can serve the traffic directly. This approach has severe limits, because the viability of these gateways often depends solely on the amount of feed that a carrier can provide. Because of cabotage restrictions, foreign airlines cannot carry domestic traffic. Given the economics of operating airplanes, they cannot afford to put a fleet of airplanes in the United States to collect enough local traffic for

the one or two flights a day that most carriers run; nor could the U.S. carriers, for that matter, afford to do it in most places in Europe. The capital cost of a fleet would swamp the additional revenues they would generate on the traffic. So, even though foreign carriers have pushed for additional gateways, that has not been enough. They're starting to press for cabotage rights and most recently, and again, equally predictably, the right to acquire substantial ownership interest in U.S. airlines.

INSTITUTIONAL FORCES

This has led to an institutional problem. If the United States were to consider granting to foreign airlines full or fuller access to internal U.S. traffic, the political dimension of the economy would dictate (as I believe would economic self-interest) that the United States seek comparable access for U.S. carriers abroad. In other words, if British Airways gets to come in and play in the U.S. market, the United States should have equivalent rights in British Airways' markets. The problem, of course, is that when the United States says to British Airways you are now authorized to carry any traffic you can get between Los Angeles and New York, we can deliver on that commitment. When the British government says to the United States government, you have the British government's authority to carry all the traffic you can between Paris and London, the British government can't deliver. The French must also go along with it. We can grant internal rights in the United States, as could the British in Great Britain, but there's not much there folks. Great Britain is a much smaller island, and there is not as much traffic. It is not a good political trade, it won't work.

So, we have an institutional problem: What can the United States get in return for granting broader access here? Those of you who have followed recent events in the airline industry know that lurking behind this is also the question of how much investment can be permitted by foreign carriers in a U.S. carrier.

Basically the United States is left with a dilemma. Even as the United States decides it wants to start negotiating more market-opening agreements, it has found it very difficult to come to grips with the institutional basis of a trade. The British cannot give us enough to justify us giving them what they want. The only solution is to put together some kind of broader aggregation of rights on the European side. If the European Community were to come together, access to the internal European market would be roughly equivalent to access of the internal U.S. market. This would seem to set the stage nicely for an exchange of route rights that would open things up.

Even if that were to come to pass, a number of problems would remain. One is the difference between the wide open regulatory system in the United States and that in Europe, where even though the commission continues to press, the right to establish new airlines or to enter new routes is very restricted. Second, a number of airlines are state-owned or subsidized. As a market opens up and competition becomes freer, questions arise about how to compete in a wideopen free-for-all if you have state-owned or state-subsidized airlines. There is also a variety of restrictions on "doing business" -- things like computer reservation systems, ground handling monopolies, monopoly of other airport services, sometimes by the local flag carrier with whom one is in competition. Finally, there is the problem of infrastructure. For example, if we negotiate an agreement with the Japanese, we could authorize them to fly to New York or Kansas City or to Chicago -- pick the most congested airport that takes international service. We grant those rights, and they get the slots to fly as many flights as they want. U.S. carriers, if they could get rights to go to Japan, will get very restricted access, because the Osaka Airport is closed to new entrants. Narita Airport is almost closed to new entrants, and any increase is permitted only on a very tight and incremental basis. Despite these problems, European airlines are frantically figuring how they can get into the U.S. market, whether by code sharing, by investment, or by some other means. Some very creative legal approaches are being discussed that would permit foreign carriers to operate in the United States, arguably within the provisions of the Federal Aviation Act, and U.S. carriers to operate in Europe on the same basis. The carriers, in other words, are not going to wait for governments to get things sorted out. The perceived gains are large enough and the competitive pressures are strong enough to stimulate a large amount of activity by U.S. and foreign carriers, largely behind the scenes.

What are the options? There are really three. One would be for the United States to wait for the European Community to get its act together and then sit down and deal with the Community. In many ways, this would be a simpler negotiation because the Community would then act in the way the Federal Government does in this country; and, it could speed negotiations greatly, particularly if the Commission continued to exert its jurisdiction by negotiating directly with the United States.

The difficulty is that it is not clear how quickly Europe is going to "get its act together." 1992 is close at hand. There is a fierce resistance in some quarters in the Community to further liberalization. Nonetheless, it appears that the liberalization will proceed. The real

question is whether the Community's competition policy is going to prevent the large incumbent carriers in Europe from dividing up the market, tying up all of the available hubs and airports and slots, before the market is officially open to new competition. Right now it is about a 50-50 proposition, with the Commission now considering a couple of very critical cases involving agreements that European carriers have entered into that would, in effect, divide up the market.

The second option would be to look to the General Agreement on Tariffs and Trade (GATT) to put trade in air services under the trade and goods regime as discussed at the Uruguay round. The problems here are many. To start with, two fundamental GATT principles of most favored nation and national treatment, if applied in the air services, would have perverse effects. They would discourage countries from exchanging agreements and would encourage free riders. That is, instead of encouraging countries to liberalize, they would encourage countries to hold out and try to take the benefit of liberal negotiations conducted by others, say between the United States and Great Britain. National treatment raises a somewhat different, but related issue. National treatment simply says we will treat your carriers in the United States the same way we treat our carriers and vice versa. This means that a foreign carrier could then come in and be treated as any U.S. citizen -- get a license, start an airline, buy an airline, whatever. On the other hand, if a U.S. airline got national treatment in, say, France, it would mean that a U.S. airline or citizen would have exactly the same right to be told no that a French citizen now has. Whatever your views are on the economics of that kind of a trade, I can tell you what the political economics are: it's a non-starter.

Finally, there is a third option, one that is starting to get increased attention in the United States. It is called a liberal plurali-lateral. I wish I could claim that the idea is mine. It isn't. The genesis is an idea actually proposed by the Dutch government to the United States about ten years ago. The essence of the agreement is something like this. The United States would initiate negotiation with a set of liberal trading partners. Obviously, the government of the Netherlands felt it would be included in those negotiations. Ideally, one would like to get her Majesty's Government involved. Even though the U.K. is not particularly liberal in air services, it is a very important country. The Federal Republic of Germany, and perhaps one or two others, would also be involved. The objective would be to come up with an agreement that did not start with the lowest common denominator as in GATT multilateral talks where participants bargain, on the basis of "I'll give up this restriction on access if you give up that restriction." Instead, the participants would say "we are a group of liberal trading partners who plan to negotiate a very open regime and if anybody else wants to come in, they are more than welcome, but they must meet the same liberal conditions that we, the initial trading partners, have agreed to." This is a variation of what has been described in trade terminology as the "super GATT" type of regime.

DEVELOPMENTS ON THE HORIZON

This approach has a number of advantages, but the negotiations would not be easy. Far from it. However, negotiations among a smaller group of more liberal countries would be far easier and simpler than those among a larger, more diverse group. Considering the distribution of air traffic by country and who controls it, it does not take a very large group of countries to put together this kind of a regime. With a relative handful of countries, the vast majority of scheduled airline traffic could be covered; and, from there, it would be a relatively easy matter to bring other nations on board as they felt comfortable in accepting limits on national ownership, subsidies, or whatever. Obviously, such things would all be precluded under such a regime.

The next year or so is going to be very interesting in the United States and very critical to what happens in international aviation over the balance of the decade. I say this for several reasons. One, it has become increasingly clear that the traditional U.S. flag carriers -- Pan Am and TWA -- are increasingly less viable. It is likely that ten years from now, if the name Pan Am has been saved (and it may not be), it will be part of somebody else's airline. It could happen sooner rather than later.

TWA is approaching a similar situation for somewhat different reasons, some of which have to do with ownership interest and desire to put corporate funds in different kinds of investments. Another reason is that it is difficult to see how a carrier with a single hub can compete on a nationwide basis the way TWA is trying to do. Thus, the viability of two mainstays of U.S.-international aviation is increasingly in question. Indeed, TWA has agreed to sell American its Chicago-London route, which is perhaps a sign of things to come.

The third factor that will make the next year or so interesting is the question of foreign investment. In the European Community today, it may be possible for a U.S. airline to acquire control of a European airline without that airline losing its status as a citizen of the European Community. The European governments would make it easy, but there are at least two airlines in the United Kingdom already that are not controlled by

citizens of the member states. The United States has a restriction on foreign investment that is more or less 25 percent, depending on how the Secretary of Transportation feels on a given day, but at least that is what the Act says. Investment rights will become an issue because U.S. carriers --particularly the strong ones, the five or six core carriers that are likely to be survivors -- are anxious to expand abroad and because it is very difficult for them to do so. Far and away, the most effective entry vehicle for U.S. carriers abroad is likely to be investment, that is, buy in and integrate those operations as time goes on into their existing U.S. operations. It will be extremely difficult for U.S. airlines to pull that off if we do not also permit foreign carriers to buy into U.S. carriers. Therefore, in the next year or o, we are going to see proposals to amend the Federal Aviation Act that would permit the United States to negotiate, probably subject to some conditions, increased foreign investment and maybe complete foreign ownership of U.S. air carriers. One of these conditions will be reciprocity for U.S. investments abroad.

By 2000 the airline industry will be more concentrated, but it will also be far more competitive, as the U.S. market has become for the five largest domestic carriers. While market share is an interesting number, it is not very informative. Considering city pairs, which is where competition actually takes place, the number of city pairs receiving competitive service from more carriers in 1989 than in 1978, is far greater than the number of city pairs where competitive service has declined. If a city pair had two-carrier service in 1978, the chances are it has three, maybe four, carriers serving it today. On a city-pair basis, fewer carriers are competing in more places. In my view, this is a trend that will develop around the world.

TURBULENCE ON THE AIRWAYS: A REGIONAL AIRCRAFT MANUFACTURER'S PERSPECTIVE

Claxton Lovin, British Aerospace

Turbulence on the airways aptly describes the ongoing structural changes within international aviation. Dictionary definitions confirm that the word turbulence appropriately describes the events which have been happening within the air transport industry recently and which will continue to be influential in the future.

The words "storm or roughness" may be severe, but I will try to show that "commotion" or "having irregular variations in the course of time" are particularly suitable in defining the factors shaping our business.

The most prominent factors creating turbulence and bringing with it an associated change to the structure of international air transport can be grouped into four main categories: congestion, political reform, legislation, and strategic posturing. (See Figure 44).

I will talk in more detail about each of these factors. In my conclusion I will attempt some predictions about the aviation scene once these influences have run their course.

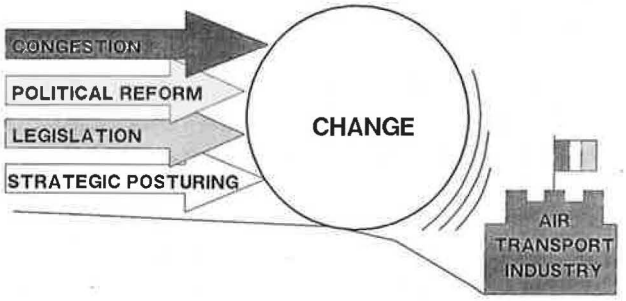


FIGURE 44 Causes of turbulence.

CONGESTION

Congestion of airports and airspace worldwide has been the subject of much debate recently and is perhaps the most important factor that could constrain the growth of air transport. It certainly will require changes in the way this industry functions. In Europe alone, estimates by the Association of European Airlines show that in 10 years over half of the 46 main airports will be heavily congested (See Figure 45). This is not unique to Europe however. Many examples worldwide spring to mind such as Sydney, Australia; Narita, Japan; Hong Kong;

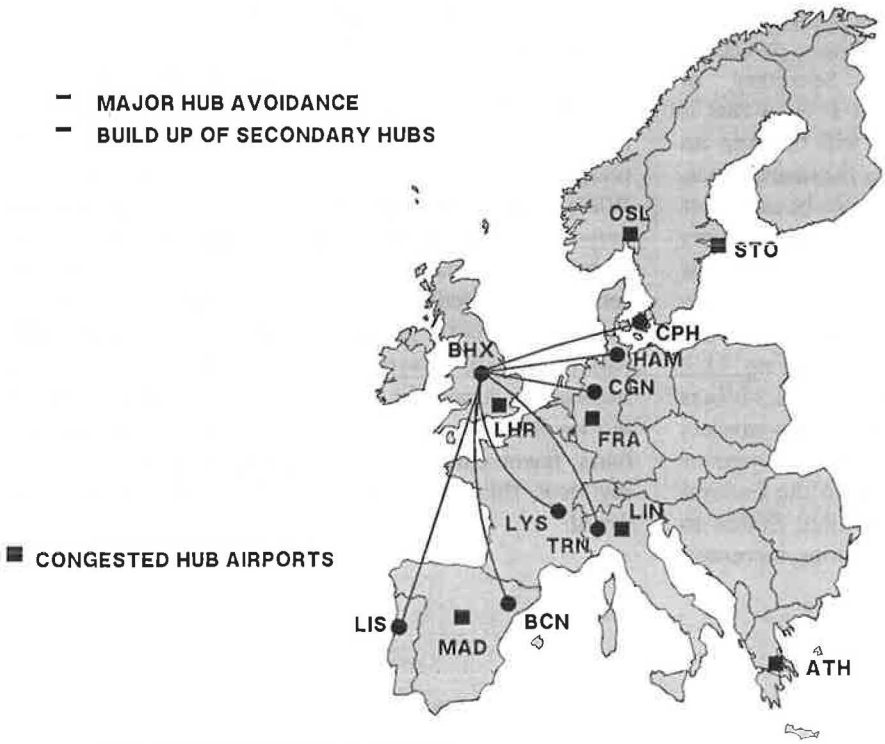


FIGURE 45 Changes to route systems.

Bangkok, Thailand; and many U.S. airports. Congestion will have various effects on the way airports are used and the scheduled services provided. Lack of suitable slot times at major airports will cause large airlines to set up secondary hubs either domestically (e.g., British Airways at Birmingham in the United Kingdom) or internationally if conditions allow (e.g., Aer Lingus at Manchester).

These secondary hubs should enable air travellers to fly on more direct point-to-point routes and thereby avoid the hassle and delay often associated with major airports. This build-up of routes which are less dependent on connections through major airports hubs will also create opportunities for regional aircraft operators who may provide feeder service from outlying areas to these secondary hubs.

Congestion at larger airports will affect aircraft manufacturers by creating a false demand among airlines for aircraft of larger capacity. As traffic grows, an airline's ability to match that growth with additional service frequencies will be reduced due to slot limitations, and increasing aircraft size will be the only option open to them. (See Figure 46). Regional aircraft, which play an important role in feeding major hubs, may be restricted in their access to these airports due to efforts by authorities to maximize the passenger-to-aircraft movement ratio. Several examples of such restriction have appeared but have always met with strong opposition. The Massport scheme of charges at Boston Logan Airport is one such example. Others are attempts by Milan airport in Italy and Dusseldorf airport in West Germany to divert regional services elsewhere.

Congestion of airspace is a problem that is also likely to be very difficult to solve. For example, within the 23 member states of European Civil Aviation Conference (ECAC), there are 22 separate Air Traffic Control (ATC) systems and 44 different ATC centers.(Figure 47)

In addition, not all ATC systems operate according to the same standards, which dictates that in some areas aircraft at the same altitude must fly 5 miles apart while in other areas coverage is so poor that a 60-mile separation is required. By contrast the continental United States controls nearly twice the airspace of Europe with a single system consisting of only 20 centers. Taking this comparison further, a flight of 780 nautical miles between Frankfurt in West Germany and Madrid in Spain requires clearances from six centers, while a flight between Chicago and Boston, a similar distance, involves only two centers.

Flight delays caused by ATC problems are a real financial burden to airlines: Lufthansa claims that delays in 1988 cost them 93 million DM ($61 million). This seemingly unavoidable cost will undoubtedly be passed on by the airline and it will be the passengers who ultimately suffer.

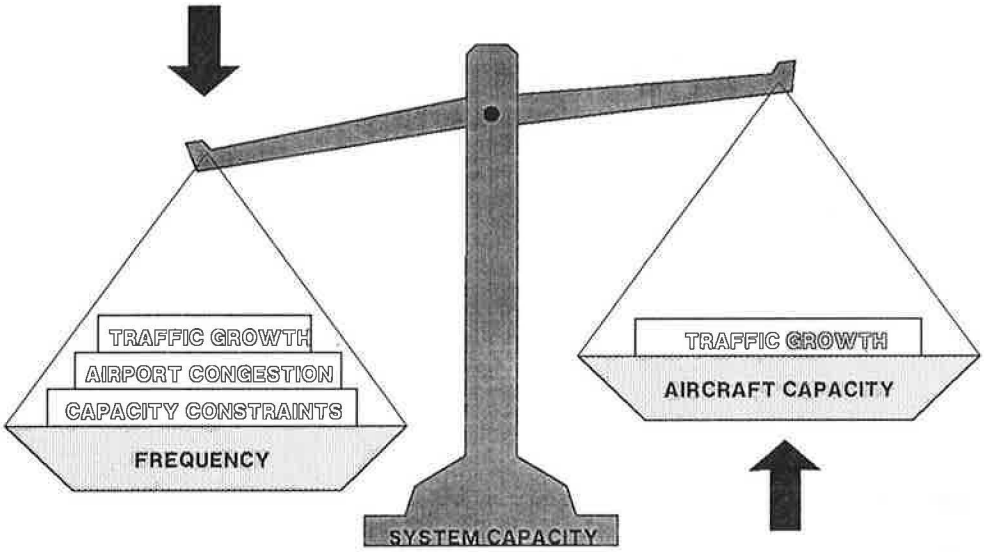
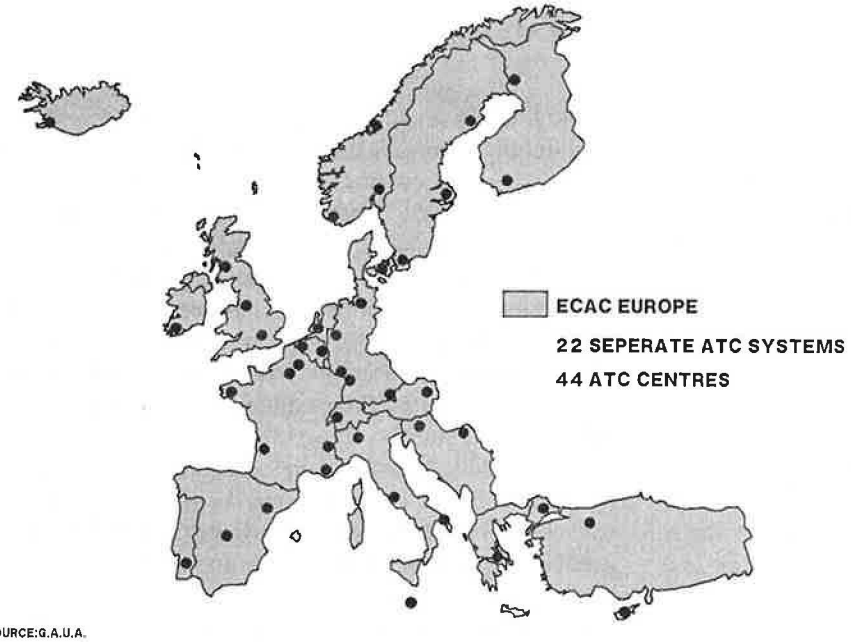


FIGURE 46 The need for larger aircraft.



SOURCE:G.A.U.A.

FIGURE 47 The need for a united European ATC system.

Various suggestions for improving Europe's ATC have been put forward. (Figure 48) The German Airspace Users Association suggests that increasing levels of improvement could be achieved according to the degree of commitment and investment. First, a harmonization of Europe's 22 ATC systems at an estimated cost of $1-2 billion could almost double current peak-period capacity, while reducing delays to an acceptable level. This interim measure could handle peak-period demand until the year 2000, when traffic levels are expected to be around twice those in 1988.

A national control facility system would leave each ECAC country with control over its own airspace but consolidate the en-route and some approach control functions into one control facility for each country. This would reduce the number of centers from 44 to 22 and should be able to carry over twice as much peak traffic as the current European ATC handles.

Finally a Regional Control Facility would consolidate en-route and terminal approach facilities and merge Europe's 44 existing ATC centers into 12, operating much more efficiently. This system would have a peak-period capacity two and one-half times greater than that of the current ATC system.

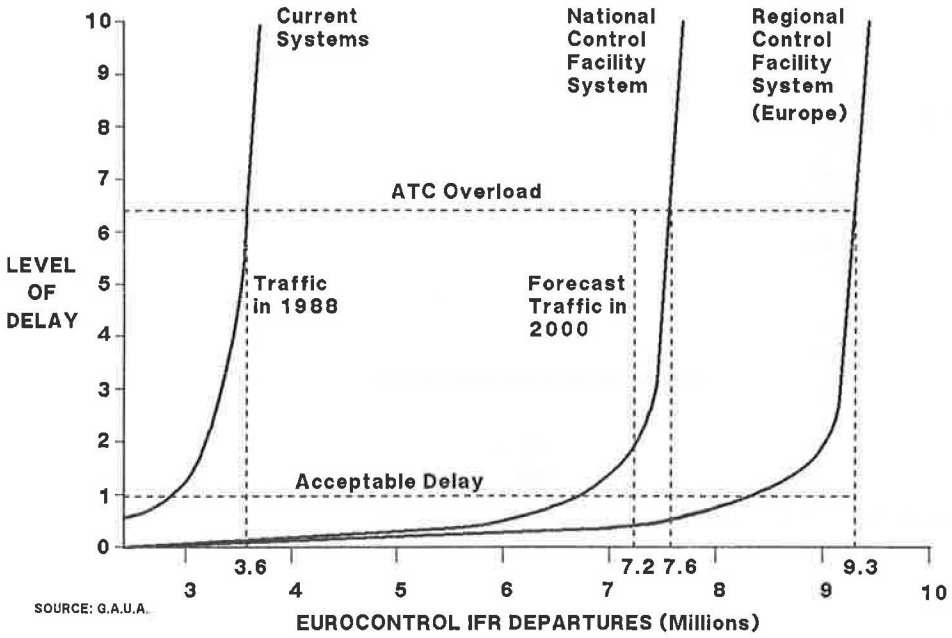


FIGURE 48 Peak period ATC performance.

POLITICAL REFORM

Next I would like to touch on the topic of political reform and how matters such as airline deregulation or changes of attitude within communist countries will affect air transport.

Deregulation of airline services has taken place recently in many countries throughout the world -- including Australia, New Zealand, Taiwan, and Canada. Europe is also currently undergoing deregulation or "liberalization". Deregulation is expected to result in more competition between airlines, better standards of service, and lower fares (See Figure 49). In light of U.S. deregulation however, one has to question these expectations. U.S. airlines have declined in numbers, competition on domestic routes, which are dominated by the use of hub airports, has been reduced; and airline fares are rising.

IN GENERAL (Based on U.S. Experience)
- Increased Competition
- Improved Service Standards
- Lower Fares
- More Routes Served

EUROPEAN LIBERALIZATION
- 5th Freedom Routes
- Cabotage
- Rules Against Anti-Competitive Behavior
- Cross Border Establishment
- Joint Route-Right Negotiation (eg. Europe-USA)

FIGURE 49 Effects of deregulation.

Within the European community, with the interests of 12 different countries at stake, liberalization is going to be a gradual process that will not resemble the overnight shock of the U.S. experience. After 1992, when the single European market should be in place, terms such as Fifth Freedom rights and cabotage should disappear for member airlines within the European community. By this time airlines will be able to serve any routes they wish. The only restrictions will be their financial and technical fitness and their commercial judgement as to suitability of routes.

One possible result of the creation of a common European airline market could be the ability to act collectively in negotiating route rights. The imbalance in gateway airports between Europe and the United States, for example, could be rectified.

The measures adopted to create the single European market will not directly affect an aircraft manufacturer such as BAe (See Figure 50). They will however affect our customers -- the airlines -- and the opportunities open to them and will create a demand for more of our products. Some of these opportunities will also create new markets to which our aircraft could be targeted such as the express freight market for which the BAe 146 in its Quite Trader configuration is suitable.

Other effects brought about by the single European market will include a harmonization of standards such as licensing or aircraft airworthiness requirements. This should make the manufacturer's job of selling aircraft in different countries easier.

The opening up of communist countries as markets for western- produced aircraft is a exciting challenge for manufacturers but not one which will be overcome easily. Lack of foreign currency makes the sale of dollar-priced aircraft difficult in such countries, and countertrade deals are likely to be involved. Soviet-produced aircraft, although now facing competition from western-produced types, will still have an advantage in that they can be sold for soft currencies. LOT of Poland announced recently that artificial currency exchange rate controls have meant that western aircraft could cost four times as much as Soviet equipment.

THE SINGLE EUROPEAN ACT DOES NOT CONTAIN SPECIFIC LEGISLATION ON MARKET OPPORTUNITIES FOR BAe BUT WILL ALTER:

- Market Opportunities For Our Customers
- The Way In Which We Sell Our Products

THE SINGLE EUROPEAN ACT WILL ALSO

- Bring About Common Standards (eg. JAR and Common Licensing)

FIGURE 50 Single European act.

LEGISLATION

Introducing legislation within the air transport industry covering matters such as aircraft noise emissions or the harmonization of operating regulations will affect manufacturers, airlines, passengers, and even the economies of individual countries.

Various proposals by regulatory or representative bodies cover the issue of noise regulations and suggest the non-addition or the non-operation of Chapter 2 aircraft. In addition, a more stringent standard for super quiet aircraft is being considered to determine which types may be operated at night or at particularly noise-sensitive airports. (Figure 51) The effects of these proposals could be harmful to some less wealthy airlines, reducing the value of their fleet of noisy aircraft and forcing them to acquire replacements. Manufacturers or suppliers of hush kits may benefit significantly.

Of the 8,000 or so aircraft in the world's commercial fleet in 1988, some 5,400 aircraft or 67 percent of the total fail to meet the most stringent ICAO Chapter 3 noise regulations, which are similar to the FAA's Part 36 Stage 3.(Figure 52) Non-operation of Chapter 2 aircraft is likely to be introduced, at the earliest, by 1995 and not uniformly throughout all the countries of the world. By 1995 many of the noncompliant aircraft will have been retired due to age, and others will be subject of hush-kitting. Even taking this into account, there will be a large demand for replacement aircraft, which manufacturers will be unlikely to satisfy and airlines will be unlikely to finance. Less developed or less wealthy countries which do not introduce such noise legislation domestically may well end up being the dumping ground for noisy aircraft.

Harmonization of air transport regulations by the European Economic Community en route to a single European market will cover three distinct areas: personnel licensing, airworthiness, and airport slot availability. (Figure 53) These measures will have considerable impact on aviation. Pilots and engineers would be able to seek employment in other countries within the EEC. Aircraft should not need recertification when being sold from one country to another, and manufacturers of new aircraft will have less complicated production lines. A new allocation system for airport slots is really necessary to ensure that the furtherance of competition among airlines is achieved and that congested airports are not used as a barrier against market entry. This will be a very contentious issue that will require revamping of the grandfather-rights system.

AIRCRAFT NOISE REGULATIONS

PROPONENTS

ICAO, FAA, EEC, ECAC

REGULATIONS

- No Addition of Chapter 2 Aircraft to Fleet
- No Operation of Chapter 2 Aircraft
- Chapter 11 Standard for Super-Quiet Aircraft

EFFECTS

- Reduction in Value of 2nd Hand Aircraft
- Large Replacement Market for Noisier Aircraft
- Hush-kitting Market Growth
- Night-sensitive Airport Access to Super-quiet Aircraft
- Hardship for Less Wealthy Airlines

FIGURE 51 Aircraft noise regulations.

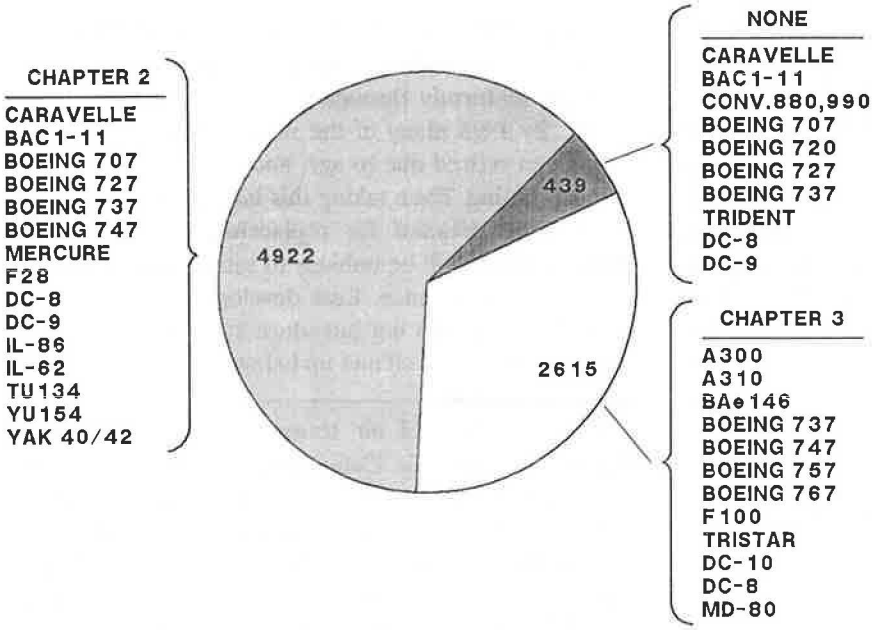


FIGURE 52 Noise classifications (ICAO).

PERSONNEL LICENSING: (A recognition of qualifications)
· Will Enable Pilots & Engineers to Work Abroad with Minimum of Complications

AIRWORTHINESS: (Common standards, e.g. JAR)
· Will Enhance Second Hand Aircraft Sales Among EEC Member States

AIRPORT SLOT AVAILABILITY: (New allocation system?)
· Will Promote Competition Among Airlines by Freeing Slots at Congested EEC Airports

FIGURE 53 EEC proposals to harmonize air transport regulations.

Strategic Posturing

Finally I would like to address the strategic posturing by airlines and manufactures. There are opportunities for both users and producers of aircraft. It is interesting to watch the strategies being adopted to benefit from these opportunities. (Figure 54) From the airlines' point of view there are significant benefits to be gained from entering into some form of relationship with another airline or airlines. These relationships can vary in rigidity from outright ownership to a simple interlining agreement. The benefits to be gained are many and varied but, in general, enable an airline to achieve a market position it probably could not have obtained otherwise in order to achieve cost reductions through economy of scale. There are many examples of relationships between airlines, and not all have been achieved with a blessing from the regulatory bodies concerned. British Airways was forced to drop certain routes when it acquired British Caledonia. American Eagle's purchase of 138 slots at Chicago from Britt Airways received much attention from the U.S. Department of Justice. Currently Air France, in particular, is being scrutinized by the European Commission for anticompetitive practices due to its dealings with Air Inter.

AIRLINE RELATIONSHIPS
·OWNERSHIP
·EQUITY POSITION
·CODE-SHARING
·INTERLINING

RATIONALE BEHIND RELATIONSHIPS
·MARKET ENTRY
·PASSENGER FEED
·SLOT/GATE ACCESS
·FLEET PLANNING
·SPARES/MAINTENANCE AGREEMENTS
·PROTECTION FROM UNFRIENDLY TAKE-OVERS

FIGURE 54 Elements of airlines' strategic posturing.

SAS of Scandinavia for example, is particularly active in its worldwide positioning strategy. Figure 55 shows the companies, both domestic and international, in which SAS has some form of equity position. In the agreement with LAN-Chile, SAS is giving LAN management advice in all areas and hopes to take advantage of LAN's extensive traffic rights across the Atlantic. LAN will effectively join the global traffic system operated by SAS

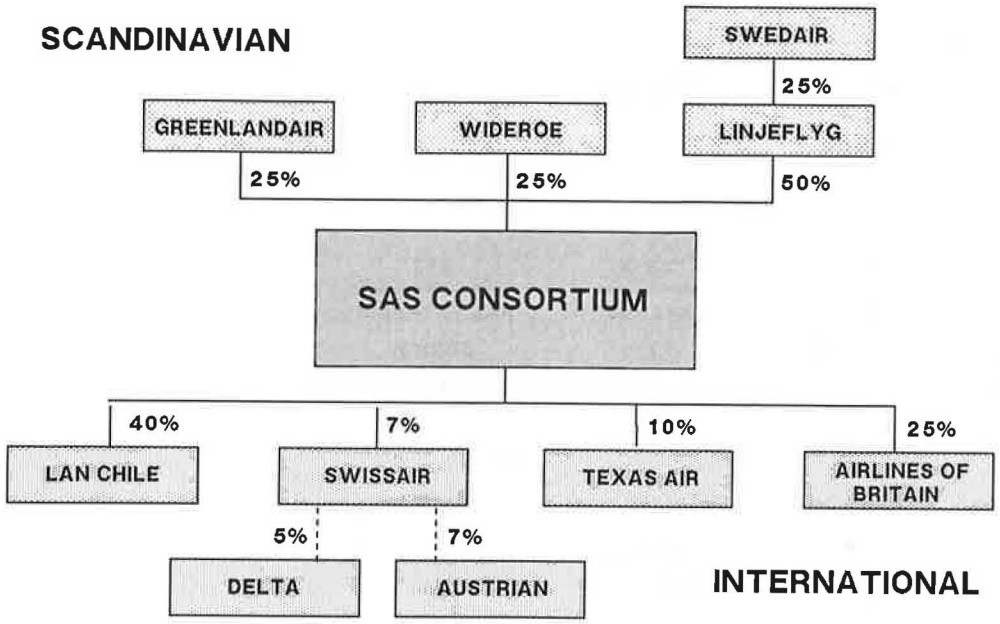


FIGURE 55 SAS relationships with other airlines.

and its other partners and will be able to offer connections through New York to both SAS and Continental Airlines flights. In addition to these equity agreements, SAS also has links with Finnair, Thai International, and All Nippon.

Strategic posturing by aircraft manufacturers is a trend in the industry that has grown recently due to the prohibitive cost of launching new products and the desire to be able to offer airline customers an attractive range of products. (Figure 56) Collaboration between manufacturers can vary from the manufacture of someone else's product under license to producing parts of the aircraft on a subcontract basis.

COLLABORATION

- LICENCE PRODUCTION
- JOINT VENTURE
- SUB-CONTRACT

RATIONALE BEHIND COLLABORATION

- SHARED DEVELOPMENT COSTS
- INDIGENOUS MARKETS
- LOW LABOUR RATES
- EXISTING EXPERTISE
- COMPETITOR ELIMINATION
- DEVELOPMENT OF EXISTING AIRCRAFT

FIGURE 56 Elements of aircraft manufacturers' strategic posturing.

The benefits of collaboration can be classed as cost and risk reduction or improvements in the marketability of the aircraft. The market for regional aircraft under 100 seats is dominated by non-U.S. manufacturers, and the number of collaborative ventures is surprising. Fluctuations in dollar exchange rates, which can be critical to an aircraft's success, can perhaps be offset by production in more than one country.

Another major advantage in collaborating with a particular manufacturer is that the home market of this firm may become open to your product. Any manufacturer with eyes on Russia as a market is sure to have this in mind.

Examples of collaboration among manufacturers are many and varied. (Figure 57) Under the heading of license-build relationships the production of BAC 1-11s in Romania is noteworthy because it exemplifies the possibility of using noise-compliant Rolls Royce Tay engines, and it is an early example of an Eastern European country building a western aircraft. The possibility of a multinational supersonic aircraft produced by the United States, Russia, and the United Kingdom in a joint venture is both intriguing and something that would have been unthinkable prior to Gorbachev's political turnaround. The Jetstream 41, launched by BAe, involves American, Swiss, and UK subcontractors on a risk-share basis. The use of Gulfstream as wing suppliers and Garrett for engines ensures that the dollar content of the aircraft is high and that exchange rate fluctuations are not particularly harmful.

LICENCE BUILD	HAL	NURTANIO	FAIRCHILD	ROMBAC
	BAe748	CASA 212	FOKKER F27	BAC 1-11
JOINT VENTURE	AIRBUS	CBA123	YS-X	SST
	BAe	EMBRAER	JAPANESE	GULFSTREAM
	MBB	FAMA	????	SUKHOI
	AEROSPATIALE			ROLLS ROYCE
	CASA			LYULKA
SUB-CONTRACT	BOEING 767	SAAB 2000	DORNIER 328	JETSTREAM 41
	JAPANESE	CASA	DAEWOO	GULFSTREAM
	AERITALIA	WESTLAND	AERMACCHI	PILATUS
	CANADAIR	VALMET		FIELDS
	GRUMMAN	ALLISON		

FIGURE 57 Collaboration among aircraft manufacturers.

CONCLUSION

Having talked about the driving forces in the air transport industry and the effects they will have, I would now like to try a few predictions of how I think industry structure will appear in the future.

Traffic will continue to show a healthy growth, and today's levels will probably be doubled by early in the next century. The major traffic flows will change, as a reflection of the Pacific Rim's importance as a major trade centre and the opening up of previously restricted countries as tourist attractions.

This growth which seems hard to believe, considering today's congested atmosphere will be accommodated in a variety of ways. First, a limited number of all-new airports will be built, but many of today's airports will be developed to permit a larger traffic capacity. Secondary hub airports will be major growth areas, and regional airports will also experience increased utilization.

There will be a decreasing number of airlines due to mergers between dominant carriers in developed countries and a pooling of resources by airlines of less developed countries. There will be a continuing role for niche carriers.

There will be fewer manufacturers producing individual aircraft. The number of manufacturers will decrease because of mergers and acquisitions but also because some manufacturers will take on the role of subcontractors rather than producing their own products. Aircraft capacities will increase, and designs will call for more environmentally friendly characteristics.

Air traffic control will be improved and rationalized in areas of heavy usage. A global positioning system will be set up, and it will enable a more efficient and precise tracking system.