CONFERENCE ON THE ECONOMICS OF AIRPORTS AND AIR NAVIGATION SERVICES

(Montreal, 19 - 28 June 2000)

Agenda Item 1: Economic situation of airports, air navigation service providers and their financial relationships with air carriers and other users

TRAFFIC FORECASTS

(Presented by the Secretariat)

SUMMARY

This paper provides a brief description of types and uses of air traffic and aircraft movement forecasts and major factors affecting the demand for air transport services. It also summarizes the latest forecasts developed by ICAO and indicates some constraints that may adversely affect the projected traffic and aircraft movement growth. Suggested action by the Conference is at paragraph 7.1.

1. Historical Perspective

1.1 Introduction

1.1.1 Air transport has experienced rapid expansion since the second world war as the global economy has grown and the technology of air transport has developed to its present state. The result has been a steady decline in airline operating costs and fares, which has stimulated traffic growth. Consequently, scheduled domestic and international air traffic has increased from some 9 million passengers in 1945 to over a billion and a half in 1999. On average, passenger traffic has grown at about 10 per cent annually, although the growth rates varied significantly from very high, exceeding 20 per cent a year in the first post-war decade, to quite moderate in recent decades as the air transport market has become more mature (see **Figure 1** at end of this paper).

1.2 Economic factors

1.2.1 As an illustration of this growth, the output of air transport (measured in terms of tonne-kilometres performed) has increased by a factor of 30 since 1960. Gross Domestic Product (GDP), which is the broadest available measure of world output, increased by a factor of 3.8 over the same period.

1.2.2 Although growth in world air traffic has been much greater than world economic growth, there is a high correlation between the two. Statistical analyses have shown that growth in GDP now explains about two-thirds of air travel growth, reflecting increasing commercial and business activity and increasing personal income and propensity to travel. Demand for air freight service is also primarily a function of economic growth and international trade. Air travel growth in excess of GDP growth is usually explained by other economic and structural factors:

- improvement in service offerings as routes, frequencies and infrastructure are added, stimulation from reductions in airline fares as costs decline, and increasing trade and the globalization of business;
- population and income distribution; and
- travel behaviour, including travel time budgets and travel costs.

1.3 Facilities planning

1.3.1 The planning of aviation facilities and the development of aviation policies requires assessment of future trends in aircraft movements as well as of passenger and freight traffic flows. This is becoming increasingly important because of concerns over airport and airspace congestion in some regions. Aircraft movements have grown quite rapidly for most of the past decade, increasing the pressure on airport and air traffic control facilities.

1.3.2 The primary factor affecting the number of aircraft movements is the demand for passenger travel. When passenger demand increases, air carriers can respond by scheduling extra flights, by using larger aircraft, or by managing higher load factors. During the 1970s, air carriers accommodated most of the growth in demand by introducing larger aircraft. As a result of both increasing aircraft size and improving load factors, the growth in aircraft movements was quite small in the 1970s despite rapid growth in passenger traffic. From the early 1980s, the trend in average aircraft size has levelled out and the growth rate in aircraft movements has approached almost the growth rate for passenger traffic as illustrated in **Figure 2.**

1.3.3 Gradual improvements in average load factors have resulted from marketing initiatives and yield management programmes, but there is evidence that the rate of increase in load factors is slowing down. Another important element having an impact on the trend in aircraft movements is the average stage length. In the past 20 years, the growth in average stage length has been around 1 to 2 per cent per annum. This increase reflects a changing pattern of demand, with growth in passenger and freight traffic being greater for long-haul routes than for short-haul routes.

1.4 Airline operations

1.4.1 Historically, airline fares and rates reflect the changes in operating costs and competitive conditions. Airline yields have declined on average in real terms almost every year since the introduction of jet aircraft. The reductions in fares and rates which occurred between 1960 and 1998 are reflected in real declines in passenger revenue yield per passenger-kilometre (2.8 per cent per annum on average) and freight yield per freight tonne-kilometre (3.6 per cent per annum on average). These declines in yield contributed substantially to traffic growth.

1.4.2 Measured in real terms, the operating costs per available tonne-kilometre of world scheduled airlines (unit costs) declined, on average, by 2.4 per cent per annum over the 1960-1998 period. Airline operating costs are heavily influenced by jet fuel prices. Due to large increases in oil prices in 1979, unit costs rose sharply in 1980 with fuel costs accounting for almost 29 per cent of total costs of scheduled airlines. Unit costs declined during the 1982-1985 period partly as a result of declining fuel prices. In 1998 fuel accounted for only 9.5 per cent of total operating costs. In addition to aircraft fuel costs, aircraft utilization, seating capacity and density have an important impact on unit costs.

1.4.3 The airline industry has a long history of improving productivity. As a result, the growth in the output of the industry has been greater than the growth in the various inputs used by the industry; the average annual growth in productivity since 1987 has been about 3.5 per cent. The progressive absorption of new technology aircraft into airline fleets has been a major contributor; in particular, new aircraft are more fuel- and labour-efficient. Improved aircraft utilization has also made an important contribution. **Figure 3** depicts the contributors to declining trend in real yields and unit costs over the 1961-1997 period.

1.4.4 Although there has been neither an improvement nor a decline in the long-term trend of the financial performance of scheduled airlines as a whole, there have been relatively large changes in the operating results over the medium term. The growth in revenues and expenses over the 1988-1998 period from some US $166 200 to $298 500 million and from some US $156 000 to $282 000 million, respectively, reflects an expansion in activity levels and general inflationary pressures, offset by improvements in the efficiency of the industry. However, the impact of these factors has varied considerably over the business cycle. During the buoyant years of the 1980s, rapid growth in demand resulted in a more intensive use of airline resources and strong productivity growth. Airlines were able to improve their operating results and also offer relatively low fares and rates to their customers. In the early 1990s, market conditions changed as demand weakened and the utilization of airline resources tended to decline. The emergence of excess capacity and consequent competitive pressures put downward pressure on yields. These factors combined to produce negative operating results in three consecutive years (1990-1992). In 1993, the airline industry started to move towards a more appropriate balance of supply and demand and achieved a small operating surplus. A much better operating result was obtained in 1994, and by 1995 the industry delivered an operating surplus of $13.5 billion and obtained a positive net result of about $4.5 billion. In 1996, a reduced operating surplus of about $12.3 billion was achieved, with a net result of $5.3 billion, but in 1997, there was an operating surplus of $16.3 billion and a net result of almost $8.6 billion, while in 1998 an operating surplus of $16.5 billion and a net result of $9 billion were achieved.

2. World economic outlook

2.1 As discussed earlier, the demand for air passenger travel is primarily determined by income levels, demographics and the cost of air travel. World energy demand, supply and prices are critically important both to economic progress and to the cost of travel. Hence, the airline industry is highly vulnerable to economic cycles and fluctuations in fuel prices.

2.2 Between 1988 and 1998, the aggregate world economy measured in terms of GDP grew at an average annual rate of 2.8 per cent in real terms. World population between 1988 and 1998 increased at an average annual rate of 1.4 per cent. Hence, growth of the world's GDP per capita between 1988 and 1998 increased at an average annual rate of 1.4 per cent, significantly lower than the growth of GDP itself.

2.3 Following a slowdown in 1998, the world economy strengthened in 1999. The estimated 3 per cent growth rate in 1999 resulted from rapid recoveries in most of the Asian economies, preliminary indications of a long-awaited turnaround in Japan, milder than expected downturns in Brazil and Russia, stable growth in Western Europe, and continuing strong growth in the economy of the United States. The consensus of economist forecasting institutions is that in 2000-2001, economic growth will pick up to around 3.5 per cent in real terms. For the period up to 2010, the world economy is projected to grow at an average annual rate of 2.5 per cent in real terms.

3. Traffic forecasts

3.1 ICAO produces two generic sets of traffic forecasts on a regular basis. Medium term (three year) forecasts of scheduled passenger traffic worldwide and by region of airline registration are prepared annually and published in a Circular entitled *The World of Civil Aviation* which covers recent and future developments in civil aviation (the 1998-2001 edition was published as Circular 275 in October 1999 and an update will be provided at the Conference). Long-term (10 year) forecasts of scheduled passenger and freight traffic worldwide and by region of airline registration, along with passenger traffic by international route group, are published every two or three years (most recently in November 1997 as Circular 270 - *Outlook for Air Transport to the Year 2005*, with forecasts through to the year 2010 just completed for the next publication).

3.2 In addition, the Secretariat develops even longer term forecasts (10 years and beyond) to meet specific requirements such as those of airports and air navigation systems planning and environmental planning. Traffic forecasts and other planning parameters are being developed by ICAO's various traffic forecasting groups to support the planning of air navigation facilities and air traffic services including the implementation of CNS/ATM systems components in particular regions. Funding institutions will invest in the implementation process on the basis of expected rates of return which will depend in turn on credible and authoritative traffic forecasts.

3.3 The above forecasts have been updated and consolidated in general terms below for the information of the Conference. The basic assumptions underlying all these forecasts (which are developed on the basis of econometric models) are:

- a "most likely" average rate of world economic growth of 2.5 per cent per annum through to 2010 and marginally lower thereafter (in real terms);
- moderate growth in world trade at between 3.5 and 4.0 per cent through to 2010; and
- minimal change in average passenger and freight yields (fares and rates, in real terms).

3.4 In terms of scheduled passenger kilometres performed, the most recent ICAO 10-year forecasts show domestic traffic growing at an average annual rate of 3.5 per cent and international traffic at 5.2 per cent for the period 1998 – 2010. Overall (domestic plus international) growth is projected at 4.5 per cent per annum, with total traffic by airline region varying from 7.2 per cent per annum for airlines of the Asia/Pacific region to 2.8 per cent per annum for airlines of the North American region.

3.5 In the longer term, passenger traffic worldwide, expressed in passenger-kilometres performed, is projected to grow for the period 1997-2020 at an average annual rate of 4.5 per cent, with freight traffic growth expected to be somewhat higher (it should be borne in mind that approximately 70 per cent of freight traffic is carried on bellies of passenger aircraft). The growth rates vary from a high of 6.2 per cent per annum for the transpacific compared with a low of 2.9 per cent for the more mature intra-North American market as illustrated in **Table 1**. The North Atlantic route group which has the highest share in passenger traffic is projected to grow at 3.8 per cent per annum.

3.6 Based on these traffic growth rates, assumptions in aircraft utilization, average stage length, aircraft load factors, and average seat size, global aircraft movements are projected to increase at an average annual rate of about 3.5 per cent over the 1997-2020 period. Aircraft movements forecasts as well as planning parameters such as “peak-period” traffic flow patterns for specific major route groups are being developed by traffic forecasting groups (TFGs) established for each ICAO region. The current 5-year and (for the transpacific and North Atlantic route groups) 15-year horizon outlook showing regional variations appear as **Table 2**.

4. Fleet forecasts

4.1 In order to estimate the fleet requirements to meet the projected traffic growth, several other factors have been studied. They include aircraft productivity, frequency/capacity considerations as well as retirement patterns for existing aircraft types. The increase in productivity results from higher aircraft utilization, technology improvements and higher load factors.

4.2 On this basis, a fleet forecast has been developed for six generic aircraft seat categories ranging from less than 100 seats to greater than 500 seats. It is estimated that the world airlines will require a fleet of almost 20 000 aircraft by 2020 to accommodate the traffic growth (see **Figure 4**).

4.3 The requirements for new aircraft are a combination of growth and replacement. It is estimated that of the 1998 fleet of some 10 000 aircraft, about 3 900 will remain in the year 2020. Consequently, the number of new aircraft delivered during the time period is estimated to be just under 16 000, which requires a considerable capital investment. The highest number of aircraft requirements is expected in the 100-175 seat category (see **Figure 5**).

5. Constraints on growth

5.1 The traffic forecasts presented in this working paper have been developed with the implicit assumption that sufficient system infrastructure and capacity will be available to handle the demand. This growth will therefore be influenced by the extent to which the industry faces up to major challenges, such as airport and airspace congestion, environmental protection and increasing capital investment requirements. The shape and the size of the air transport system will be also affected by government decisions, notably those determining the nature and extent of economic regulation of airlines.

5.2 In some parts of the world, particularly in Europe and North America, the airports and airspaces are operating under constraints that limit their ability to provide efficient service. These constraints are likely to become more acute in the future as air transport continues to expand. Major new airports in most developed countries appear to be unlikely. The ICAO-promoted global CNS/ATM system that is in the process of being implemented promises enhanced system capacity, even higher margins of safety, and environmental benefits. However, airport and airspace capacity will remain finite resources that have to serve the anticipated growth in traffic.

5.3 Other system constraints are related to environmental issues. Aircraft noise has become a major issue affecting airport expansion in some countries and there are also concerns regarding the impact of aircraft engine emissions at both the local and global levels. These issues are being studied by ICAO's Committee on Aviation Environmental Protection. Meanwhile, some States are calling for greater use of economic instruments as a means of limiting the growth of international air transport.

5.4 Finally, air transport is particularly vulnerable to fuel prices. The industry has benefited over the past from relatively low and stable prices of aircraft fuel, but even today fuel represents some 13 per cent of airline operating costs worldwide. Prevailing industry expectations are for no increase in real terms, but a surge in prices (which occurred in 1973-4, 1979, 1990 and, to a lesser extent, in 1999-2000) has a dual impact, increasing air transport costs and reducing demand.

6. Conclusion

6.1 The global demand for air transport measured in terms of passenger-kilometres is projected to increase at an average annual rate of 4.5 per cent for the period 1997-2020. Aircraft movements for the same period are projected to increase at an average annual growth rate of 3.5 per cent. In response to this demand, the world aircraft fleet is expected to almost double from some 10 000 aircraft in 1998 to almost 20 000 aircraft in the year 2020. Aircraft productivity will continue to improve at moderate rates, although somewhat slower compared with the last 20 years. These growth prospects present a major challenge to air transport as airports and air traffic management systems will be expected to accommodate almost a 2.7 fold increase in traffic and doubling of aircraft movements.

7. Action by the Conference

7.1 The Conference is invited to note the information in this paper.

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TABLE 1

ICAO TRAFFIC FORECASTS BY ROUTE GROUP TO THE YEAR 2020

	Passenger-kms (billions)		Average Annual
	1997	2020	Growth(%) 1997-2020
International Routes			
North Atlantic	316.1	753	3.8
South Atlantic	35.6	119	5.4
Mid Atlantic	41.2	140	5.5
Transpacific	178.0	712	6.2
Europe<=>Asia/Pacific	208.4	758	5.8
Europe<=>Africa	76.6	217	4.6
Europe<=>Middle East	38.3	98	4.2
North America<=>South America	39.5	114	4.7
North America<=>Central America/ Caribbean	39.3	125	5.1
Intra Africa	7.1	18	4.1
Intra Asia/Pacific	208.9	701	5.4
Intra Europe	150.5	370	4.0
Intra Latin America	15.1	48	5.1
Intra Middle East	4.7	12	4.2
Intra North America	24.0	46	2.9
Other International Routes	94.8	334	5.6
Total International	1478.0	4564	5.0
Domestic Routes			
Africa	9.4	22	3.7
Asia/Pacific	201.1	651	5.2
Europe	111.6	280	4.1
Latin America	42.5	105	4.0
Middle East	11.8	30	4.1
North America	716.5	1428	3.0
Total Domestic	1092.9	2516	3.7
Global (International + Domestic)	2570.9	7080	4.5

TABLE 2

ICAO AIRCRAFT MOVEMENT FORECASTS BY MAJOR INTERNATIONAL TRAFFIC ROUTE GROUP
(Per cent increase per annum - base year 1996)

Route group	5-year horizon	15-year horizon
Transpacific[1/]	5.2	4.7
North Atlantic[1/]	4.6	3.2
North America-Africa	4.0	
Europe-Africa	3.7	
Middle East-Africa	4.2	
Asia/Pacific-Africa	4.7	
Intra Africa	5.0	
Asia/Pacific-Middle East	4.5	
Europe-Middle East	3.3	
Intra Middle East	5.5	
South Atlantic	3.3	
Mid Atlantic	4.8	
Intra South America	2.5	
Intra Central America/Caribbean	3.6	
North America-South America/Central America/Caribbean	4.5	
South America-Central America/Caribbean	2.3	

1/ Base year 1998.

FIGURE 1

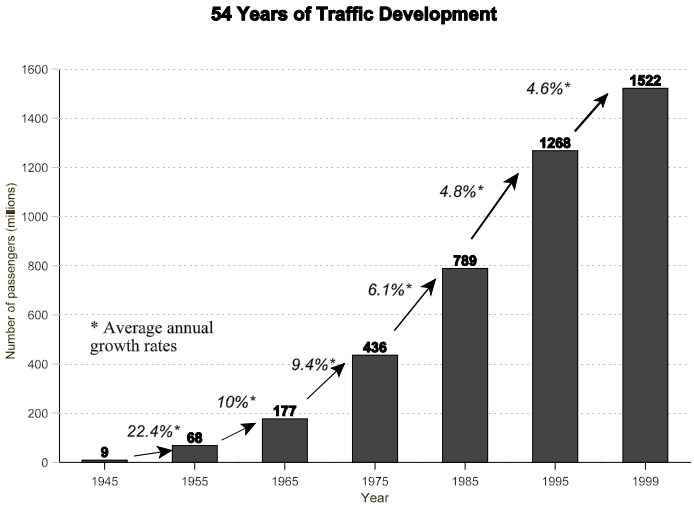


FIGURE 2

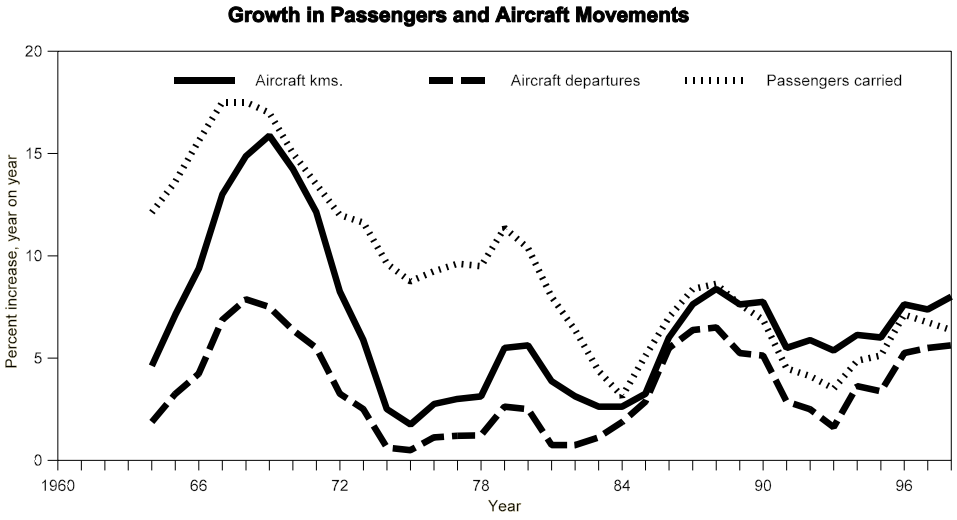


FIGURE 3

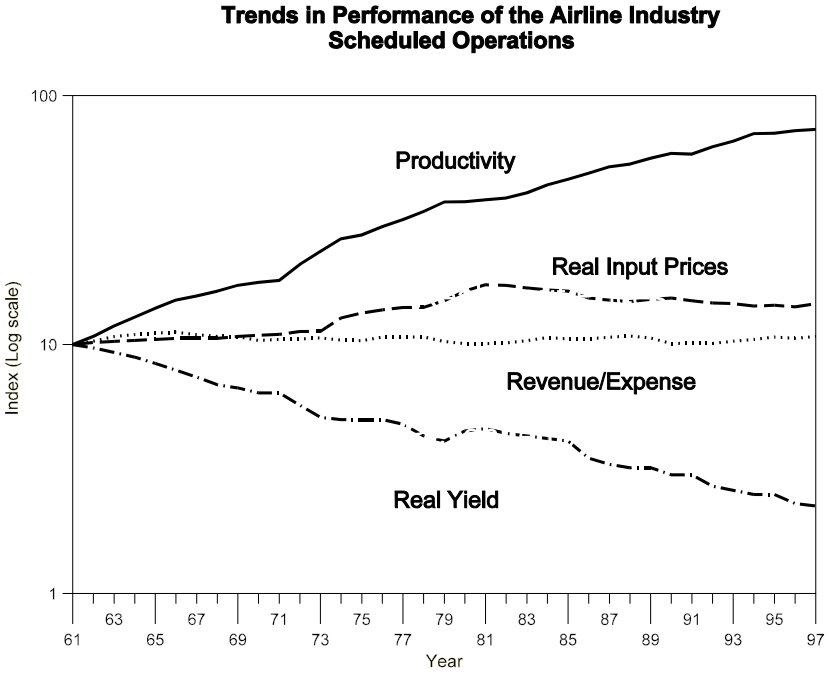


FIGURE 4

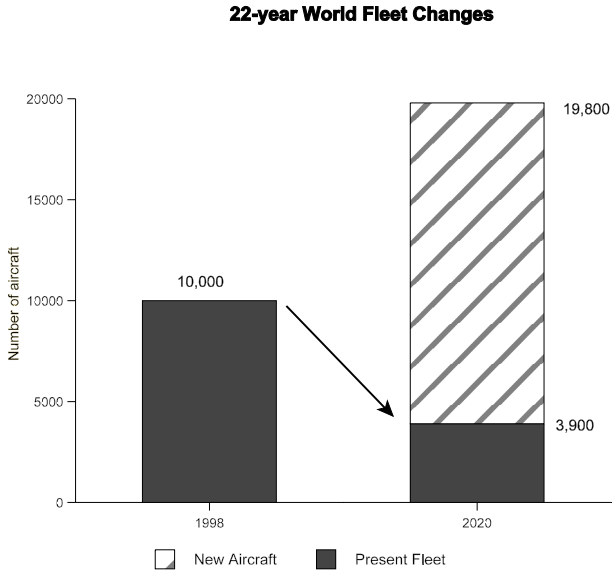
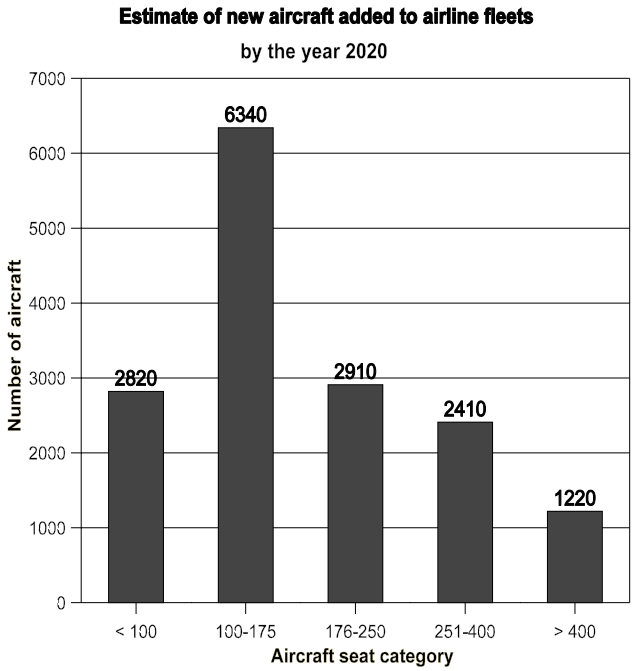


FIGURE 5


Estimate of new aircraft added to airline fleets
by the year 2020
Number of aircraft
7000
6000
5000
4000
3000
2000
1000
0
2820
6340
2910
2410
1220
< 100
100-175
176-250
251-400
> 400
Aircraft seat category

- END -