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THE ECONOMIC SITUATION OF AIR TRANSPORT

REVIEW AND OUTLOOK

1978 TO THE YEAR 2000

*Approved by the Secretary General
and published under his authority*

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FOREWORD

Terms of reference

1. *This review is the ninth in a triennial series beginning with ICAO Circular 73 published in 1965 and followed by Circular 89 (1968), Circular 105 (1971), Circular 122 (1974), Circular 133 (1977), Circular 158 (1980), Circular 177 (1983) and Circular 200 (1986). After examination of the second review, the Sixteenth Session of the Assembly expressed the view that similar documents should be produced for each major session as background material for the work of the Economic Commission. At the request of the Air Transport Committee the present document includes additional information on commercial and regulatory prospects, primarily in Chapter 1.*

Coverage

2. *The coverage of this review extends to the whole of the Organization's 160 Contracting States as of 31 December 1988 for the period from 1978 to 1988, data for new States having been included retroactively where possible. Data for 1988 have been estimated on the basis of partial reporting for that year. Coverage extends to all activities of the scheduled airlines of Contracting States reported to ICAO for the years 1978 to 1988 and published in the statistical series on aircraft on register, airline fleet and personnel, airline traffic, and airline financial data. The activities of the non-scheduled operators are covered less fully since data for these carriers, although supplemented from other sources, are somewhat incomplete.*

Sources of information

3. *In addition to the ICAO Digests of Statistics, use has been made of many of the Organization's economic studies, such as the earlier editions of this review, and the series of regional studies dealing with the development of international air freight and air passenger transport. Use has also been made of the Annual Reports of the Council to the Assembly for the years 1978 to 1988.*

4. *Sources of information other than ICAO, referred to in the text, include the appropriate and most recently available statistical publications of the United Nations; the United Nations Conference on Trade and Development (UNCTAD); the European Civil Aviation Conference (ECAC); the Organization for Economic Cooperation and Development (OECD); the International Air Transport Association (IATA); the Association of European Airlines (AEA); the United States Department of Transportation (DOT); the World Tourism Organization (WTO); the International Monetary Fund (IMF); and the World Bank.*

5. *Unless indicated otherwise, all references in this circular to "cents" mean U.S. cents, and all references to "dollars" mean U.S. dollars.*

Status

6. *This circular has been approved and is published by authority of the Secretary General.*

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of ICAO concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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Chapter 1

COMMERCIAL AND REGULATORY TRENDS — 1978 TO THE YEAR 2000

1. This survey reviews significant developments in air transport over the past decade and outlines expected trends to the year 2000. These developments have changed the world's air transport system during the past decade and, in many cases, seem likely to influence its future directions. They are often interrelated and can be broadly categorized under the following headings: traffic, regulatory, airline organizational and economic.

Airline Traffic Trends

2. By 1988 the number of passengers carried yearly by the world's airlines approximated one fifth of the world's population. Foremost among the expectations for the air transport system is the anticipated virtual doubling of air travel by the year 2000. Almost a quarter (by value) of world trade in manufactured goods is now carried by air and the proportion is growing. Together these facts underline the increasing importance of air transport to international tourism, world commerce and airline industry employment.

3. The Asia and Pacific region had the highest international traffic growth figures during the past decade and promises to continue to do so in the coming decade. The international passenger traffic share of the North American airlines resumed growth in relative importance as more emphasis was placed on international services following domestic restructuring.

4. Airline fleets grew significantly in parallel with continuing traffic growth. Orders for commercial transport aircraft recently reached unprecedented numbers and delivery dates are now backed up into the mid-1990s for some types. Other indicators, such as the number of airlines, freight traffic volume, and airline personnel, also showed strong growth as did averages for stage and trip distance, speed, payload capacity, yield and productivity. Operating profits began to improve after poor results during the economic downturn of 1981-1982, but profits nevertheless remain marginal for most airlines.

Regulatory Developments

5. The shape and size of the air transport system have been and will continue to be influenced to a great extent by governmental decisions, whether they be those of individual States or those made on a bilateral or multilateral basis. Although decisions continue to be made largely by air transport authorities, there has been increased involvement in airline regulation by bodies outside the system.

Air transport regulation

6. The most significant regulatory development within the system has been the moves taken by numerous governments towards less economic control of airlines, the promotion of competition, and greater reliance on market forces as opposed to governmental decisions to determine service levels and industry

concentration in both domestic and international markets. Paradoxically, this has led both to the creation of many new airlines accompanied by the availability of lower fares in some markets, and to an increase in airline industry concentration in some countries as companies failed or merged.

7. In many countries liberalization produced varying degrees of privatization of government-owned airlines. A growing number of domestic airlines began international service and some international airlines started domestic operations. Minority equity participation in national airlines by foreign airlines occurred with increasing frequency in all regions. New methods continue to be developed to regulate capacity and prices, as well as expansions in agreed market access for airlines, although the widespread neglect of the Article 83 obligation upon States to register their bilateral air agreements with ICAO has significantly reduced the transparency envisaged in the Chicago Convention. As liberalization spreads, there is an increased need for governments to ensure that all carriers, particularly the smaller ones, continue to have a fair and equal opportunity to compete (for example, in computer reservations systems) and that passengers are adequately protected.

8. Liberalization of air transport has also raised three important questions. Will the investments be made to expand and modernize the airports and airways system to accommodate increased traffic demand resulting from liberalization? Can high standards of safety regulation be maintained over the long run where the economic regulation of air carriers has been significantly lessened? Can the benefits of liberalization be sustained in circumstances where airline concentration has made it more difficult to start a new airline?

External factors

9. In recent years air transport authorities have become increasingly concerned about the interest shown by competition law authorities in the regulation of international air transport. The establishment of unified regional economic markets has also evoked concerns about possible adverse effects on the national airlines of non-participating States and about potential actions by the economic union to supplement or supplant existing national and bilateral air service regulation. The inclusion of international air transport in a broad multilateral accord on trade in services (e.g. telecommunications, transport, insurance), under consideration in the General Agreement on Tariffs and Trade (GATT), could significantly affect air transport regulation. The possibility of some States acting to protect the confidentiality of personal data sent by electronic means across national borders could restrict the transborder flow of information essential to air services.

10. Other governmental measures also affect air transport. Such measures include the expansion of airline responsibilities associated with national entry requirements (particularly for inadmissible passengers), more stringent health standards for entry (particularly where prevention of the spread of acquired immune deficiency syndrome is sought), national narcotics control efforts and the imposition of various taxes on air transportation.

Airline Organizational Developments

11. The most noteworthy changes during the 1980s in airline structure and marketing arose from the need to meet increased traffic demand, the need for creative responses to the liberalization of certain domestic and international markets and technological developments (e.g. automation, extended range aircraft).

Responses to traffic demand and liberalization

12. An important innovation in the United States, which has attracted attention elsewhere, has been the refinement of the "hub and spoke" system to employ large "banks" or "complexes" of inter-connecting flights to maximize the number of city-pair markets that can be served on each flight. "Mega-

carriers” arose from a perceived need to operate several hubs and to achieve “critical mass” (i.e. a size sufficient to ensure independent survival and the ability to influence market conditions). As both a part of this development and a reaction to it there has been a continuing process of formation of inter-carrier (often transnational) alliances, as well as joint-marketing arrangements often involving the sharing of airline designator codes to expand on-line markets. These developments have caused some small- and medium-size airlines concern for their survival and have prompted efforts by some airlines to enter various alliances of their own.

13. Computer reservations systems (CRS) have become the principal airline distribution tool in a number of countries, particularly in markets where there are many travel agents and frequent changes in schedules and fares (e.g. North America, Europe). With participation in a CRS now essential in many markets and widespread criticism of some systems for being biased towards certain carriers, the trend is expected to continue towards the conversion of existing systems to more neutral systems owned or controlled by groups of carriers, with participation open to all carriers world-wide.

14. Developments in automation during the 1980s permitted the creation of sophisticated yield management systems for airlines, associated with usage of a CRS, enabling the airlines concerned to optimize the mix of high to low fare passengers on each flight to maximize revenues. In deregulated markets, yield management has enabled established higher-cost airlines to compete selectively, yet effectively, against new lower-cost airlines often reliant upon low fares to achieve market penetration.

15. An important marketing development in the past decade, with implications for the future of air freight, has been the creation of numerous highly sophisticated airline/parcel express delivery companies, primarily in North America and Europe, which now operate large jet cargo fleets providing continental over-night deliveries and second day intercontinental services via strategically placed sorting hubs. The concept has also been adopted by a limited number of postal administrations.

Technological advances

16. Another important development during the past decade has been the introduction of new, longer range aircraft permitting non-stop flights over distances never before possible. In addition, the availability of twin-engine wide-body aircraft has permitted the economic introduction of non-stop services in many city-pair markets too small to be served by larger wide-body aircraft. A related development has been the expansion of authorized limits on some extended range over-water flights by twin-engine jets.

17. Although jet aircraft are not expected to grow much in size beyond the 500-seat maximum of the B747 in the next decade, jet aircraft of 50-70 seats are being built to serve smaller regional markets. At the same time, larger, faster, higher altitude turboprop transports in the same seat range are being developed. The competitive interactions between these two aircraft types, and the effect on both of the changes resulting from liberalization (which initially created an increased demand for 100-150 seat twin-engine jets), and airport/airways congestion factors, increase the complexity of this development.

Economic Developments in Air Transport

18. Although air transport costs are generally expected to continue to increase at a slower rate than consumer prices, the air transport system as a whole is faced with high levels of investment and the imposition of new charges. It also faces continuing uncertainties about the long-term price of fuel. Economic developments which affect air transport pose concerns for airports/airways and aircraft fleet development.

Airports/airways

19. A major problem facing the air transport system is increasing airport and airways congestion. Although technological developments can be expected to provide some relief, few new airports were built

during the past decade or are currently planned or under construction in the most congested regions. The limits to terminal and runway expansion are being reached at some major airports and air traffic control systems are aging. Some relief for congested facilities is expected from the continuing development of high-speed rail services in many States in Europe, Japan and to a very limited extent the United States, as well as from the eventual completion of the Channel Tunnel between France and the United Kingdom.

20. The majority of States, particularly developing States, still do not recover the full cost of providing their principal international airports and route facilities from operating revenues, a situation which is unlikely to improve significantly in the coming decade. The security measures required to prevent unlawful interference with international civil aviation have caused difficulties in many States because of the substantial funds required to finance their provision and operation. The difficulties and costs are likely to grow as the required sophistication of security devices and procedures increases. They may be compounded by the cost of facilities needed in the coming decade to meet rising traffic demands and to transition from the use of instrument landing systems (ILS) to microwave landing systems (MLS).

Fleet development

21. A significant factor regarding future airline fleet development is the economic implications of possible noise restrictions on subsonic jet aircraft which do not meet the noise certification requirements of Annex 16. Similarly, as more is learned about aircraft aging, this factor may affect the fleet replacement rate. Also confronting the industry are increasing costs and difficulties in financing the acquisition of aircraft for normal fleet renewal and for growth to meet future traffic demand, with anticipated aircraft investment needs of about \$500 000 million (in 1988 United States dollars) to the year 2005, or an average of about \$30 000 million a year. Additional costs will be incurred by airlines to equip their aircraft to use MLS rather than ILS and to improve safety by equipping with collision avoidance systems (CAS).

General Perspectives on Developments

22. From the standpoint of users, the most significant change in commercial air transport in the past ten years, one which promises to be accentuated over the coming decade, is the transformation of the system, in much of the developed world in particular, from one which once catered largely to the transport requirements of the elite to a system of mass transport. Many who now depend on air transport use it so frequently and repeatedly as to give little thought to how extraordinary commercial flying once was. While the benefits of air travel are undeniable, as are the rapid, often overnight, delivery of documents and parcels to many parts of the world, accompanying changes add new elements of stress to air transport. These include ~~highly congested terminals~~, ~~increased flight delays~~, more required changes of aircraft en-route through hubs, significantly heightened emphasis on security due to acts of unlawful interference against aircraft and new concern over the unknown risk factors of aging aircraft.

23. The benefits brought to the world community by air transport, i.e. chiefly the facilitation of commerce, tourism, government affairs and economic development, are large and unassailable. At the same time air transport faces competing demands from other sectors. These range from protection of the environment from unwarranted aircraft noise and air pollution, to the competing needs for scarce capital for investment (particularly in airports and airways), to attempts to shift the financial burdens of customs, agriculture, health and immigration controls from the general or particular populaces which benefit from them to the air transport system users obliged to endure them. Unwarranted shifts of cost burdens to the air transport system, the availability to it of a fair share of investment resources, and the need to accommodate broader concerns such as that of the human environment are important issues to be faced by air transport as it enters a new decade of continuing growth.

Chapter 2

DEVELOPMENT OF AIR CARRIERS AND THEIR FLEETS — 1978 TO 1988

1. There were approximately 950 commercial air carriers in the world operating at least one aircraft of more than 9 000 kg maximum take-off weight in 1988. Of these carriers, 663 performed international services, in many cases in addition to domestic services. The distribution of these carriers by region of registration and by type of operation is shown in Table 2-1.

2. Of the total number of international carriers, 343 were scheduled airlines, of which 30 were specialized all-cargo carriers. In addition, there were 320 non-scheduled carriers, of which 67 offered only cargo services. The largest number of scheduled airlines was registered in Europe (95), followed by Latin America and the Caribbean (73) and Africa (64). Of the non-scheduled carriers, 139 were registered in Europe and 73 in North America.

The Commercial Transport Fleet

3. At the end of 1988, the scheduled and non-scheduled carriers of ICAO Contracting States¹ had a combined fleet of about 10 600 large² commercial transport aircraft for their international and domestic operations, an increase of 26 per cent over 1978 (Table 2-2). Available capacity increased during the decade by about 82 per cent on all routes and by over 90 per cent on international services, reflecting the introduction of more productive aircraft. The changes between 1978 and 1988 in the size and composition of the world fleet by type and by region are given in Appendices 1, 2, 3 and 4.

Categories of aircraft

4. The number of jet aircraft in the world fleet increased by more than 2 400, from 68 per cent of the total in 1978 to 76 per cent in 1988, while the proportion of turboprop aircraft increased from 17 to 18 per cent and that of piston-engine aircraft declined from 15 to 6 per cent.

5. As illustrated in Figure 2-1, showing the changing relationship between the various categories and sub-categories of aircraft, the most important development during the decade has been the near doubling of the number of 2-engine narrow-body jets in service, to account for 36 per cent of the total fleet, up from 25 per cent in 1978, and the more than doubling of the number of wide-body jets. Within the latter category 2-engine wide-body jets (now increasingly providing long-haul services) grew eleven-fold from 1978 and now constitute 6 per cent of the world fleet. In contrast, the number of 4-engine narrow-body jets has shown a steady decline since 1978, from 16 per cent of the fleet in that year to 6 per cent in 1988. While the number of 2-engine turbo-prop aircraft increased by 62 per cent during the decade the number of 4-engine turbo-prop aircraft dropped by 26 per cent. Piston-engine aircraft in use continued to decline from 15 per cent of the world fleet in 1978 to only 6 per cent in 1988.

1. Except China and the USSR.

2. Defined as aircraft with a maximum take-off weight exceeding 9 000 kg.

**Table 2-1. Number of international scheduled and non-scheduled air carriers in 1988¹
(distribution by region of registration)**

| Region of registration | Type of operator | | | | | | Total |
|-----------------------------|------------------|-----------|------------|----------------------------|-----------|------------|------------|
| | Scheduled | | | Non-scheduled ² | | | |
| | Mixed | All-cargo | Total | Mixed | All-cargo | Total | |
| Africa | 62 | 2 | 64 | 19 | 11 | 30 | 94 |
| Asia and Pacific | 52 | 2 | 54 | 12 | 2 | 14 | 68 |
| Europe | 92 | 3 | 95 | 128 | 11 | 139 | 234 |
| Latin America and Caribbean | 60 | 13 | 73 | 39 | 17 | 56 | 129 |
| Middle East | 12 | 1 | 13 | 6 | 2 | 8 | 21 |
| North America | 35 | 9 | 44 | 49 | 24 | 73 | 117 |
| Total | 313 | 30 | 343 | 253 | 67 | 320 | 663 |

1. Carriers operating aircraft with a maximum take-off weight of more than 9 000 kg.

2. Includes 44 domestic scheduled airlines operating non-scheduled international services (Africa — 5; Asia and Pacific — 2; Europe — 12; Latin America and Caribbean — 8; Middle East — 2; and North America — 15).

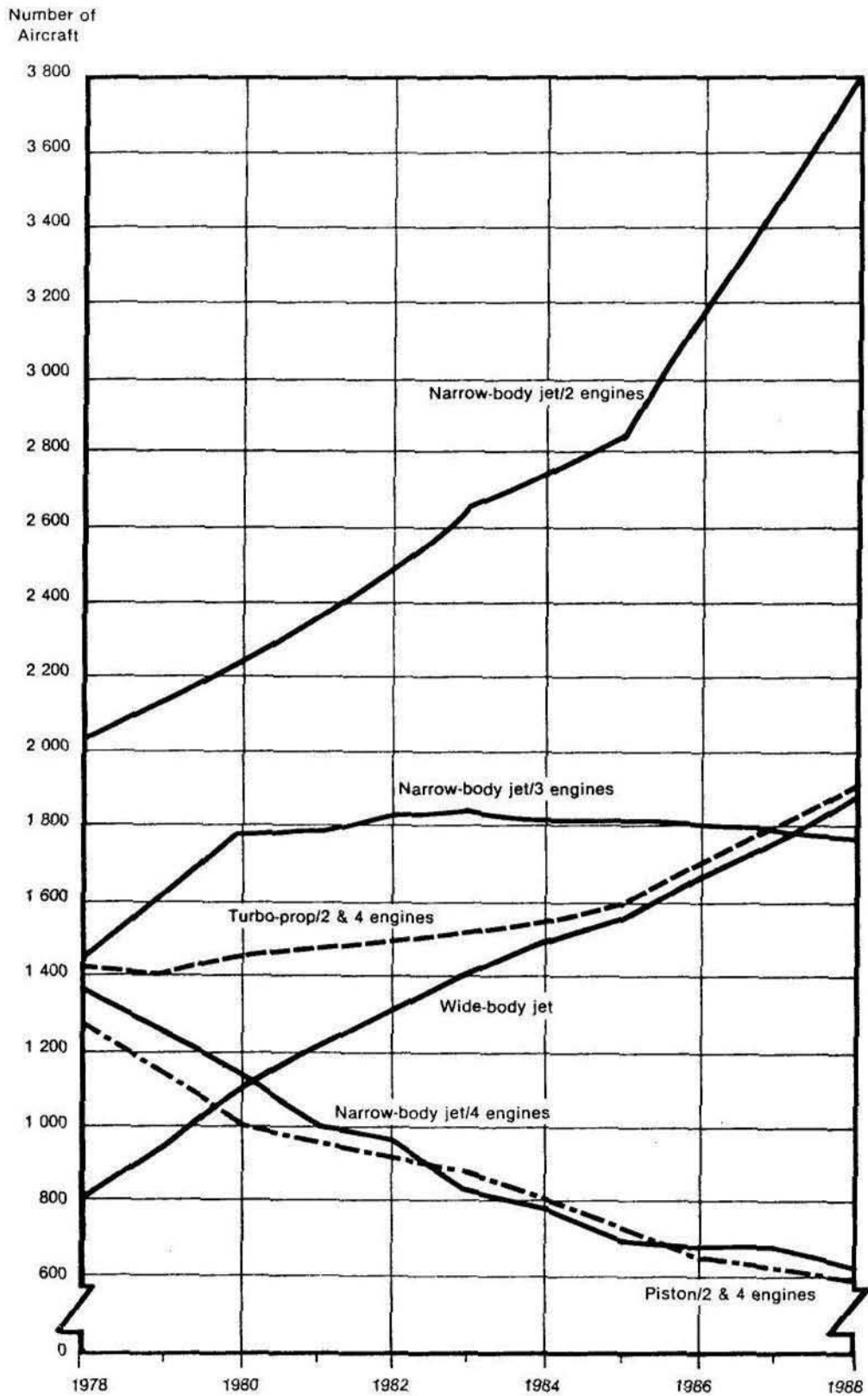
**Table 2-2. Total commercial transport fleet in 1978, 1983 and 1988¹
(distribution by aircraft category as of 31 December)**

| Aircraft category | 1978 | | 1983 | | 1988 | |
|-------------------|--------------|------------|--------------|------------|---------------|------------|
| | No. | % | No. | % | No. | % |
| Jet | 5 695 | 68 | 6 732 | 74 | 8 100 | 76 |
| SST | 11 | 0 | 14 | 0 | 14 | 0 |
| Wide-body | 800 | 10 | 1 404 | 15 | 1 869 | 17 |
| 4-engine | (330) | (4) | (538) | (6) | (640) | (6) |
| 3-engine | (411) | (5) | (565) | (6) | (584) | (5) |
| 2-engine | (59) | (1) | (301) | (3) | (645) | (6) |
| Narrow-body | 4 884 | 58 | 5 314 | 58 | 6 217 | 59 |
| 4-engine | (1371) | (16) | (837) | (9) | (640) | (6) |
| 3-engine | (1458) | (17) | (1826) | (20) | (1783) | (17) |
| 2-engine | (2055) | (25) | (2651) | (29) | (3794) | (36) |
| Turbo-prop | 1 416 | 17 | 1513 | 16 | 1910 | 18 |
| 4-engine | (441) | (5) | (407) | (4) | (326) | (3) |
| 2-engine | (975) | (12) | (1106) | (12) | (1584) | (15) |
| Piston-engined | 1 269 | 15 | 878 | 10 | 590 | 6 |
| Total | 8 380 | 100 | 9 123 | 100 | 10 600 | 100 |

1. Excluding China and the USSR.

Source:

Appendix 1.



Note: Excludes China and the USSR.

Figure 2-1. Composition of the world commercial transport fleet (end of each year, 1978-1988)

Table 2-3. Regional distribution of total commercial transport fleet in 1978 and 1988¹
(distribution by aircraft category as of 31 December)

| Aircraft category | Africa | | Asia and the Pacific | | Europe | | Latin America and Caribbean | | Middle East | | North America | | World | |
|-------------------|--------|------|----------------------|-------|--------|-------|-----------------------------|------|-------------|------|---------------|-------|-------|--------|
| | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 |
| Numbers | | | | | | | | | | | | | | |
| SST | - | - | - | - | 11 | 14 | - | - | - | - | - | - | 11 | 14 |
| Wide-body | 25 | 65 | 150 | 430 | 200 | 450 | 18 | 75 | 44 | 140 | 363 | 709 | 800 | 1 869 |
| Narrow-body | 225 | 345 | 470 | 400 | 1 396 | 1 316 | 412 | 505 | 186 | 210 | 2 192 | 3 441 | 4 884 | 6 217 |
| Total jet | 250 | 410 | 620 | 830 | 1 610 | 1 780 | 430 | 580 | 230 | 350 | 2 555 | 4 150 | 5 695 | 8 100 |
| Other | 320 | 210 | 500 | 420 | 490 | 700 | 610 | 390 | 60 | 30 | 705 | 750 | 2 685 | 2 500 |
| Total | 570 | 620 | 1 120 | 1 250 | 2 100 | 2 480 | 1 040 | 970 | 290 | 380 | 3 260 | 4 900 | 8 380 | 10 600 |
| Per cent | | | | | | | | | | | | | | |
| SST | - | - | - | - | 1 | 1 | - | - | - | - | - | - | - | - |
| Wide-body | 4 | 10 | 13 | 34 | 10 | 18 | 2 | 8 | 15 | 37 | 11 | 15 | 10 | 17 |
| Narrow-body | 40 | 56 | 42 | 32 | 66 | 53 | 39 | 52 | 64 | 55 | 67 | 70 | 58 | 59 |
| Total jet | 44 | 66 | 55 | 66 | 77 | 72 | 41 | 60 | 79 | 92 | 78 | 85 | 68 | 76 |
| Other | 56 | 34 | 45 | 34 | 23 | 28 | 59 | 40 | 21 | 8 | 22 | 15 | 32 | 24 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

1. Excluding China and the USSR.

Source:
Appendix 2.

Regional distribution

6. The distribution of the world fleet according to region of aircraft registration is shown in Table 2-3 (derived from Appendix 2). North America now accounts for 51 per cent of the world jet fleet, up from 45 per cent in 1978, and an even larger proportion of the narrow-body jet fleet. While the number of jet aircraft increased by only 11 per cent in Europe, it grew by 62 per cent in North America, largely reflecting the new requirements of the air system in the United States which was restructured to provide a higher frequency of largely narrow-body jet services through hubs. The number rose by 64 per cent in Africa, 52 per cent in the Middle East, 35 per cent in Latin America and the Caribbean, and 34 per cent in Asia and the Pacific. In 1988, three regions accounted for 85 per cent of the wide-body aircraft and for 83 per cent of the narrow-body aircraft, North America (38 per cent and 55 per cent respectively), Europe (24 per cent and 21 per cent) and Asia and the Pacific (23 per cent and 7 per cent).

7. The largest growth in the proportion of jet aircraft in regional fleets took place in the developing regions. Between 1978 and 1988 it rose from 44 to 66 per cent in Africa, from 55 to 66 per cent in Asia and the Pacific, from 41 to 60 per cent in Latin America and the Caribbean and from 79 to 92 per cent in the Middle East. In North America it grew from 78 to 85 per cent and in Europe it dropped from 77 to 72 per cent, the latter in part a reflection of the greater liberalization in Europe of smaller regional routes than of high volume trunk routes. Wide-body aircraft as a proportion of the total fleet in each region were relatively most important in the fleets of the Middle East (37 per cent) and Asia and the Pacific (34 per cent), followed by Europe (18 per cent), North America (15 per cent), Africa (10 per cent) and Latin America and the Caribbean (8 per cent). Turboprop and piston-engine types remain important in Latin America and the Caribbean (40 per cent), Africa (34 per cent) and Asia and the Pacific (34 per cent).

Distribution by type of carrier

8. The number of aircraft by category that were operated by scheduled and non-scheduled carriers in 1978 and 1988 is shown in Table 2-4 (derived from Appendix 3). Over the decade, the proportion of the

Table 2-4. Total commercial transport fleet by type of operator in 1978 and 1988¹
(distribution as of 31 December)

| Aircraft category | Scheduled airlines | | | | Non-scheduled operators | | | | All operators | | | | Non-scheduled | |
|-------------------|--------------------|-----|-------|-----|-------------------------|-----|-------|-----|---------------|-----|--------|-----|---------------|------|
| | 1978 | | 1988 | | 1978 | | 1988 | | 1978 | | 1988 | | % of total | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | 1978 | 1988 |
| Jets | | | | | | | | | | | | | | |
| SST | 11 | 0 | 14 | 0 | - | - | - | - | 11 | 0 | 14 | 0 | - | - |
| Wide-body | 773 | 11 | 1 789 | 19 | 27 | 2 | 80 | 6 | 800 | 10 | 1 869 | 17 | 3 | 4 |
| Narrow-body | 4 470 | 63 | 5 502 | 60 | 414 | 34 | 715 | 51 | 4 884 | 58 | 6 217 | 59 | 8 | 12 |
| Total | 5 254 | 74 | 7 305 | 79 | 441 | 36 | 795 | 57 | 5 695 | 68 | 8 100 | 76 | 8 | 10 |
| Other | 1 893 | 26 | 1 891 | 21 | 792 | 64 | 609 | 43 | 2 685 | 32 | 2 500 | 24 | 29 | 24 |
| Total | 7 147 | 100 | 9 196 | 100 | 1 233 | 100 | 1 404 | 100 | 8 380 | 100 | 10 600 | 100 | 15 | 13 |

¹ Excluding China and the USSR.

Source:
Appendix 3.

total fleet operated by non-scheduled carriers fell slightly to about 13 per cent. There continues to be a marked difference in the combined fleets of the two categories of carriers, with jet aircraft representing 79 per cent of the scheduled airline fleet, as against 57 per cent for the non-scheduled carriers.

Types of aircraft in service

9. The ten most important aircraft types in service with the scheduled airlines of ICAO Contracting States are listed in Table 2-5 for the first and last years of the decade (see Appendix 4 for all aircraft types in each of the years 1978-1988). These aircraft represent a decreasing proportion of the total fleet, from 72 per cent in 1978 to 69 per cent in 1988. Although the ranking of individual types has altered over this period, there has been little change in the actual composition of the group, with the Boeing 707/720 and the Douglas DC-8 in the 1978 listing being replaced by the Airbus A300 and the Boeing 767 in 1988. Only two propeller-driven types (F-27/FH-227 and the DC-3) continue to figure in the list. The Boeing 727 remains, as in 1978, the most widely used aircraft, followed by the DC-9/MD-80 and the Boeing 737, which together account for 45 per cent of the world fleet. The two basic 4-engine narrow-body aircraft (the Boeing 707/720 and the Douglas DC-8) declined in number by 74 per cent during the decade, while the wide-body aircraft among the ten most important aircraft types increased by 130 per cent.

Productivity of International Scheduled Airlines

10. Some indications of productivity developments for international scheduled airlines between 1978 and 1988 are given in Table 2-6 and in the annual data in Appendices 5 and 6. The growth of 87 per cent (equivalent to an average annual growth of 6.4 per cent) in capacity provided (item 6) was achieved with

Table 2-5. Major aircraft types in service in 1978 and 1988¹
(scheduled international and domestic airline fleets)

| 1978 | | | 1988 | | |
|---------------------------------|-------|-----|---------------------------------|-------|-----|
| Rank and aircraft type | No. | % | Rank and aircraft type | No. | % |
| 1. Boeing 727 | 1 336 | 19 | 1. Boeing 727 | 1 530 | 17 |
| 2. Douglas DC-9 | 794 | 11 | 2. Douglas DC-9/MD-80 | 1 320 | 14 |
| 3. Boeing 707/720 | 659 | 9 | 3. Boeing 737 | 1 308 | 14 |
| 4. Boeing 737 | 465 | 7 | 4. Boeing 747 | 620 | 7 |
| 5. Fokker/Fairchild F-27/FH-227 | 424 | 6 | 5. Fokker/Fairchild F-27/FH-227 | 365 | 4 |
| 6. Douglas DC-8 | 413 | 6 | 6. Douglas DC-10 | 340 | 4 |
| 7. Boeing 747 | 322 | 5 | 7. Airbus A-300 | 268 | 3 |
| 8. Douglas DC-3/C-47 | 315 | 4 | 8. Boeing 767 | 227 | 2 |
| 9. Douglas DC-10 | 248 | 3 | 9. Lockheed L-1011 | 205 | 2 |
| 10. Lockheed L-1011 | 151 | 2 | 10. Douglas DC-3/C-47 | 205 | 2 |
| Total 10 major types | 5 127 | 72 | Total 10 major types | 6 388 | 69 |
| Total all other types | 2 020 | 28 | Total all other types | 2 808 | 31 |
| Total | 7 147 | 100 | Total | 9 196 | 100 |

1. Excluding aircraft manufactured in China and the USSR.

Source:

Appendix 4.

an increase of 19 per cent in the number of aircraft in service (item 2), an increase of 21 per cent in total personnel employed (item 4) and an increase of 52 per cent in total aircraft hours flown (item 5). To a great extent these developments result from the growing use made of wide-body aircraft, a factor reflected in the increase in average payload capacity per aircraft (item 11) which has risen by 38 per cent from 21 tonnes in 1978 to about 29 tonnes in 1988. Associated with an increase of 12 per cent in the average stage distance (item 9), the average aircraft speed (item 10) increased marginally over the decade with little impact upon the general rise in total capacity.

11. The number of hours flown per aircraft (item 13) rose by 28 per cent in spite of the temporary decrease in this indicator in 1981, 1982 and 1983, which was influenced to some extent by the number of aircraft grounded by some airlines in response to high fuel costs and the disparity between traffic demand and capacity. Tonne-kilometres available per aircraft (item 14) rose by 57 per cent during the period. The decade saw a continued increase in the weight load factor (item 8), resulting in a greater improvement in productivity measured in terms of traffic carried compared to capacity produced. Tonne-kilometres performed (TKP) per aircraft (item 15) were up by 66 per cent, while TKPs per employee rose by 63 per cent.

12. In general, it may be noted that the improvements achieved between 1978 and 1988, as measured by the indicators in Table 2-6, are noticeably better than those observed in previous issues of this review.

**Table 2-6. Developments in productivity between 1978 and 1988
(international scheduled airlines¹, including domestic
and non-scheduled operations)**

| Items | 1978 | 1988 | Per cent change |
|--|---------|-----------|-----------------|
| 1. Number of airlines | 236 | 343 | 45 |
| 2. Number of aircraft in fleet | 6 130 | 7 300 | 19 |
| 3. Number of flight crew ² | 96 500 | 115 000 | 19 |
| 4. Total number of personnel | 953 500 | 1 150 000 | 21 |
| <i>Performance data</i> | | | |
| 5. Aircraft hours flown (thousands) | 13 032 | 19 870 | 52 |
| 6. Tonne-kilometres available (millions) | 174 392 | 325 676 | 87 |
| 7. Tonne-kilometres performed (millions) | 99 114 | 195 919 | 98 |
| 8. Weight load factor (per cent) | 57 | 60 | 5 |
| <i>Measures of productivity</i> | | | |
| 9. Average stage distance (kilometres) | 927 | 1 034 | 12 |
| 10. Average speed (km/hr) | 628 | 634 | 1 |
| 11. Average payload capacity (tonnes) | 21 | 29 | 38 |
| 12. TKAs per flight hour | 13 351 | 15 898 | 19 |
| 13. Hours flown per aircraft | 2 126 | 2 722 | 28 |
| 14. TKAs per aircraft (thousands) | 28 449 | 44 613 | 57 |
| 15. TKPs per aircraft (thousands) | 16 169 | 26 838 | 66 |
| 16. TKAs per employee (thousands) | 183 | 283 | 55 |
| 17. TKPs per employee (thousands) | 104 | 170 | 63 |

1. Excluding China and the USSR.

2. Excluding cabin attendants.

Source:

Appendix 5, ATR Forms A-1.

**Table 2-7. World air transport development¹ and related economic indicators
(data in millions of U.S. dollars except when otherwise indicated)**

| Description | 1978 | 1983 | 1988 | Average annual increase (%) | | |
|---|-------------|-------------|-------------------------|-----------------------------|--------------------|--------------------|
| | | | | 1978-83 | 1983-88 | 1978-88 |
| <i>Total scheduled air traffic</i> | | | | | | |
| Tonne-km performed | 99 120 | 128 610 | 190 410 | 5.3 | 8.2 | 6.7 |
| Total operating revenue | | | | | | |
| in dollars | 58 769 | 98 300 | 166 000 | 10.8 | 11.0 | 10.9 |
| in SDR ² | (45 110) | (93 892) | (123 356) | (15.7) | (5.6) | (10.6) |
| World GDP, excluding services (index) ^{3,4} | 95 | 104 | 123 | 1.9 | 3.5 | 2.7 |
| World production of electric energy, kWh ⁵ | 7 688 000 | 8 824 000 | 10 402 000 | 2.8 | 3.3 | 3.1 |
| <i>Air passenger traffic</i> | | | | | | |
| Passenger-km | 805 000 | 1 024 000 | 1 497 000 | 4.9 | 7.9 | 6.4 |
| Passenger revenue | | | | | | |
| in dollars | 46 625 | 77 600 | 125 800 | 10.7 | 10.1 | 10.4 |
| in SDR ² | (35 789) | (74 120) | (93 483) | (15.7) | (4.8) | (10.1) |
| Gross national product, industrial market economies | | | | | | |
| in dollars ⁶ | 5 674 000 | 7 831 000 | 10 913 000 ⁷ | 6.7 | 8.7 ⁷ | 7.5 ⁷ |
| in SDR ² | (4 355 268) | (7 479 822) | (7 692 470) | (11.4) | (0.6) ⁷ | (6.5) ⁷ |
| International tourist arrivals ⁸ | 257 | 284 | 390 | 2.0 | 6.5 | 4.3 |
| International tourist receipts | | | | | | |
| in dollars ⁸ | 69 000 | 98 000 | 195 000 | 7.3 | 14.8 | 10.9 |
| in SDR ² | 53 000 | 93 600 | 144 900 | (12.0) | (9.1) | (10.6) |
| <i>Air freight traffic</i> | | | | | | |
| Freight tonne-km | 23 820 | 32 740 | 51 220 | 6.6 | 9.4 | 8.0 |
| Freight revenue | | | | | | |
| in dollars | 6 463 | 10 830 | 20 000 | 10.9 | 13.1 | 12.0 |
| in SDR ² | (4 961) | (10 344) | (14 826) | (15.8) | (7.5) | (11.6) |
| World production, manufactured goods (index) ^{3,5} | 94 | 102 | 126 | 1.6 | 4.3 | 3.0 |
| World export, manufactured goods | | | | | | |
| in thousands of dollars ⁵ | 738 | 992 | 1 860 | 6.4 | 13.4 | 9.7 |
| in SDR ² | (566) | (948) | (1 382) | (10.9) | (7.8) | (9.3) |
| <i>Air passenger average unit price</i> | | | | | | |
| Passenger yield | | | | | | |
| in U.S. cents per pass-km | 5.8 | 7.6 | 8.4 | 5.6 | 2.0 | 3.8 |
| in SDR ² per 100 pass-km | (4.5) | (7.3) | (6.2) | (10.2) | (-3.2) | (3.3) |
| Gross national product, industrial market economies, per capita | | | | | | |
| in dollars ⁶ | 8 217 | 10 727 | 14 643 ⁷ | 5.5 | 8.1 ⁷ | 6.6 ⁷ |
| in SDR ² | (6 307) | (10 246) | (10 322) | (10.2) | (0.2) | (5.6) |
| <i>Air freight average unit price</i> | | | | | | |
| Freight yield | | | | | | |
| in U.S. cents per tonne-km | 27.1 | 33.1 | 39.0 | 4.1 | 3.3 | 3.7 |
| in SDR ² per 100 tonne-km | (20.8) | (31.6) | (29.0) | (8.7) | (-1.8) | (3.4) |
| Unit value index, world export manufactured goods for developed market economies ³ | | | | | | |
| in dollars | 79 | 89 | 123 | 2.4 | 6.7 | 4.5 |
| in SDR ² | (82) | (108) | (116) | (5.7) | (1.4) | (3.5) |

| Description | 1978 | 1983 | 1988 | Average annual increase (%) | | |
|--|------|------|------------------|-----------------------------|------------------|------------------|
| | | | | 1978-83 | 1983-88 | 1978-88 |
| <i>Labour productivity</i> | | | | | | |
| Air transport tonne-km performed per employee (index) ³ | 90 | 109 | 147 | 3.9 | 6.2 | 5.0 |
| Manufacturing, developed market economies (index) ³ | 96 | 108 | 121 ⁹ | 2.4 | 3.9 ⁹ | 2.9 ⁹ |

1. Excluding domestic operations within the USSR to ensure comparability between traffic and financial data series; 1988 data are based on preliminary estimates.
2. SDR: Special Drawing Rights shown to discount fluctuations in U.S. dollars.
3. Index: 1980 = 100.
4. International Monetary Fund, "International Financial Statistics".
5. United Nations, "Yearbook of Statistics" and "Monthly Bulletin of Statistics".
6. World Bank, "World Development Report" and "World Bank Atlas".
7. Data for 1987. Rates of growth for 1983-1987 and 1978-1987.
8. World Tourism Organization, "World Tourism Statistics".
9. Data for 1986. Rates of growth for 1983-1986 and 1978-1986.

Air Transport Related to General Economic Indicators

13. Various aspects of the development of air transport between 1978 and 1988 are compared with changes in related economic indicators in Table 2-7. Monetary values are shown in both U.S. dollars and special drawing rights (SDRs), in order to adjust values for fluctuations in the value of the U.S. dollar. The following analysis is based on SDR values where applicable.

14. During the first half of the decade, world economic activity as well as air transport were affected by the widespread economic recession of 1980-1982. The latter part of the decade, however, was marked by a period of sustained economic growth at the global level. Although air transport was adversely affected by the sharp increase in fuel prices in 1979-1980 and the economic recession, the industry continued to perform better than average as measured against selected general economic indicators.

15. From 1978 to 1988, total scheduled air traffic (excluding domestic operations in the USSR for comparability with airline financial data), increased at an average annual rate of 6.7 per cent, while total operating revenues climbed by 10.6 per cent. By comparison, the world gross domestic product rose by 2.7 per cent per year and world electrical production by 3.1 per cent.

16. Scheduled air passenger traffic during this period increased by 6.4 per cent a year, compared to 4.3 per cent for international tourist arrivals, while freight traffic rose by 8 per cent against 3 per cent for world production of manufactured goods. Financial comparisons show that total passenger revenues were up by 10.1 per cent a year, comparable to the increase of 10.6 per cent in international tourist receipts, and revenues earned from the carriage of freight increased at 11.6 per cent a year, against 9.3 per cent for the value of world exports of manufactured goods.

17. The comparatively favourable position of air transport in terms of production and revenue may be partially explained by the fact that the price of these services to the user has not generally risen as much as per capita income and the general price index. The average annual rate of increase in the air passenger fare per kilometre was 3.3 per cent against 5.6 per cent for per capita GNP in industrial market economies. In the case of freight, the rate per tonne-kilometre rose by 3.4 per cent per annum, compared to a 3.5 per cent rise in the unit price of manufactured goods exported by developed market economies.

18. Historically, the ability of the air transport industry to offer users transportation at unit prices which have increased less than those for other goods and services has been explained by improved productivity made possible by technological innovation and automation. This continues to be true as productivity per airline employee rose at an average annual rate of 5 per cent between 1978 and 1988 while labour productivity in manufacturing in developed market economies increased by 2.9 per cent per year during the same period.

Chapter 3

DEVELOPMENT OF AIR CARRIER TRAFFIC — 1978 TO 1988

1. In 1988 the scheduled and non-scheduled carriers of ICAO Contracting States transported approximately 233 880 million tonne-kilometres of passenger, freight and mail traffic¹ on their international and domestic services. Of this total about 90 per cent (211 150 million) was transported on scheduled services and 10 per cent on charter services. Details concerning the development of this traffic over the past decade are presented in Appendices 7 to 12.

Scheduled Traffic

Distribution by type and category of service

2. International scheduled traffic, as a proportion of total scheduled traffic, increased from 47 per cent in 1978 to 53 per cent in 1988². International passenger traffic increased as a proportion of total passenger traffic from about 42 per cent in 1978 to nearly 45 per cent in 1988, while international freight traffic rose from 65 per cent of total freight traffic in 1978 to almost 77 per cent in 1988. International passengers accounted for about two-thirds of the total load on all international services in 1978, declining slightly over the decade, whereas air freight increased its share of the total load from 32 per cent in 1978 to 37 per cent in 1988.

3. The major emphasis in this review is placed on international air transport, but it is noteworthy that of the 1988 total domestic scheduled traffic 78 per cent is accounted for by two countries: the United States at nearly 57 per cent (56 305 million tonne-kilometres) and the USSR at 21 per cent (20 732 million tonne-kilometres).

Traffic growth by region: 1978-1988

4. Average annual rates of growth for international scheduled traffic from 1978 to 1988 are given in Table 3-1 (derived from Appendices 9A and 10) for the world and by region of airline registration. The global rates compared to those for the earlier decade 1975-1985 were lower for passenger-kilometres (7.0 per cent against 8.2 per cent), for freight tonne-kilometres (9.3 per cent against 9.5 per cent) and for mail tonne-kilometres (3.9 per cent against 4.3 per cent). The sum of all international scheduled traffic increased from 53 440 million tonne-kilometres in 1978 to 112 570 in 1988, with passenger traffic growing from 385 000 million to 756 000 million passenger-kilometres.

5. For the period under review (1978-1988) there were, however, significant differences among the regions. The highest growth rates for both passenger and freight traffic were achieved by the airlines of Asia/Pacific and North America, the lowest for passenger and total traffic by the African and European airlines, the lowest for freight traffic by the Latin American/Caribbean and the African airlines, and the lowest for mail traffic by the North American and Latin American/Caribbean airlines.

1. All 1988 traffic data are preliminary.

2. Percentages determined using tonne-kilometres performed as presented in Appendix 7.

Table 3-1. Growth of international scheduled traffic by region: 1978-1988
(average annual percentage increase)

| Traffic category | Region of airline registration | | | | | | |
|--------------------------|--------------------------------|--------|------------------|--------|-----------------------------|-------------|---------------|
| | World | Africa | Asia and Pacific | Europe | Latin America and Caribbean | Middle East | North America |
| Passenger-km | 7.0 | 4.6 | 10.4 | 4.8 | 5.8 | 5.8 | 8.4 |
| Freight tonne-km | 9.3 | 7.1 | 13.8 | 7.7 | 6.4 | 7.4 | 8.6 |
| Mail tonne-km | 3.9 | 3.6 | 8.4 | 3.2 | 2.8 | 6.9 | 2.6 |
| Total tonne-km performed | 7.7 | 5.2 | 11.5 | 5.8 | 6.1 | 6.4 | 8.3 |

Note. — 1988 data are preliminary.

Source:
Appendix 9A.

Regional distribution of international scheduled traffic: 1978-1988

6. Table 3-2 shows that within a single decade the share of world international scheduled traffic carried by airlines registered in Asia and the Pacific grew from 20.6 to 29.0 per cent. That of North American airlines grew by only one percentage point, but the shares of all four other regions declined collectively by 9.4 percentage points, led by Europe with an almost 7 percentage point loss.

Distribution of international scheduled passenger traffic by route groups: 1978-1987

7. The changing distribution of international scheduled passenger traffic by major route groups for the years 1978 and 1987 is shown in Table 3-3. This table also shows the average annual percentage increases in their traffic between 1978 and 1987.

8. In 1987, with about 27 per cent of the total passenger traffic (in terms of passenger-kilometres), the Transatlantic remained the single most important international route group. Its relative importance, however, has decreased since 1978 due to the significant increase in traffic on routes to/from and within Asia and the Pacific. In 1978 the latter routes accounted for about 32 per cent of the total international scheduled passenger traffic; by 1987 they accounted for about 42 per cent. The traffic increase on these routes, while contributing to the significant development of the carriers registered in Asia and the Pacific, was also a major factor in the increase in traffic for carriers registered in other regions which operate on routes to and from Asia and the Pacific.

Traffic of individual States and airlines

9. The shares of the world's international scheduled traffic accounted for by the top 30 States or groups of States, and the top 30 airlines in 1978 and 1988, are given in Appendices 10 and 11 respectively. In 1988 these States together accounted for some 87 per cent of the total tonne-kilometres performed and the 30 airlines for more than 73 per cent. These shares were virtually the same as in 1978.

**Table 3-2. Regional distribution of international scheduled traffic in 1978 and 1988¹
(percentage)**

| Region of airline registration | Passenger-km | | Freight tonne-km | | Mail tonne-km | | Total tonne-km | | Weight load factor | |
|--------------------------------|--------------|-------|------------------|-------|---------------|-------|----------------|-------|--------------------|------|
| | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 |
| Africa | 4.9 | 3.9 | 3.4 | 2.7 | 2.6 | 2.5 | 4.3 | 3.4 | 53 | 53 |
| Asia and Pacific | 20.3 | 27.6 | 21.0 | 31.4 | 13.1 | 20.0 | 20.6 | 29.0 | 61 | 69 |
| Europe | 42.4 | 34.5 | 43.0 | 37.0 | 40.6 | 38.0 | 42.4 | 35.5 | 59 | 66 |
| Latin America and Caribbean | 6.7 | 6.0 | 6.5 | 5.0 | 2.8 | 2.5 | 6.6 | 5.7 | 58 | 61 |
| Middle East | 5.4 | 4.8 | 6.4 | 5.4 | 1.7 | 2.3 | 5.6 | 4.9 | 49 | 56 |
| North America | 20.3 | 23.2 | 19.7 | 18.5 | 39.2 | 34.7 | 20.5 | 21.5 | 56 | 61 |
| World | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 58 | 64 |

1. 1988 data are preliminary.

Source:
Appendix 9A.

Table 3-3. Distribution and growth of international scheduled passenger traffic by route group: 1978-1987

| Route group | Percentage distribution of passenger-km | | Average annual percentage change in passenger-km |
|--|---|-------|--|
| | 1978 | 1987 | 1987/1978 |
| Within the Americas | 16.2 | 12.0 | 3.2 |
| Within Europe ¹ | 10.6 | 9.1 | 4.9 |
| Transatlantic | 28.5 | 27.3 | 6.2 |
| Within Asia/Pacific | 6.8 | 9.2 | 10.2 |
| Between Europe/Middle East/ Africa and Asia/Pacific | 15.2 | 18.9 | 9.2 |
| Transpacific | 9.9 | 14.2 | 11.0 |
| Other routes | 12.8 | 9.3 | 3.0 |
| World | 100.0 | 100.0 | 6.6 |

1. In this context Europe includes Algeria, Morocco and Tunisia.

Sources:
ICAO annual Circulars on Regional Differences in Fares, Rates and Costs for International Air Transport.

10. The average annual growth rate over the decade 1978-1988 for total international traffic was 7.7 per cent, but in the case of four States and one group of States the rates were between 11.8 and 21.5 per cent:

| | |
|-------------|---------------|
| Indonesia | 21.5 per cent |
| Thailand | 14.9 per cent |
| Malaysia | 14.8 per cent |
| Gulf States | 14.0 per cent |
| Singapore | 11.8 per cent |

Correspondingly, among the top 30 international airlines, the highest average annual growth rates for total international traffic for the period 1978-1988 were achieved by the following five:

| | |
|-------------------|---------------|
| Northwest | 20.9 per cent |
| Cathay Pacific | 17.6 per cent |
| MAS | 14.8 per cent |
| American Airlines | 14.7 per cent |
| Flying Tiger | 14.5 per cent |

Monthly traffic variation: 1978-1988

11. The monthly distribution of international scheduled traffic for the years 1978 to 1988 is shown in Appendix 8 for passenger-kilometres and freight tonne-kilometres performed. Monthly variations were greater for passenger than for freight traffic with about 31 per cent of the annual volume typically falling in the peak third quarter for the former in contrast with less than 27 per cent in the peak fourth quarter for the latter category of traffic. The degree of seasonality is indicated as a traffic ratio determined by dividing the peak month by the trough month. For passenger traffic over the period under consideration this ratio fluctuated within the range of 1.66 to 1.88 while for freight traffic it fluctuated between 1.21 and 1.49. For international passenger traffic February and August have been, respectively, the trough and the peak months throughout the decade, while for freight traffic January and October have been the trough and the peak months respectively.

Non-scheduled Traffic

12. The global development of non-scheduled traffic has been partially masked by some reporting deficiencies among the non-scheduled air carriers. However, the data obtained permit some indications to be given of the nature, development and importance of charter traffic.

Operational characteristics

13. In Table 3-4 a comparison is shown between non-scheduled and scheduled operations with respect to average stage distance, speed and payload capacity per aircraft for the year 1987. Compared with data presented in the previous Triennial Review for the year 1984, the average stage length for non-scheduled services increased from 1 221 kilometres in 1984 to 1 571 kilometres in 1987 while in contrast it increased only moderately for scheduled operations from 1 683 to 1 752 kilometres. Also, average block speed for scheduled and non-scheduled operations was slightly up. The average aircraft capacity for non-scheduled operations was again noticeably lower than for scheduled services.

Table 3-4. Comparison of stage, speed and capacity averages for scheduled and non-scheduled operations in 1987 (averages per aircraft on international services)

| Type of operation | Stage distance (km) | Block speed (km/hr) | Payload capacity (tonnes) |
|-------------------|---------------------|---------------------|---------------------------|
| Scheduled | 1 752 | 679 | 35.1 |
| Non-scheduled | 1 571 | 617 | 20.9 |

Source:
ATR Forms A-1 and A-2.

Distribution of non-scheduled traffic

14. The distribution of non-scheduled traffic by category of load and services is shown in Table 3-5 for the year 1987. This type of air transport may be seen to be predominantly international, and has been primarily devoted to the carriage of passenger traffic.

International non-scheduled passenger traffic

15. The growth rate of international non-scheduled passenger traffic averaged 4.4 per cent per year between 1978 and 1988 (Table 3-6). Non-scheduled passenger traffic, as a proportion of total international passenger traffic, decreased during the first part of the decade from a 23 per cent share in 1978 to about 17 per cent since 1981. For 1988 this traffic is estimated at 171 400 million passenger-kilometres. The share of the specialized charter carriers fluctuated from 1978 to 1988 between 51 and 66 per cent.

16. The relative development of non-scheduled and scheduled passenger traffic on the North Atlantic, over the period 1978-1988, is shown in Table 3-7 in terms of passengers carried. The non-scheduled share of total traffic on these routes decreased dramatically from 29 per cent in the peak year 1977 to about 7 per cent in 1987 and 1988. The 2 million non-scheduled passengers carried in 1988 represented a 54 per cent decline from the 1977 peak year total of 4.4 million.

Table 3-5. Estimated distribution of total non-scheduled traffic in 1987¹ (scheduled and non-scheduled carriers)

| Type of service | Passenger-km (millions) | Tonne-kilometres in millions | | | Per cent distribution | |
|-----------------|-------------------------|------------------------------|--------------|---------------|-----------------------|--------------|
| | | Passengers | Freight/mail | Total | Passenger | Freight/mail |
| International | 160 800 (94%) | 14 055 (94%) | 4 020 (54%) | 18 075 (81%) | 78% | 22% |
| Domestic | 10 000 (6%) | 905 (6%) | 3 390 (46%) | 4 295 (19%) | 21% | 79% |
| Total | 170 800 (100%) | 14 960 (100%) | 7 410 (100%) | 22 370 (100%) | 67% | 33% |

1. Excluding China and the USSR.

Source:
ATR Forms A-1 and A-2.

Table 3-6. Estimated international non-scheduled passenger traffic: 1978-1988
(thousands of millions of passenger-kilometres)

| Year | Non-scheduled traffic ² | | | Non-scheduled carriers % share | Scheduled traffic | Total traffic | Non-scheduled per cent of total traffic | Per cent change over previous year | | |
|-------------------|------------------------------------|--------------------|-----------------------------|--------------------------------|-------------------|---------------|---|------------------------------------|-------------------|---------------|
| | Non-scheduled carriers | Scheduled carriers | Total non-scheduled traffic | | | | | Non-scheduled traffic | Scheduled traffic | Total traffic |
| 1978 | 70.6 | 41.1 | 111.7 | 63.2 | 384.8 | 496.5 | 22.5 | 3.7 | 15.9 | 12.9 |
| 1979 | 72.3 | 36.7 | 109.0 | 66.3 | 440.2 | 549.2 | 19.8 | -2.4 | 14.4 | 10.6 |
| 1980 | 59.6 | 43.1 | 102.7 | 58.0 | 466.5 | 569.2 | 18.0 | -5.8 | 6.0 | 3.6 |
| 1981 | 57.6 | 41.1 | 98.7 | 58.4 | 494.4 | 593.1 | 16.6 | -3.9 | 6.0 | 4.2 |
| 1982 | 64.9 | 40.6 | 105.5 | 61.5 | 496.5 | 602.0 | 17.5 | 6.9 | 0.4 | 1.5 |
| 1983 | 69.5 | 38.8 | 108.3 | 64.2 | 510.8 | 619.1 | 17.5 | 2.7 | 2.9 | 2.8 |
| 1984 | 75.2 | 40.6 | 115.8 | 64.9 | 555.3 | 671.1 | 17.3 | 6.9 | 8.7 | 8.4 |
| 1985 | 72.7 | 49.0 | 121.7 | 59.7 | 589.3 | 711.0 | 17.1 | 5.1 | 6.1 | 5.9 |
| 1986 | 63.9 | 69.6 | 133.5 | 47.9 | 602.4 | 735.9 | 18.1 | 9.7 | 2.2 | 3.5 |
| 1987 | 81.7 | 80.0 | 161.7 | 50.5 | 686.1 | 847.8 | 19.1 | 21.1 | 13.9 | 15.2 |
| 1988 ¹ | 87.7 | 83.7 | 171.4 | 51.2 | 755.9 | 927.3 | 18.5 | 6.0 | 10.2 | 9.4 |

1. Preliminary estimates.

2. China and the USSR data excluded 1978-1982, included 1983-1988.

Source:

ATR Forms A-1 and A-2.

**Table 3-7. Non-scheduled and scheduled passenger traffic
on the North Atlantic: 1978-1988
(numbers of passengers in thousands)**

| Year | Non-scheduled operations | Scheduled operations | Total operations | Non-scheduled as a per cent |
|------------------------------|--------------------------|----------------------|------------------|-----------------------------|
| 1978 | 3 629 | 13 199 | 16 828 | 21.6 |
| 1979 ¹ | 2 759 | 15 830 | 18 589 | 14.8 |
| 1980 | 1 925 | 16 650 | 18 575 | 10.4 |
| 1981 | 1 779 | 17 236 | 19 015 | 9.4 |
| 1982 | 2 193 | 16 344 | 18 537 | 11.8 |
| 1983 | 2 301 | 17 388 | 19 689 | 11.7 |
| 1984 | 2 674 | 19 469 | 22 143 | 12.1 |
| 1985 | 2 271 | 20 964 | 23 235 | 9.8 |
| 1986 | 1 359 | 19 724 | 21 083 | 6.4 |
| 1987 | 1 819 | 24 022 | 25 841 | 7.0 |
| 1988 | 2 043 | 26 200 | 28 243 | 7.2 |
| <i>Average annual growth</i> | | | | |
| 1978-1983 | -8.7% | 5.7% | 3.2% | - |
| 1983-1988 | -2.4% | 8.5% | 7.5% | - |

1. As of January 1979 transatlantic flights to and from Miami included as "North Atlantic".

Source:

IATA, World Air Transport Statistics, 1978-1988.

17. Intra-ECAC/European (defined by the territory of the 22 European Civil Aviation Conference Member States) non-scheduled traffic (Table 3-8) constitutes the largest single component of the 1988 world charter market. Its share of the world international non-scheduled passenger traffic in 1988 was about 59 per cent. It is estimated that in 1988, the scheduled traffic performed by AEA-member airlines represented about 90 per cent of the total intra-ECAC scheduled traffic. Taking this into consideration, approximately 44 per cent of all intra-ECAC passengers in 1988 were carried on non-scheduled operations, which accounted for about 62 per cent of the total passenger-kilometres performed.

Table 3-8. Intra-European international non-scheduled and scheduled passenger traffic (millions)

| Year | Passengers carried | | |
|------------------------------|---------------------------------------|-----------------------------------|--|
| | Non-scheduled operations ¹ | Scheduled operations ² | Non-scheduled as a percentage of total |
| 1978 | 26.8 | 41.4 | 39.3 |
| 1979 | 29.2 | 43.8 | 40.0 |
| 1980 | 27.5 | 42.9 | 39.1 |
| 1981 | 28.0 | 44.2 | 38.8 |
| 1982 | 30.6 | 43.5 | 41.3 |
| 1983 | 32.7 | 43.3 | 43.0 |
| 1984 | 34.6 | 47.5 | 42.1 |
| 1985 | 37.3 | 50.9 | 42.3 |
| 1986 | 44.2 | 52.5 | 45.7 |
| 1987 | 50.0 | 58.9 | 45.9 |
| 1988 | 53.0 | 62.9 | 45.7 |
| <i>Average annual growth</i> | | | |
| 1978-1983 | 4.1 | 0.9 | - |
| 1983-1988 | 10.1 | 7.5 | - |

1. Between ECAC Member States (estimated data).
2. AEA airlines only within geographical Europe (for 1978, 1979 and 1980, data are estimated figures). AEA airlines carried an estimated 90 per cent of scheduled traffic in 1988.

Source:
AEA

Distribution by carrier

18. The distribution of international non-scheduled passenger traffic by carrier is shown for the year 1987 in Table 3-9. Collectively the 15 major specialized charter operators accounted for 71 per cent of the total 63 946 millions of non-scheduled passenger-kilometres performed by this category of carrier, a higher concentration of traffic than occurred with the scheduled airlines operating charters. In 1987 the top non-scheduled carriers included 13 from Europe and two from North America. Collectively the group of 15 scheduled carriers which accounted for the most non-scheduled passenger-kilometres included 11 airlines from Europe and 4 from North America.

Table 3-9. International non-scheduled passenger traffic in 1987
(millions of passenger-kilometres by non-scheduled and scheduled carriers)

| Rank | Non-scheduled operators | | Scheduled airlines | |
|------|------------------------------------|-----------------|-----------------------------------|-----------------|
| 1. | Condor (Fed. Rep. of Germany) | 7 755 | Britannia (United Kingdom) | 11 485 |
| 2. | LTU (Fed. Rep. of Germany) | 7 623 | Dan-Air Services (United Kingdom) | 7 709 |
| 3. | Scanair (Scandinavia) | 6 682 | Monarch Airlines (United Kingdom) | 4 890 |
| 4. | British Airtours (United Kingdom) | 5 529 | Wardair (Canada) | 4 031 |
| 5. | Sterling (Denmark) | 5 130 | American Transair (United States) | 3 302 |
| 6. | Hapag Lloyd (Fed. Rep. of Germany) | 4 622 | Finnair (Finland) | 3 192 |
| 7. | Martinair Holland (Netherlands) | 3 426 | Air Europe (United Kingdom) | 3 025 |
| 8. | Air Charter Intl (France) | 3 202 | Orion (United Kingdom) | 2 947 |
| 9. | Cal Air Intl (United Kingdom) | 2 413 | Transavia (Netherlands) | 2 092 |
| 10. | Balair (Switzerland) | 2 130 | Air Canada (Canada) | 1 937 |
| 11. | Conair (Denmark) | 2 124 | Flying Tiger Line (United States) | 1 636 |
| 12. | World Airways (United States) | 2 073 | Braathen's Safe (Norway) | 1 490 |
| 13. | Aero Lloyd (Fed. Rep. of Germany) | 1 937 | Air Malta (Malta) | 1 438 |
| 14. | Air Europa (Spain) | 1 822 | Adria Airways (Yugoslavia) | 1 389 |
| 15. | Worldways (Canada) | 1 708 | Aviaco (Spain) | 1 371 |
| | Total top 15 carriers | 58 176 (71%) | | 51 934 (65%) |
| | Total remaining carriers | 23 524 (29%) | | 28 066 (35%) |
| | Total all carriers | 81 700 | | 80 000 |

Source:

ATR Forms A-1 and A-2.

Chapter 4

AIR CARRIER FINANCIAL TRENDS — 1978 TO 1988

1. The analysis of financial data given in this chapter is based primarily on the statistics presented in Appendices 12 to 16. The main purpose is to indicate general trends for the decade from 1978 to 1987, preliminary estimates for 1988 being given where possible. The treatment is global in nature, dealing with totals and averages for the airlines as a whole, and for this reason does not show the wide differences that exist between individual carriers. Since the available information on non-scheduled operators is incomplete, the analysis is confined to the scheduled airlines of ICAO Contracting States.

2. The steep increase in the cost of fuel and the world-wide economic recession were the main factors adversely affecting the financial environment of the air transport industry in the first half of the period. The result was a net loss of more than \$4 billion between 1980 and 1983. During the last several years, however, a decrease in fuel costs, along with other cost reduction and yield control measures, brought about a remarkable improvement in the financial results of the industry.

Operating Revenues, Expenses and Results

Trends

3. From 1978 to 1988, in terms of current money values and as shown in Table 4-1, the total operating revenues of the world's scheduled airlines on all their services, scheduled and non-scheduled, increased at the average annual rate of 10.9 per cent from \$58 769 million to \$166 000 million. During the same period the corresponding total operating expenses also increased at a rate of 10.9 per cent from \$55 669 million to \$156 500 million. Operating surpluses ranged between 1.0 and 5.7 per cent of operating revenues with the exception of 1980, 1981 and 1982 when marginal operating losses were experienced (Table 4-2). For the period as a whole, the operating profit was \$34 949 million or 3 per cent of the aggregate operating revenues of \$1 156 932 million, and the aggregate net surplus (after allowing for non-operating items such as the retirement of property, subsidies, interest charges and income taxes) was 0.6 per cent of operating revenues. The growth in the development of world airline operating revenues during this period resulted from the average annual growth in traffic of 6.6 per cent in terms of tonne-kilometres performed and the rise in airline yields (average operating revenue per tonne-kilometre performed) from 55.7 cents in 1978 to 82.9 cents in 1988 (at an average annual rate of 4.1 per cent). The more rapid (4.5 per cent on average) growth of unit costs (average operating expenses per tonne-kilometre of available capacity) was offset by steadily increasing load factors.

4. For international services alone revenues and expenses for 1988 have not been estimated but, for the period from 1978 to 1987, total operating revenues increased at a higher rate than operating expenses (see Table 4-1). Throughout this period the aggregate operating profit of the world's scheduled airlines on their international services amounted to \$15 550 million, about 2.8 per cent of their aggregate operating revenues. The net result for the period, however, was a cumulative gain of only \$2 936 million or approximately 0.5 per cent of total operating revenues. For international operations, average yields increased at an annual rate of 3.4 per cent, from 56.6 cents per tonne-kilometre performed in 1978 to 76.2 cents in 1987,

Table 4-1. Operating revenues and expenses for scheduled airlines

| Year | Operating revenues (\$ million) | Operating expenses (\$ million) | Total traffic all services (TKP million) | Unit revenue (cents/TKP) | Total capacity all services (TKA million) | Unit cost (cents/TKA) |
|------------------------------------|------------------------------------|------------------------------------|--|-----------------------------|---|--------------------------|
| <i>Total services</i> | | | | | | |
| 1978 | 58 769 | 55 669 | 105 420 | 55.7 | 184 730 | 30.1 |
| 1988 ¹ | 166 000 | 156 500 | 200 260 | 82.9 | 334 190 | 46.8 |
| Average annual growth, per cent | 10.9 | 10.9 | 6.6 | 4.1 | 6.1 | 4.5 |
| <i>International services</i> | | | | | | |
| 1978 | 33 122 | 32 037 | 58 480 | 56.6 | 100 670 | 31.8 |
| 1987 | 83 820 | 77 870 | 110 022 | 76.2 | 172 128 | 45.2 |
| Average annual growth, per cent | 10.9 | 10.4 | 7.3 | 3.4 | 6.1 | 4.0 |

1. 1988 data are preliminary.

Source:
Appendices 12 and 13.

Table 4-2. Operating and net results of scheduled airlines — 1978-1988

| Year | All services | | | | International services only | | | |
|-------------------|--------------------------------|-------------------------------------|--------------------------------|-------------------------------------|--------------------------------|-------------------------------------|--------------------------------|-------------------------------------|
| | Operating result | | Net result | | Operating result | | Net result | |
| | Millions of U.S. dollars | Per cent of operating revenue | Millions of U.S. dollars | Per cent of operating revenue | Millions of U.S. dollars | Per cent of operating revenue | Millions of U.S. dollars | Per cent of operating revenue |
| 1978 | 3 100 | 5.3 | 2 412 | 4.1 | 1 085 | 3.3 | 668 | 2.0 |
| 1979 | 736 | 1.0 | 588 | 0.8 | 478 | 1.2 | 280 | 0.7 |
| 1980 | -635 | -0.7 | -919 | -1.0 | -1 221 | -2.4 | -1 696 | -3.4 |
| 1981 | -692 | -0.7 | -1 150 | -1.2 | -959 | -1.9 | -1 565 | -3.0 |
| 1982 | -160 | -0.2 | -1 300 | -1.4 | 290 | 0.6 | -756 | -1.5 |
| 1983 | 2 100 | 2.1 | -700 | -0.7 | 1 872 | 3.5 | -414 | -0.8 |
| 1984 | 5 100 | 4.8 | 2 000 | 1.9 | 2 875 | 5.2 | 1 169 | 2.1 |
| 1985 | 4 100 | 3.7 | 2 100 | 1.9 | 2 400 | 4.0 | 1 250 | 2.1 |
| 1986 | 4 600 | 3.7 | 1 500 | 1.2 | 2 780 | 4.1 | 1 300 | 1.9 |
| 1987 | 7 200 | 4.9 | 2 500 | 1.7 | 5 950 | 7.1 | 2 700 | 3.2 |
| 1988 ¹ | 9 500 | 5.7 | - | - | - | - | - | - |

1. 1988 data are preliminary.

Source:
Appendices 12 and 13.

while the unit cost rose from 31.8 cents per tonne-kilometre available in 1978 to 45.2 cents in 1987, or by 4.0 per cent annually. Concurrently, traffic increased at the rate of 7.3 per cent and capacity by 6.1 per cent per annum.

Annual variations

5. The over-all trends cited in the foregoing paragraphs were not constant throughout the period. For international and domestic services combined (see Figure 4-1 and Appendix 12), total operating revenues per tonne-kilometre performed and expenses per tonne-kilometre available each showed marked year-to-year variations. The highest annual percentage growth rate in expenses per tonne-kilometre available was recorded in 1980 (18 per cent) mainly due to the second fuel crisis, with a slight decrease in 1982 through 1984 and then a moderate increase from 1985 to 1988.

6. As shown in Table 4-2 and Appendix 12, for total domestic and international services of the scheduled airlines, operating results expressed as a percentage of revenues fluctuated from highs of more than 5 per cent in 1978 and 1988 to lows of less than 1 per cent in 1980, 1981 and 1982. Net results after taxes fluctuated between profits of 4.1 per cent in 1978 and losses of -1.4 per cent in 1982.

7. The same pattern of variations for international services only is evident in Table 4-2 and Appendix 13. Operating and net results expressed as percentages of operating revenues were considerably lower between 1979 and 1983 and higher between 1984 and 1987. Operating results varied between 7.1 and -2.4 per cent, and net results between 3.2 and -3.4 per cent.

Level and Distribution of Revenue and Expense Items

8. The levels of individual expense and revenue items expressed in cents per tonne-kilometre performed and tonne-kilometre available are given in Appendices 12 and 13. For the world's domestic and international services combined, unit passenger, freight and mail revenues per tonne-kilometre performed developed at similar rates of increase of about 4 per cent per annum during the past ten years. The yields from non-scheduled services increased at an average annual rate of 6 per cent throughout the 1978-1988 period. In terms of shares of total revenues, passenger revenues declined from 79.3 per cent in 1978 to 75.8 per cent in 1988, freight revenues and mail and non-scheduled revenues remained at about 11 and 5 per cent respectively, while incidental revenues increased from 4.5 per cent in 1978 to 7.5 per cent in 1988. Revenue shares for international scheduled passenger services only dropped from 71.1 per cent in 1978 to 68.9 per cent in 1987 while those of non-scheduled services and incidental revenue grew (Table 4-3).

9. Among airline operating expenses, the most significant increase between 1978 and 1988 was attributable to "general, administrative and other expenses" which rose at an average annual rate of 14.5 per cent compared to only 8.3 per cent for "aircraft fuel and oil". As a result, this item increased from 6.4 per cent of total operating expenses in 1978 to 8.9 per cent in 1988 while "aircraft fuel and oil" decreased from 18.4 per cent in 1978 to 14.5 per cent in 1988. "Ticketing, sales and promotion" also increased its share from 15.5 per cent in 1978 to 17.6 per cent in 1988 while the costs of "user charges and station expenses" and "passenger services" were about the same as in 1978. The proportion of direct aircraft operating expenses dropped and that of indirect operating expenses increased from 1978 to 1987 (Table 4-3).

10. Figure 4-2 compares the development in fares, passenger revenues and passenger costs expressed in terms of U.S. cents per passenger-kilometre between 1978 and 1987. The figures shown for average passenger operating revenue represent the over-all weighted average for all fare types that apply on each individual route, whereas the fare level figures refer only to the applicable normal economy class fare. Despite this difference in definition the figures show a similarity between the trend of the normal economy fare level and that of the average passenger revenue.

Table 4-3. Percentage distribution of operating revenues and expenses in 1978 and 1987

| Description | All services | | International only | |
|---|--------------|-------|--------------------|-------|
| | 1978 | 1987 | 1978 | 1987 |
| <i>Operating revenues</i> | | | | |
| Scheduled services | | | | |
| Passenger | 79.3 | 76.1 | 71.1 | 68.9 |
| Cargo | 11.0 | 11.9 | 14.1 | 13.4 |
| Mail | 1.7 | 1.3 | 1.8 | 1.4 |
| Sub-total | 92.0 | 89.3 | 87.0 | 83.7 |
| Non-scheduled | 3.5 | 3.7 | 5.8 | 7.2 |
| Incidental | 4.5 | 7.0 | 7.2 | 9.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |
| <i>Operating expenses</i> | | | | |
| Direct aircraft | | | | |
| Flight operations | 30.0 | 26.3 | 27.9 | 24.4 |
| Flight crew | 8.5 | 6.8 | 6.5 | 5.6 |
| Fuel and oil | 18.4 | 14.8 | 16.8 | 14.1 |
| Other | 3.1 | 4.7 | 4.6 | 4.7 |
| Maintenance and overhaul | 12.3 | 11.4 | 11.9 | 11.4 |
| Depreciation and amortization | 7.9 | 7.9 | 8.0 | 7.8 |
| Sub-total | 50.2 | 45.6 | 47.8 | 43.6 |
| Indirect | | | | |
| User charges and station expenses | | | | |
| Total | 17.8 | 17.7 | 17.3 | 16.5 |
| Landing and associated airport charges | 4.0 | 3.7 | 5.0 | 4.3 |
| En-route facility charges | 1.2 | 1.5 | 1.7 | 2.1 |
| Station expenses | 12.7 | 12.5 | 10.6 | 10.1 |
| Passenger services | 10.1 | 10.4 | 10.1 | 11.1 |
| Ticketing, sales, promotion | 15.5 | 17.5 | 17.1 | 19.3 |
| General and administrative and other operating expenses | 6.4 | 8.8 | 7.7 | 9.5 |
| Sub-total | 49.8 | 54.4 | 52.2 | 56.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |
| <i>Source:</i> | | | | |
| Appendices 12 and 13. | | | | |

11. Figure 4-2 also shows that in most instances passenger revenues failed to cover passenger costs. The significant increase in costs between 1978 and 1980 must be attributed to a large extent to the rise in fuel prices. However, a contributing factor which helped to magnify the increase in costs (and fares) was the decrease in the value of the U.S. dollar in relation to the other major world currencies. The latter is also a significant factor in the increase in costs shown for the last two years (1985 to 1987) when fuel prices were actually declining.

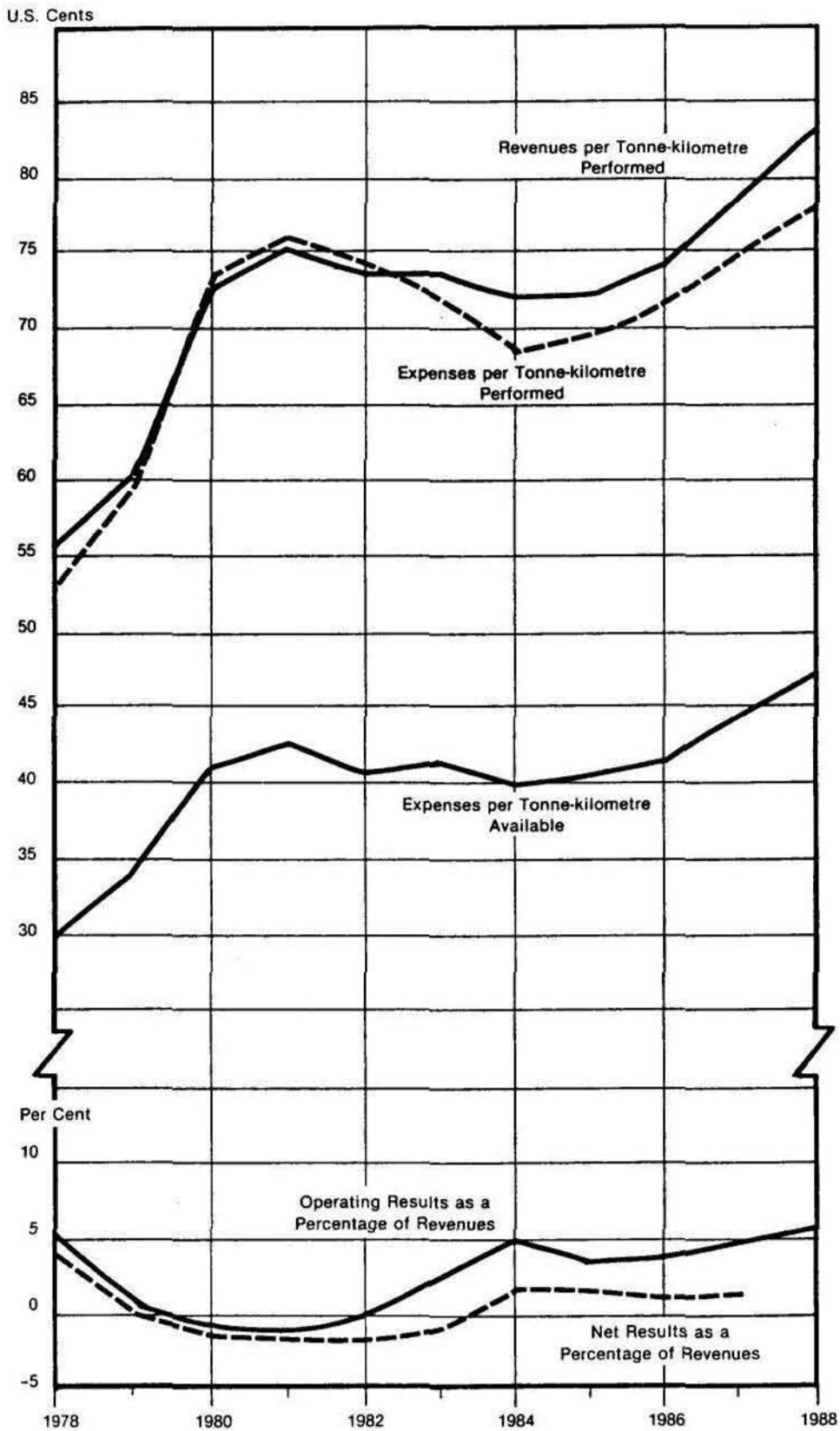


Figure 4-1. Financial data for scheduled airlines (1978-1988)

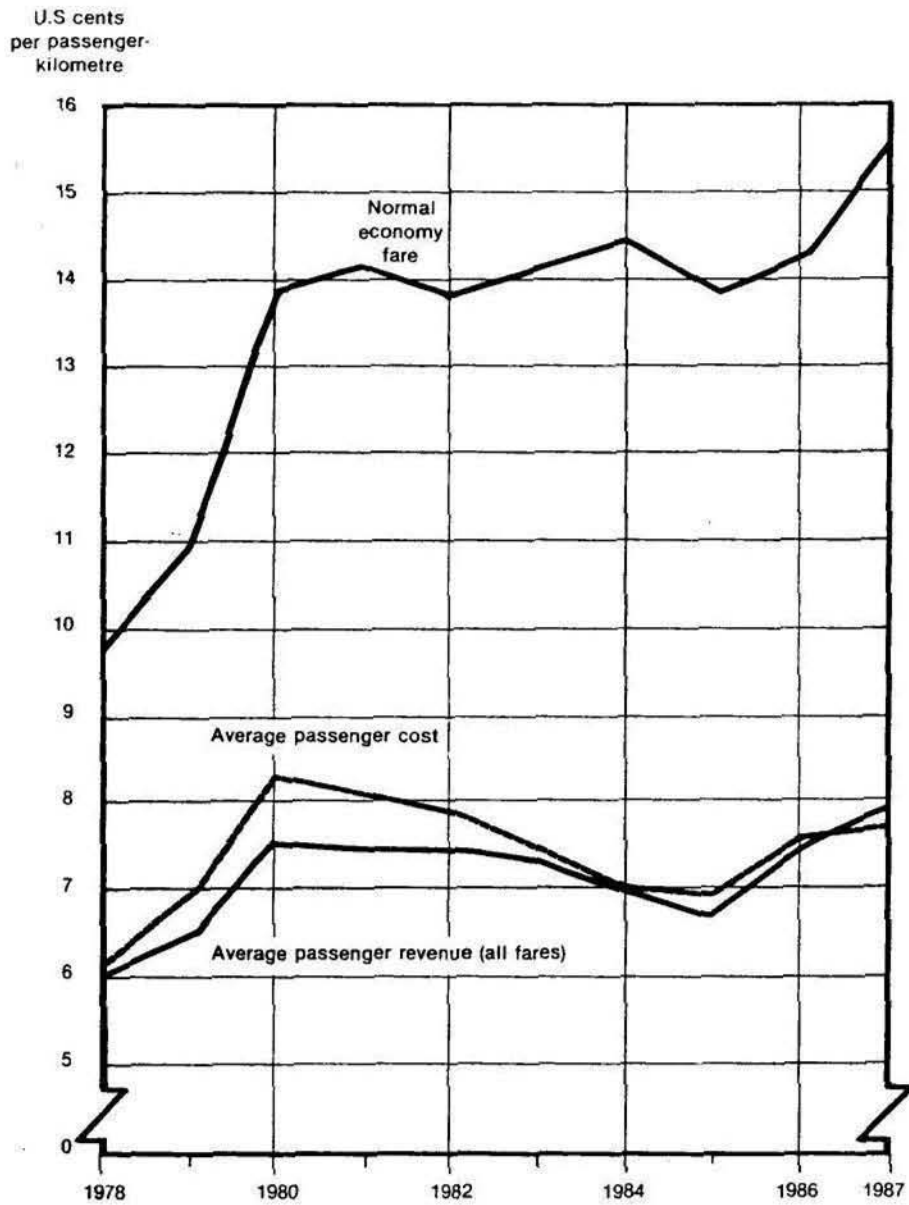


Figure 4-2. Passenger fares, revenues and costs (scheduled international passenger service — 1978-1987)

Regional trends in airline revenues and expenses

12. Estimates of the distribution of total operating revenues and expenses according to the region of airline registration are given in Table 4-4 for 1978 and 1987 together with the corresponding operating results. In 1987 about 40 per cent of operating revenues and expenses of the world's airlines were attributable to the North American airlines, 29 per cent to the European airlines, 19 per cent to the airlines of Asia and the Pacific, with the remaining 12 per cent divided about equally among those of Africa, the Middle East and Latin America/ Caribbean. Compared to 1978 the 1987 shares of operating revenues and expenses of the airlines of Asia/Pacific and the Middle East together represented a gain of about 4 percentage points of the world total, while those of the European and Latin America/Caribbean carriers declined proportionately. The shares of the African and North American airlines were virtually unchanged. Over the period 1978-1987 the operating results (expressed as a percentage of operating revenues) for the airlines in Europe and the Middle East were both up by 2.8 percentage points and those of the airlines of Asia and the Pacific by 1.7 percentage points. Those of the airlines of Africa, Latin America/Caribbean and North America dropped by 8.9, 6.6, and 2.5 percentage points respectively.

Table 4-4. Regional distribution of total operating revenues and expenses in 1978 and 1987¹

| Region of airline registration | Year | Operating revenues | | Operating expenses | | Operating result | | |
|--------------------------------|------|---------------------|-------------------|---------------------|-------------------|---------------------|-------------------|--------------------------------|
| | | Millions of U.S. \$ | Per cent of World | Millions of U.S. \$ | Per cent of World | Millions of U.S. \$ | Per cent of World | Per cent of operating revenues |
| Africa | 1978 | 1 926 | 3.3 | 1 831 | 3.3 | 95 | 3.1 | 4.9 |
| | 1987 | 5 000 | 3.4 | 5 200 | 3.7 | -200 | -2.8 | -4.0 |
| Asia and Pacific | 1978 | 9 210 | 15.7 | 8 682 | 15.6 | 528 | 17.0 | 5.7 |
| | 1987 | 28 300 | 19.3 | 26 200 | 18.8 | 2 100 | 29.2 | 7.4 |
| Europe ² | 1978 | 18 276 | 31.1 | 17 715 | 31.8 | 561 | 18.1 | 3.1 |
| | 1987 | 42 400 | 28.8 | 39 900 | 28.5 | 2 500 | 34.7 | 5.9 |
| Middle East | 1978 | 1 909 | 3.2 | 1 929 | 3.5 | -20 | -0.6 | -1.0 |
| | 1987 | 5 600 | 3.8 | 5 500 | 3.9 | 100 | 1.4 | 1.8 |
| North America | 1978 | 24 071 | 41.0 | 22 408 | 40.2 | 1 663 | 53.6 | 6.9 |
| | 1987 | 59 100 | 40.2 | 56 500 | 40.4 | 2 600 | 36.1 | 4.4 |
| Latin America and Caribbean | 1978 | 3 377 | 5.7 | 3 104 | 5.6 | 273 | 8.8 | 8.1 |
| | 1987 | 6 600 | 4.5 | 6 500 | 4.7 | 100 | 1.4 | 1.5 |
| World | 1978 | 58 769 | 100.0 | 55 669 | 100.0 | 3 100 | 100.0 | 5.3 |
| | 1987 | 147 000 | 100.0 | 139 800 | 100.0 | 7 200 | 100.0 | 4.9 |

1. These estimates are based on the financial data reported to ICAO which are incomplete for some regions.

2. Excluding domestic operations within the USSR.

Source:

ICAO Digests of Statistics, Series F, Financial Data.

13. Table 4-5 compares the average passenger revenues and costs in terms of U.S. cents per passenger-kilometre for major route groups as well as their revenue/cost ratio for the years 1978 and 1987. Part of the difference in the cost levels shown in the table for the various route groups is inherent in the type of operations they cover. Hence the relative difference between the operating costs shown for Europe and those for routes across the Pacific is in part due to the longer haul sectors and larger aircraft operated on the latter.

Balance sheet

14. The assets and liabilities of the world airlines shown in Appendix 14 more than tripled from \$57 543 million in 1978 to \$178 000 million in 1988, an average annual increase of 12 per cent, slightly higher than the growth in operating revenues. Current assets and flight equipment made up about 80 per cent of total assets of which equipment alone accounted for about 50 per cent. Special funds and deferred charges showed the highest growth (about 25 per cent annually) though they accounted for only 4 per cent of total assets. Current liabilities and long-term debt made up about 60 per cent of total liabilities. Operating reserves showed the most growth (23 per cent per year) during the decade, but accounted for only 2 per cent of the total liabilities in 1988.

15. The current ratio of the industry balance sheet, a measure of the ability to meet current obligations, fell from 1.10 in 1978 to 0.83 in 1981, but increased to 0.98 in 1988. The debt-equity ratio followed the same pattern, increasing from 1.41 in 1978 to 2.49 in 1982 and then decreasing considerably to 1.59 in 1988.

Table 4-5. Revenues and costs of international scheduled passenger services by route group (1978 and 1987)

| Route group | U.S. cents per passenger-km | | | | Revenue/cost Ratio ¹ | |
|--|-----------------------------|------|-----------------|------|---------------------------------|------|
| | Passenger revenues | | Passenger costs | | 1978 | 1987 |
| | 1978 | 1987 | 1978 | 1987 | | |
| Within the Americas | 5.4 | 7.1 | 5.2 | 7.6 | 1.05 | 0.95 |
| Within Europe ² | 10.9 | 17.5 | 9.6 | 15.8 | 1.15 | 1.10 |
| Transatlantic | 4.6 | 6.1 | 5.0 | 6.3 | 0.90 | 0.95 |
| Within Asia/Pacific | 6.5 | 8.2 | 6.2 | 7.3 | 1.05 | 1.10 |
| Between Europe/Middle East/Africa and Asia/Pacific | 5.2 | 6.3 | 5.8 | 6.3 | 0.90 | 1.00 |
| Transpacific | 4.7 | 5.9 | 4.7 | 6.0 | 1.00 | 1.00 |
| Other routes | 8.0 | 9.6 | 7.5 | 9.4 | 1.05 | 1.00 |
| World | 6.0 | 7.8 | 6.0 | 7.7 | 1.01 | 1.01 |

1. Rounded to the nearest twentieth for individual route groups.

2. In this context Europe includes Algeria, Morocco and Tunisia.

Source:

ICAO annual Circulars on Regional Differences in Fares, Rates & Costs for International Air Transport.

Financial Productivity

16. The development of productivity, viewed in financial terms, may be seen by a year to year comparison of operating revenues earned per dollar of assets (Appendices 12 and 14). This ratio, which was 1.02 in 1978, increased favourably to 1.07 in 1981, but declined to 0.93 in 1988.

17. Appendix 15 presents data on flight crew productivity and costs for international scheduled airlines for the years 1978 to 1987. Throughout this period the number of flight crew members needed for every 1 000 aircraft hours varied from 7.40 in 1978 to 7.72 in 1982 and down to 6.22 in 1988. Between 1978 and 1982 crew costs per hour flown increased at an average annual rate of 3.4 per cent (from \$345 to \$481) whereas crew costs per tonne-kilometre available grew from 2.6 cents in 1978 to 3.0 cents in 1987, a much lower average annual rate of 1.4 per cent due to increases in average aircraft capacity and speed.

18. In Appendix 16, some examples are given of productivity changes from 1978 to 1988 in terms of tonne-kilometres of capacity produced per employee and per dollar of remuneration for 17 major international airlines from the six ICAO regions. Average remuneration per employee, for example, varied greatly among airlines from about \$2 146 to \$32 210 in 1978 and from \$3 806 to \$77 024 in 1988. Average tonne-kilometres of capacity per employee varied from 45 000 to 332 000 in 1978 and from 64 000 to 515 000 in 1988. In both 1978 and 1988 airlines with higher average remuneration tended to achieve greater productivity. The differences in terms of tonne-kilometres of capacity produced per dollar of remuneration varied from 6 to 93 in 1978 and from 6 to 41 in 1988. By this measure productivity appears to be inversely related to the level of remuneration. It should be borne in mind that the employment and salary data for different airlines are not provided on a completely uniform basis.

Chapter 5

FORECASTS OF AIR CARRIER TRAFFIC TO THE YEAR 2000

1. Over the ten years 1978-1988 world scheduled air traffic measured in terms of passenger-kilometres performed (PKP) grew at an average annual rate of about 6.0 per cent per annum. This chapter examines the prospects for future growth of passenger and freight traffic in light of likely developments in world economic growth, costs and other factors expected to affect air transport activity. The forecasts are presented on a global and regional basis but no predictions of the volume of traffic on particular routes, and at particular airports, are attempted because these would require extensive individual examination as well as analysis of network factors.

Summary of Main Trends

2. Passenger traffic trends observed over the past decade and expected during the period 1988-2000 are illustrated in Figure 5-1. Total world passenger-kilometres flown on scheduled services are expected to grow at an average annual rate of about 6.0 per cent over the 1988 to 2000 period. This is considered to be the "most likely" rate, with a "low" rate of 4.0 per cent per annum and a "high" rate of 8.0 per cent per annum outlining a range of future growth prospects. International scheduled traffic is expected to grow at an average rate of 7.0 per cent per annum and domestic scheduled traffic at a lower rate of 5.5 per cent. Growth in terms of numbers of passengers carried is expected to be about 1.0 percentage point lower than growth in passenger-kilometres.

3. Freight traffic trends, past and future, are illustrated in Figure 5-2. World scheduled freight traffic, measured in tonne-kilometres performed (TKP), is projected to grow at a "most likely" rate of 7.0 per cent per annum with "low" and "high" rates of 5.0 and 9.0 per cent per annum, respectively. For the international and domestic components, the "most likely" rates are 8.5 and 3.0 per cent per annum, respectively. Freight growth in terms of numbers of tonnes carried is expected to be about 2.5 percentage points lower than growth in tonne-kilometres.

External Factors Affecting Traffic Growth

4. Many factors influence the level and structure of demand for air transport. Some of these are external to aviation such as general economic activity, international trade, exchange rates and tourism.

Economic outlook

5. The long-term demand for air transport is primarily determined by the economic developments in the world. Developments in personal income affect the level of consumer purchasing power and the propensity to undertake leisure travel. Business activity and trade have a direct impact on business travel and air freight traffic. Between 1960 and 1973, the world economy grew at an average annual rate of about 5.0 per cent in real terms, and air traffic at about 13.0 per cent. Between 1973 and 1988, world economic growth averaged 2.8 per cent per annum in real terms and air traffic growth averaged 7.0 per cent per annum.

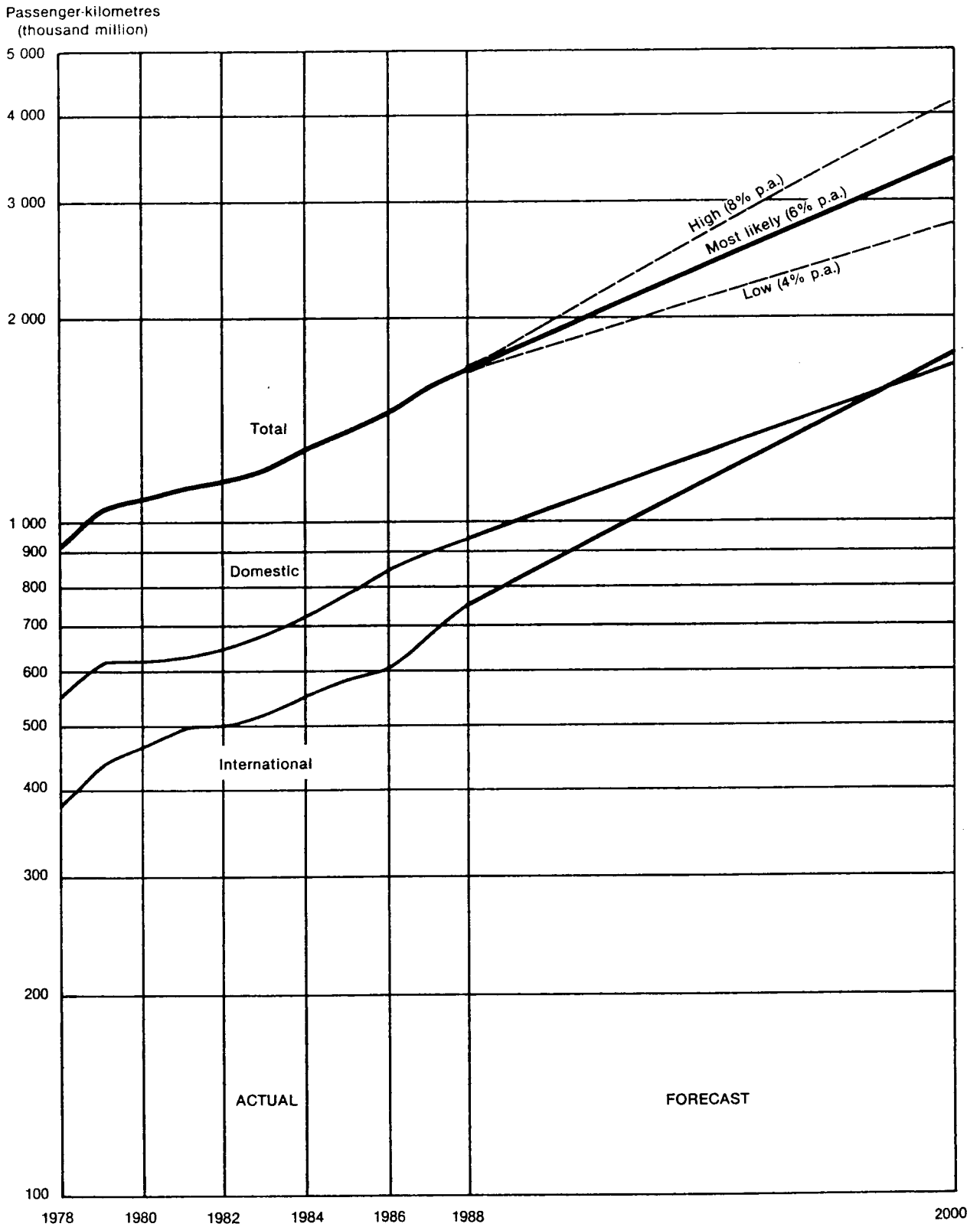


Figure 5-1. Trends in world scheduled passenger traffic (ICAO Contracting States)

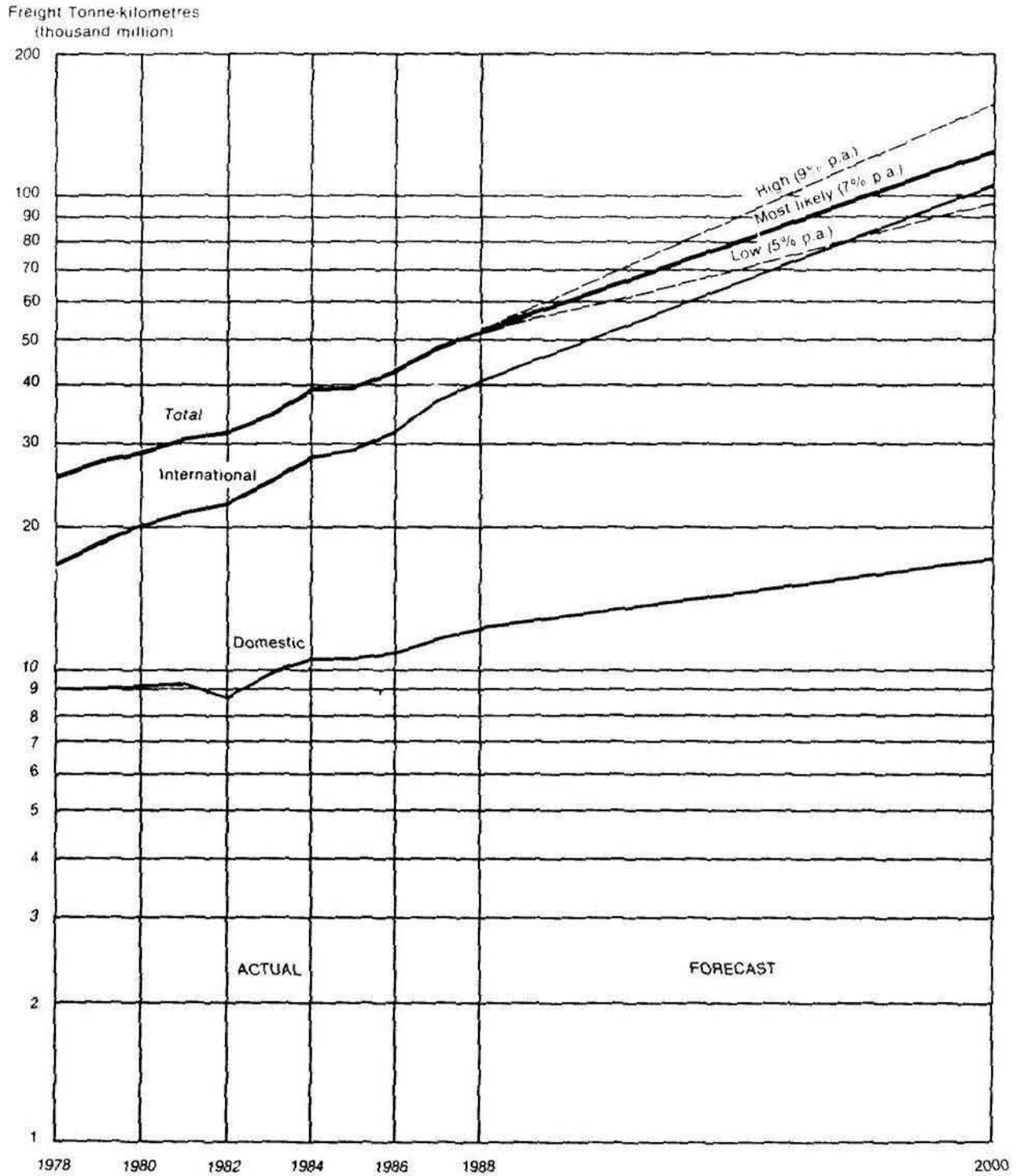


Figure 5-2. Trends in world scheduled freight traffic
(ICAO Contracting States)

The link between economic growth and air transport demand observed over the longer term is also apparent in shorter-term cyclical movements. Figure 5-3 illustrates the fluctuations in the rate of development of air traffic and in the rate of economic growth for the period 1973-1988. Also shown in Figure 5-3 are the movements in crude oil prices, in real terms. The link between the oil price increases in 1973-1974 and 1979-1980 and the two world-wide economic recessions during this period, and the 1982-1988 gradual decline in oil prices and the corresponding economic growth are clearly illustrated. Crude oil prices have influenced air transport through their influence on general economic growth and, more directly, air transport costs.

6. The aggregate world economy sustained momentum in 1988 by growing at approximately 3.2 per cent in real terms, the sixth consecutive year of expansion. This strong growth was attained primarily by strong economic activity in the Asia/Pacific region and in North America where economic growth of 5.0 per cent and 3.3 per cent, respectively, were experienced in spite of the October 1987 stock market decline.

7. The International Monetary Fund (IMF) expects a growth of approximately 4.0 per cent for developing countries and about 2.8 per cent for major industrialized countries respectively in 1989, and a 3.1 per cent average for the world. Growth performance, however, is expected to vary considerably among countries, with the heavily indebted and the fuel exporting countries experiencing the lowest growth rates. Table 5-1 summarizes the World Bank economic growth prospects over the 1986-1995 period as well as economic growth for the world as a whole, developed by ICAO for the period 1988-2000 to reflect the IMF and World Bank projections. In this study, the "most likely" forecasts of traffic growth are based on a rate of world economic growth of 2.8 per cent per annum in real terms over the forecast period.

International trade

8. The level of trade, which affects business travel and air freight traffic, is closely associated with the level of economic activity, although international trade has tended to grow more rapidly than Gross Domestic Product (GDP) in real terms. This is particularly true of trade in manufactured goods and other products suitable for shipment by air. The value of the world international merchandise trade in real terms

**Table 5-1. Growth of real gross domestic product GDP, 1973-1995
(average annual growth rates, per cent)**

| | Actual | | Forecast | | |
|--------------------------|-----------|-----------|-----------|------|-----|
| | 1973-1980 | 1980-1986 | 1986-1995 | | |
| | | | High | Low | |
| Developing countries | 5.4 | 3.6 | 5.9 | 3.9 | |
| Industrialized countries | 2.8 | 2.3 | 4.3 | 2.5 | |
| Middle income countries | 5.7 | 2.0 | 5.4 | 3.6 | |
| Oil exporters | 6.0 | 0.8 | 4.4 | 3.6 | |
| | | | 1988-2000 | | |
| | | | High | Base | Low |
| Total world* | | | 3.9 | 2.8 | 1.7 |

* ICAO estimate based on World Bank data.

Source:

The World Bank "World Development Report, 1987".

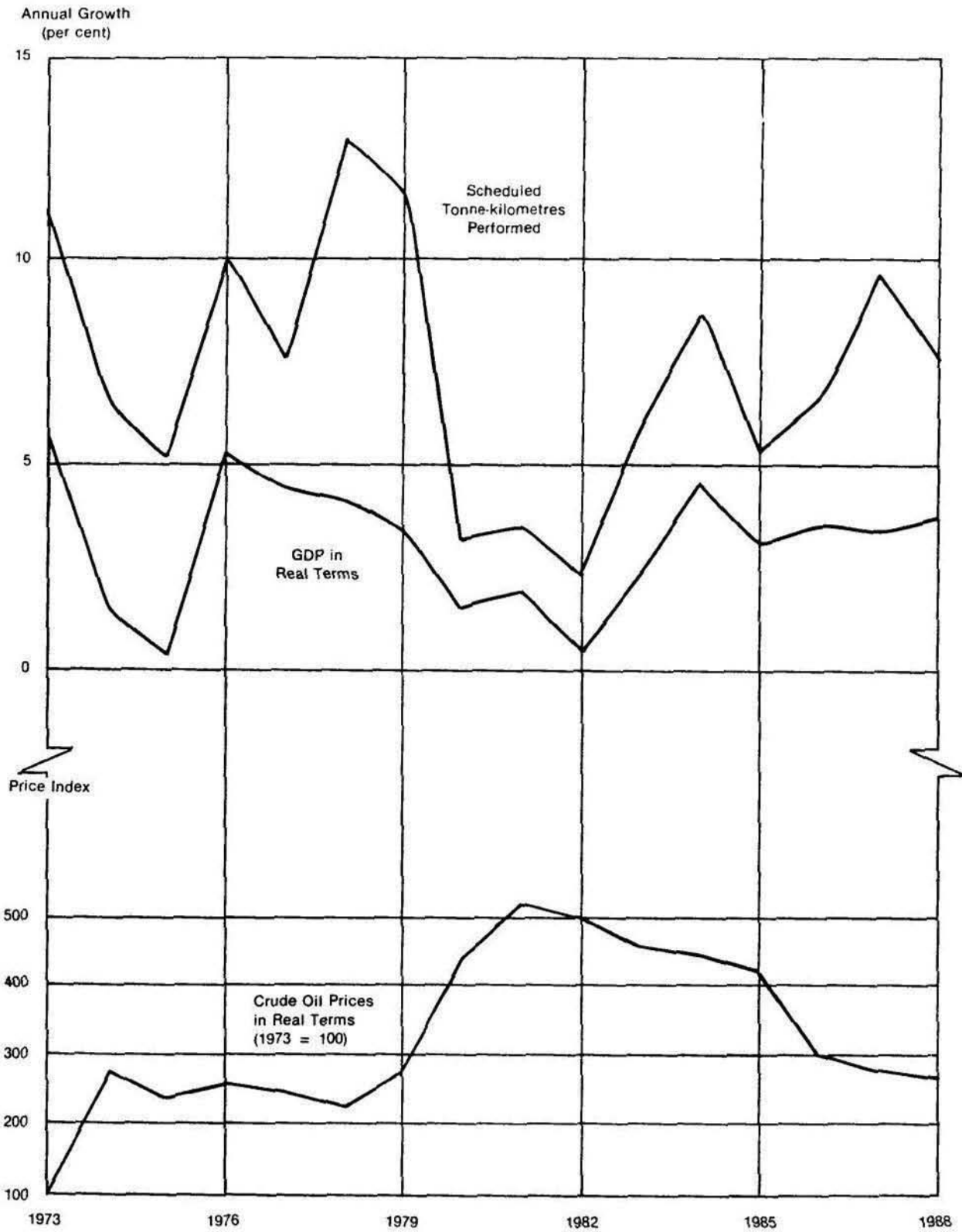


Figure 5-3. Annual growth in world GDP and world air traffic and trend in oil prices

grew at an average annual rate of about 7.0 per cent between 1960 and 1975 and about 3.8 per cent between 1975 and 1988. World scheduled air freight traffic grew at about 15.3 per cent and 8.5 per cent per annum over the same two periods. For the purposes of this study, an average annual rate of growth of about 4.5 per cent over the period 1988 to 2000 is assumed. This rate is approximately 1.7 per cent above the growth rate established for GDP.

Tourism

9. An important element of air passenger traffic is travel for leisure and other personal reasons. The demand for such travel, which is closely related to disposable income, has tended to grow at a faster rate than over-all economic activity and governments generally as well as the travel industry have actively promoted this demand through tourism policy and provision of appropriate infrastructure and travel arrangements. It may be expected that with continued economic growth and tourism promotion the demand for air travel for personal reasons will continue to increase at a comparatively fast rate.

Industry Factors Affecting Traffic Growth

10. Industry factors, including airline operating costs, capacity utilization and regulatory policies, also influence the demand for air transport through the price, quantity and quality of air services provided.

Fares and rates

11. Historically the air transport industry has been able to reduce fares and rates, measured in real terms, and this has contributed to traffic growth. Over the 1978-1988 period revenue yield per tonne-kilometre performed, which is an approximate measure of average fare and rate levels, declined at an average annual rate of about 7.5 per cent in real terms. Reduced unit operating costs and increased load factors have been contributory factors to the decline in yields over the period, as illustrated in Figure 5-4.

Airline costs

12. Measured in real terms, total operating costs per available tonne-kilometre for the world scheduled airlines are estimated to have declined by about 6.7 per cent per annum between 1978 and 1988. Although unit costs rose sharply in 1974 and again in 1979 and 1980 (see Figure 5-4) mainly due to the rises in the price of oil, increased efficiency resulting mainly from the progressive replacement of older aircraft with larger more efficient aircraft assured a decrease in unit costs over the period as a whole. The decline in oil prices during the 1982-1985 period and relative price stability during the last three years (1986-1988) contributed significantly towards the decrease in unit cost during this period.

13. Airline equipment programmes, covering replacement and expansion, are influenced by the need to meet anticipated growth in demand in the most efficient and competitive manner, and to take advantage, where possible, of economies offered by new aviation technology. Numerous airframe and engine developments are presently occurring over a wide range of aircraft payload/range categories. The introduction into airline service of several types of new fuel-efficient aircraft in the 180-230 seat range is of particular significance for the trend in unit costs over the forecast period. Improved airline financial results should accompany a sustained recovery in the general economy and in air traffic demand, making possible continued injection of renewed ordering of new equipment. The magnitude of the improvements in cost efficiency resulting from fleet developments, however, may be less than in the past due to the high capital cost of the new aircraft.

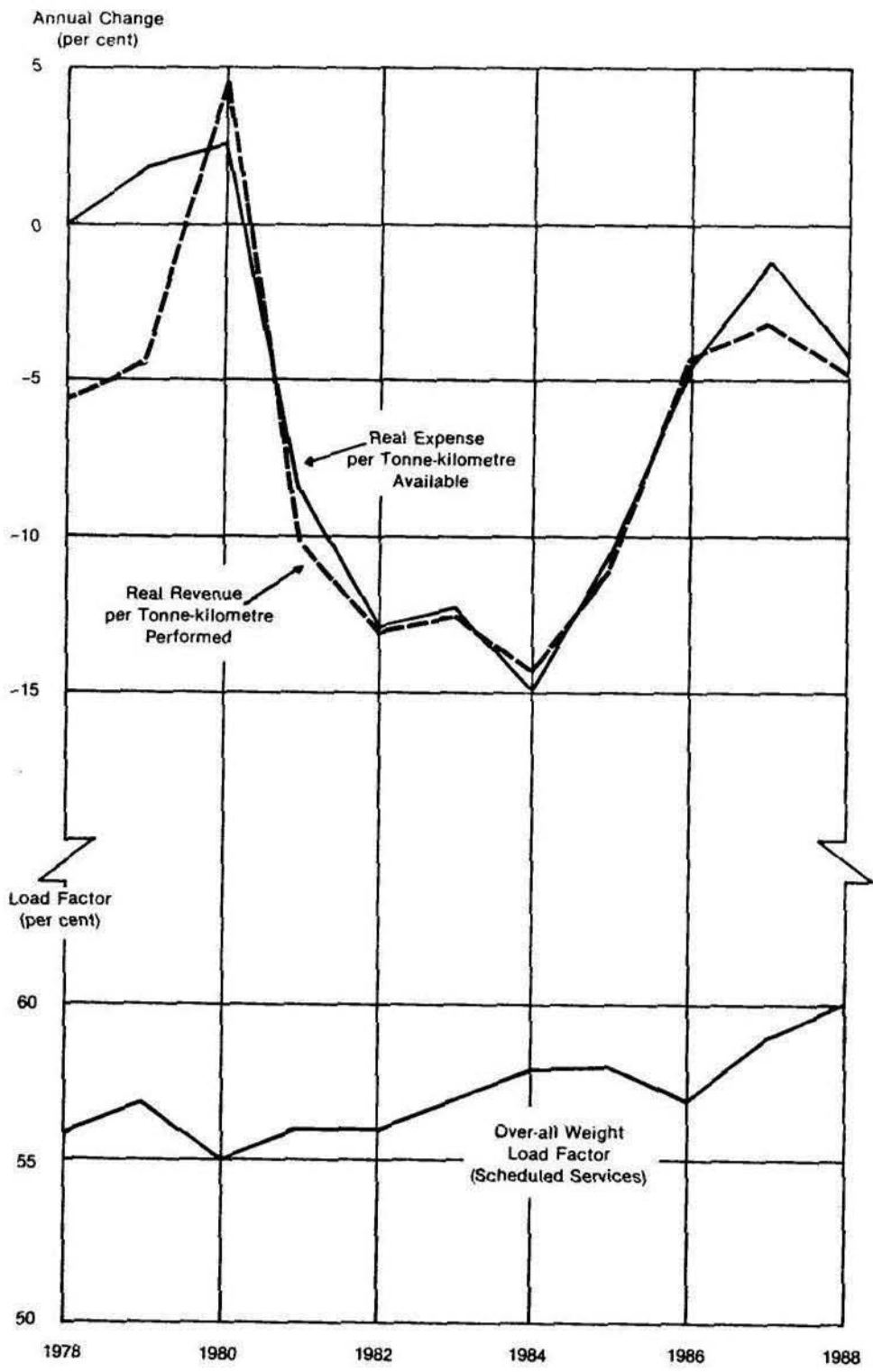


Figure 5-4. Trend in load factor and annual changes in real yield and unit cost for all scheduled airlines

14. During the periods 1973-1974 and 1979-1981, large increases in fuel prices have seriously affected airline costs, with fuel accounting for about 25-30 per cent of total operating costs. In 1987 fuel accounted for approximately 15.0 per cent of total operating costs. However, after gradual declines during the period 1982-1985, oil prices declined in late 1985 by about a third and price stability was maintained during the 1986-1988 period. The broader economic implications of this oil price fall have been generally good for air transportation, and have resulted in an over-all operating cost reduction. Although the long term outlook for fuel prices is not clear, prevailing industry expectations are for moderate increases in current terms during the forecast period which will have a relatively small impact on real operating costs.

Load factors

15. During the late 1970s and in the 1980s improved load factors made possible a more rapid decline in average fares and rates, in real terms, than the decline in unit costs. This was particularly true between 1976 and 1979 and again between 1982 and 1985, as illustrated in Figure 5-4. An increase in passenger load factors of approximately 3 percentage points was achieved over the period 1978 to 1988. The wider availability of low promotional fares, together with improved load control, have been major factors contributing to this development. However with the average passenger load factor on all scheduled services currently at about 68 per cent, the scope for further improvements appears limited. Consequently, although the use of promotional fares may be expected to continue, their impact may be less than during the 1970s through the mid-1980s.

Price competition

16. During the period 1980-1982, the world airline industry as a whole incurred substantial operating losses, partly a result of vigorous price competition during a period of sluggish demand and excess capacity. Yield increases lagged costs during periods of rising fuel prices. This trend has reversed as demand recovered during the 1983-1988 period with the general upturn of economic activities and productivity increases as well as stability achieved in fuel prices. Taking into account the various cost and demand factors affecting the future price of passenger and freight transport, it is assumed that fares and rates will decline at an average annual rate of about 1.0 per cent, in real terms, during the period 1988-2000.

Availability of airline services

17. After a long period of expansion of international scheduled services through the addition of new routes and increased service frequencies, there was a slowdown in the number of aircraft departures and aircraft-kilometres flown in 1981 and 1982 because of low growth in demand and poor financial results. During the period 1983-1988, both the number of aircraft kilometres flown and aircraft departures again increased significantly as demand resumed its growth. In addition to being a response to improved traffic and profitability, service improvements should themselves stimulate demand.

Factors affecting air freight

18. In addition to the external and internal factors mentioned above, air freight growth will be influenced by increased containerization, improved inter-modal co-ordination, more liberal service patterns and marketing developments. The increasing use of wide-body aircraft for passenger services has created extra capacity for freight on these services as well as a greater ability to carry larger shipments with greater frequency. It is assumed that the impact of these various factors will continue.

Air Traffic Forecasts by Other Organizations

19. Some recent long-term forecasts by major airframe manufacturers of growth in world scheduled traffic, international and domestic combined, are given in Table 5-2. These forecast growth rates are in the range of 5.2 to 5.9 per cent per annum for passenger traffic with freight traffic generally forecast to grow at a slightly higher rate.

20. Separate forecasts for the number of passengers and freight tonnes carried on international routes by member airlines are regularly prepared by the International Air Transport Association (IATA), the most recent covering the 1988-1992 period. These indicate an average growth of 6.7 per cent per annum for international passengers and 7.7 per cent per annum for international freight tonnes.

Forecasting Methodology

21. As a basis for the preparation of the traffic forecasts for this study, econometric analyses were carried out of the effects of underlying factors on the historic aggregate demands for scheduled passenger and freight traffic. These analyses were used to translate expectations of future world economic development and future trends in international trade and average fares into projections of future traffic demand. The projected traffic growth rates were then reviewed in light of the results of other forecasts, and prospective changes in other factors which could not be accommodated in the econometric analysis.

22. More detailed projections for international and domestic scheduled traffic for the airlines of each geographical region were initially developed from the forecasts of total scheduled traffic by analyzing historic traffic trends and market shares of the individual geographical region. These projections were then calibrated in light of recent ICAO regional traffic forecasts, national traffic forecasts and other relevant information affecting the traffic prospects of airlines in each of the regions.

23. The procedures described above relate to traffic forecasts in terms of passenger-kilometres performed and freight tonne-kilometres performed. In addition, forecasts of the numbers of passengers carried and freight tonnes carried were prepared for total scheduled international and domestic services. These were derived from the forecasts of passenger-kilometres and tonne-kilometres on the basis of expectations of future trends in the average length of haul for the various types of services in different geographical regions.

**Table 5-2. Available forecasts of world scheduled traffic growth
(average annual growth rates, per cent)**

| Source of forecast | Forecast period | Pass-km | Freight tonne-km |
|--------------------|-----------------|---------|------------------|
| Airbus Industrie | 1986-1996 | 5.7 | 6.7 |
| | 1996-2006 | 5.3 | - |
| Boeing | 1987-2000 | 5.9 | 6.0 |
| McDonnell Douglas | 1987-2002 | 5.7 | 6.0 |

Note:— These forecasts exclude USSR traffic. The Airbus and Boeing passenger forecasts include all scheduled services and the McDonnell Douglas passenger forecast includes both scheduled and non-scheduled traffic.

Sources:

- Airbus Industrie, Global Market Forecast, November 1987;
- Boeing Commercial Airplane Company, Current Market Outlook, February 1989; World Air Cargo Forecast, June 1988;
- McDonnell Douglas Corporation, Outlook for Commercial Aircraft 1988-2002, February 1989.

Main Assumptions

24. The following are the main assumptions concerning trends over the next decade in the factors which underly traffic growth:

- a) a "most likely" average rate of world economic growth of 2.8 per cent per annum (in real terms);
- b) moderate growth in world trade of about 4.5 per cent per annum;
- c) a "most likely" decline of 1.0 per cent per annum (in real terms) in average fares and rates for the world as a whole; and
- d) availability of adequate capital resources for the development of aviation and tourist infrastructure.

Results of the econometric analysis

25. Several econometric models were developed on the basis of historic data both for scheduled passenger travel demand and freight traffic demand for total world traffic and for geographical regions. Appendix 17 depicts the econometric models developed for total world scheduled passenger-kilometres performed (PKPs) and total world freight tonne-kilometres (FTKs). The first model provided estimates of the effect on scheduled passenger travel of changes in world GDP and average passenger fare levels (both in real terms), and the second provided estimates of the effect on scheduled freight transport of changes in world exports and average freight rate levels (in real terms).

26. Applying the above assumptions for the future to these models resulted in future growth rates for world scheduled traffic (excluding USSR) of 6.5 per cent per annum for passenger-kilometres and 7.5 per cent per annum for freight tonne-kilometres. Most of this growth in traffic is attributable to growth in real GDP and exports, and impact of fares and rates for the forecast period.

Passenger Traffic Forecasts

27. The above analysis of quantifiable economic factors, and the consideration of further factors which influence developments at global or regional levels, led to a forecast growth rate for world scheduled passenger traffic during the 1988 to 2000 period of about 6.0 per cent per annum, somewhat below the rate obtained from the econometric analysis. This growth rate is considered to be the "most likely" and compares with a historic growth rate of 6.1 per cent per annum over the 1978 to 1988 period.

28. As in the past, year-to-year growth is likely to fluctuate considerably. As an indication of the sensitivity of traffic growth to alternative assumptions about economic growth and trends in unit costs, a "low" forecast of 4.0 per cent per annum results from assumptions of 2.0 per cent per annum for real economic growth and increased in real fares at 0.5 per cent per annum. A "high" forecast of 8.0 per cent per annum results from assumptions of 3.5 per cent per annum for economic growth and an average annual decline in real fares of 1.5 per cent.

29. International scheduled passenger traffic (PKP) is forecast to grow at an average rate of 7.0 per cent per annum compared with 5.0 per cent per annum for domestic scheduled passenger traffic (Table 5-3). The slower growth of domestic traffic is due to the fact that 78.0 per cent of all domestic scheduled traffic is accounted for by the already highly developed domestic systems in the United States and USSR where future growth rates are expected to be moderate.

Table 5-3. Summary of ICAO scheduled passenger traffic forecast to the year 2000 (ICAO Contracting States)

| | Actual | | Forecast | Average annual growth | |
|-----------------------------|--------------------|-------------------|----------|-----------------------|------------------------|
| | 1978 | 1988 ¹ | 2000 | 1978-1988 | 1988-2000 ² |
| | (thousand million) | | | (per cent) | |
| <i>Passenger-kilometres</i> | | | | | |
| Scheduled services | 937 | 1 696 | 3 450 | 6.1 | 6.0 |
| International | 385 | 756 | 1 740 | 7.0 | 7.0 |
| Domestic | 552 | 940 | 1 710 | 5.5 | 5.0 |
| <i>Passengers carried</i> | | | | | |
| | | (million) | | (per cent) | |
| Scheduled services | 679 | 1 072 | 1 945 | 4.7 | 5.0 |
| International | 143 | 232 | 480 | 5.0 | 6.0 |
| Domestic | 536 | 840 | 1 465 | 4.6 | 4.5 |

1. Preliminary.
2. Rounded to the nearest 0.5 percentage point.

30. Forecasts of scheduled passenger traffic in terms of numbers of passengers carried are also given in Table 5-3. Growth in passengers carried is expected to be lower than growth in passenger-kilometres because the latter includes the effect of a gradual increase in the average passenger journey distance at an annual rate of approximately 1.0 per cent. The increase in average journey length during the last decade has been more pronounced for international trips than for domestic trips.

31. The "most likely" forecasts of scheduled airline passenger traffic by region of airline registration are given in Table 5-4, together with historic figures. The airlines of the Asia/Pacific region are expected to continue to show the highest growth in passenger traffic, at 9.5 per cent per annum through to the year 2000, while the airlines of the African region are expected to show the lowest growth, at 4.0 per cent per annum. While economic growth in developed regions (3.0 per cent per annum) is expected to be lower than in developing regions (4.5 per cent per annum) and growth in the passenger traffic of European airlines is consequently forecast to be relatively low, at 4.5 per cent per annum through to the year 2000, traffic of North American airlines is expected to grow at the world average rate of 6.0 per cent per annum. The growth rates for all regions represent status quo or a moderate slowdown in comparison with historic rates.

32. The most significant changes in the regional shares of world scheduled passenger traffic (shown in Table 5-4) are expected for airlines of the Europe and Asia/Pacific regions. The European share is anticipated to decline by over 5 percentage points to 24.6 per cent of total world traffic by the year 2000, while the Asia/Pacific region is expected to increase its share of traffic by about 8 percentage points to 26.1 per cent by the year 2000 (with its share of total international scheduled passenger traffic increasing to approximately 39.1 per cent by the year 2000).

33. Non-scheduled passenger traffic, flown by both scheduled airlines and non-scheduled carriers, occurs mainly in Europe and on the North Atlantic. In recent years this traffic has fluctuated under the influence of general economic factors and competitive pressures from scheduled operations. During 1978-1988, European non-scheduled traffic increased its share of total traffic in Europe to 62 per cent, whereas non-scheduled traffic share of total North Atlantic traffic decreased from 21.6 per cent to 7.2 per cent (passengers carried). In view of various uncertainties the future growth of non-scheduled traffic is extremely uncertain and to a large degree depends upon national policies, regulatory environment, special events and other related factors.

**Table 5-4. Forecasts of scheduled passenger traffic by region
(region of airline registration, ICAO Contracting States)**

| Region | Passenger-kilometres (thousand-million) | | | Average annual growth rate (per cent) | | Regional share of world traffic (per cent) | | |
|--------------------------------|--|-------------------|------------------|---|---------------------------------|--|-------|-------|
| | Actual | | Forecast 2000 | 1978 to 1988 | 1988 to 2000 ² | 1978 | 1988 | 2000 |
| | 1978 | 1988 ¹ | | | | | | |
| Africa | 24.1 | 36.8 | 60 | 4.3 | 4.0 | 2.6 | 2.2 | 1.7 |
| International | 18.7 | 29.2 | 49 | 4.6 | 4.5 | 4.9 | 3.9 | 2.8 |
| Domestic | 5.4 | 7.6 | 11 | 3.5 | 3.0 | 1.0 | 0.8 | 0.6 |
| Asia/Pacific | 125.6 | 308.3 | 900 | 9.4 | 9.5 | 13.4 | 18.2 | 26.1 |
| International | 78.0 | 209.1 | 680 | 10.4 | 10.5 | 20.3 | 27.6 | 39.1 |
| Domestic | 47.6 | 99.2 | 220 | 7.6 | 7.0 | 8.6 | 10.6 | 12.9 |
| Europe | 321.3 | 507.9 | 850 | 4.7 | 4.5 | 34.3 | 29.9 | 24.6 |
| International | 163.3 | 260.6 | 450 | 4.8 | 4.5 | 42.4 | 34.5 | 25.9 |
| Domestic | 158.0 | 247.3 | 400 | 4.6 | 4.0 | 28.6 | 26.3 | 23.4 |
| Middle East | 25.6 | 44.4 | 85 | 5.6 | 5.5 | 2.7 | 2.6 | 2.5 |
| International | 20.7 | 36.2 | 70 | 5.8 | 5.5 | 5.4 | 4.8 | 4.0 |
| Domestic | 4.9 | 8.2 | 15 | 5.2 | 5.0 | 0.9 | 0.9 | 0.9 |
| North America | 393.1 | 718.9 | 1 415 | 6.2 | 6.0 | 42.0 | 42.4 | 41.0 |
| International | 78.2 | 175.4 | 405 | 8.4 | 7.5 | 20.3 | 23.2 | 23.3 |
| Domestic | 314.9 | 543.5 | 1 010 | 5.6 | 5.5 | 57.1 | 57.8 | 59.0 |
| Latin America and Caribbean | 46.6 | 79.4 | 140 | 5.5 | 5.0 | 5.0 | 4.7 | 4.1 |
| International | 25.9 | 45.5 | 86 | 5.8 | 5.5 | 6.7 | 6.0 | 4.9 |
| Domestic | 20.7 | 33.9 | 54 | 5.1 | 4.0 | 3.8 | 3.6 | 3.2 |
| World | 936.3 | 1 695.7 | 3 450 | 6.1 | 6.0 | 100.0 | 100.0 | 100.0 |
| International | 384.8 | 756.0 | 1 740 | 7.0 | 7.0 | 100.0 | 100.0 | 100.0 |
| Domestic | 551.5 | 939.7 | 1 710 | 5.5 | 5.0 | 100.0 | 100.0 | 100.0 |

1. Preliminary.

2. Rounded to the nearest 0.5 percentage point.

Freight Traffic Forecasts

34. The econometric analysis, together with the assumptions stated earlier, resulted in a projected future growth rate of 7.5 per cent per annum for world scheduled freight tonne-kilometres, excluding USSR traffic. Taking into consideration various factors not included in the econometric analysis, a growth in total world scheduled freight traffic of 7.0 per cent per annum is considered as the "most likely" forecast for the 1988 to 2000 period. This is slightly lower than the past rate of growth for the 1978 to 1988 period. Alternative assumptions concerning the underlying factors affecting air freight suggest a band of forecast growth rates ranging from a "low" of 5.0 per cent per annum to a "high" of 9.0 per cent.

35. The ICAO forecasts of scheduled freight traffic, in terms of both tonne-kilometres performed and tonnes uplifted or carried, are presented in Table 5-5, including forecasts for the international and domestic components. International traffic is expected to grow more rapidly than domestic traffic due partly to the relatively fast growth of international commerce. Domestic freight is dominated by the more mature markets of the United States and USSR and this is another reason for the moderate growth of total domestic freight. Freight tonnes carried are expected to grow more slowly than freight tonne-kilometres because of a continuing increase in the average length of haul.

36. The "most likely" forecasts of scheduled freight traffic by region of airline registration are presented in Table 5-6. The regional pattern of growth is rather similar to that for passenger traffic. Asia/Pacific is expected to remain the fastest growing region although its forecast rate is somewhat lower than the growth rate of the past decade. By the year 2000, freight traffic by Asia/Pacific airlines is expected to surpass both that for North American and European airlines. The economic recovery and liberalized service patterns, including door-to-door service and growing express parcel market, are expected to stimulate accelerated growth of the North American freight market.

37. On the basis of the limited data available, non-scheduled freight traffic appears to have fluctuated considerably in the past. As for non-scheduled passenger traffic, it is extremely uncertain and difficult to forecast this traffic element.

**Table 5-5. Summary of ICAO scheduled freight traffic
forecast to the year 2000
(ICAO Contracting States)**

| | Actual | | Forecast 2000 (million) | Average annual growth | |
|---------------------------------|-------------------|-------------------|-------------------------------|-----------------------|--------------------------------------|
| | 1978 (million) | 1988 ¹ | | 1978-1988 | 1988-2000 ² (per cent) |
| <i>Freight tonne-kilometres</i> | | | | | |
| Scheduled services | 25 939 | 53 610 | 124 000 | 7.5 | 7.0 |
| International | 16 934 | 41 250 | 106 800 | 9.3 | 8.5 |
| Domestic | 9 005 | 12 360 | 17 200 | 3.2 | 3.0 |
| <i>Freight tonnes carried</i> | | | | | |
| | (thousand) | | (thousand) | (per cent) | |
| Scheduled services | 10 624 | 17 374 | 30 200 | 5.0 | 4.5 |
| International | 3 845 | 7 936 | 16 700 | 7.5 | 6.5 |
| Domestic | 6 779 | 9 438 | 13 500 | 3.4 | 3.0 |

1. Preliminary.

2. Rounded to the nearest 0.5 percentage point.

**Table 5-6. Forecasts of scheduled freight traffic by region
(region of airline registration, ICAO Contracting States)**

| Region | Freight tonne-kilometres (million) | | | Average annual growth rate (per cent) | | Regional share of world traffic (per cent) | | |
|--------------------------------|---------------------------------------|-------------------|------------------|--|-------------------------|---|-------|-------|
| | Actual | | Forecast 2000 | 1978 | 1988 | 1978 | 1988 | 2000 |
| | 1978 | 1988 ¹ | | to 1988 | to 2000 ² | | | |
| Africa | 633 | 1 250 | 2 650 | 7.0 | 6.5 | 2.4 | 2.3 | 2.1 |
| International | 568 | 1 130 | 2 430 | 7.1 | 6.5 | 3.4 | 2.7 | 2.3 |
| Domestic | 65 | 120 | 220 | 6.3 | 5.0 | 0.8 | 1.0 | 1.3 |
| Asia/Pacific | 4 067 | 14 420 | 49 000 | 13.5 | 10.5 | 15.7 | 26.9 | 39.5 |
| International | 3 556 | 12 940 | 46 500 | 13.8 | 11.0 | 21.0 | 31.4 | 43.5 |
| Domestic | 511 | 1 480 | 2 500 | 11.2 | 4.5 | 5.7 | 12.0 | 14.5 |
| Europe | 9 660 | 18 080 | 36 300 | 6.5 | 6.0 | 37.2 | 33.7 | 29.3 |
| International | 7 281 | 15 280 | 32 570 | 7.7 | 6.5 | 43.0 | 37.0 | 30.5 |
| Domestic | 2 379 | 2 800 | 3 730 | 1.6 | 2.5 | 26.4 | 22.6 | 21.7 |
| Middle East | 1 117 | 2 310 | 4 150 | 7.5 | 5.0 | 4.3 | 4.3 | 3.4 |
| International | 1 089 | 2 230 | 4 000 | 7.4 | 5.0 | 6.4 | 5.4 | 3.8 |
| Domestic | 28 | 80 | 150 | 11.1 | 5.5 | 0.3 | 0.6 | 0.9 |
| North America | 9 017 | 14 950 | 26 800 | 5.2 | 5.0 | 34.8 | 27.9 | 21.6 |
| International | 3 331 | 7 610 | 17 100 | 8.6 | 7.0 | 19.7 | 18.5 | 16.0 |
| Domestic | 5 686 | 7 340 | 9 700 | 2.6 | 2.5 | 63.1 | 59.4 | 56.4 |
| Latin America and Caribbean | 1 445 | 2 600 | 5 100 | 6.0 | 5.5 | 5.6 | 4.9 | 4.1 |
| International | 1 109 | 2 060 | 4 200 | 6.4 | 6.0 | 6.5 | 5.0 | 3.9 |
| Domestic | 336 | 540 | 900 | 4.9 | 4.5 | 3.7 | 4.4 | 5.2 |
| World | 25 939 | 53 610 | 124 000 | 7.5 | 7.0 | 100.0 | 100.0 | 100.0 |
| International | 16 934 | 41 250 | 106 800 | 9.3 | 8.5 | 100.0 | 100.0 | 100.0 |
| Domestic | 9 005 | 12 360 | 17 200 | 3.2 | 3.0 | 100.0 | 100.0 | 100.0 |

1. Preliminary.

2. Rounded to the nearest 0.5 percentage point.

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**Appendix I. Total commercial transport fleet distinguished by type of propulsion — 1978-1988¹
(ICAO Contracting States)²**

| | 1978 | 1979 | 1980 | 1981 | 1982 | Year 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ³ |
|--------------------------------------|-------|-------|-------|-------|-------|--------------|-------|-------|-------|--------|-------------------|
| TURBO-JET AIRCRAFT | | | | | | | | | | | |
| SST | 11 | 12 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Wide-body jets: | | | | | | | | | | | |
| four-engine | 330 | 386 | 456 | 487 | 517 | 538 | 545 | 552 | 602 | 620 | 640 |
| three-engine | 411 | 462 | 523 | 560 | 576 | 565 | 561 | 576 | 575 | 579 | 584 |
| two-engine | 59 | 84 | 120 | 153 | 221 | 301 | 381 | 431 | 492 | 555 | 645 |
| Total | 800 | 932 | 1 099 | 1 200 | 1 314 | 1 404 | 1 487 | 1 559 | 1 669 | 1 754 | 1 869 |
| Narrow-body jets: | | | | | | | | | | | |
| four-engine | 1 371 | 1 239 | 1 140 | 1 009 | 961 | 837 | 788 | 700 | 671 | 672 | 640 |
| three-engine | 1 458 | 1 629 | 1 765 | 1 781 | 1 817 | 1 826 | 1 808 | 1 807 | 1 801 | 1 794 | 1 783 |
| two-engine | 2 055 | 2 131 | 2 224 | 2 351 | 2 490 | 2 651 | 2 721 | 2 959 | 3 201 | 3 487 | 3 794 |
| Total | 4 884 | 4 999 | 5 129 | 5 141 | 5 268 | 5 314 | 5 317 | 5 466 | 5 673 | 5 953 | 6 217 |
| Total jet aircraft | 5 695 | 5 943 | 6 242 | 6 355 | 6 596 | 6 732 | 6 818 | 7 039 | 7 356 | 7 721 | 8 100 |
| TURBO-PROP AIRCRAFT | | | | | | | | | | | |
| Four-engine | 441 | 410 | 397 | 418 | 416 | 407 | 387 | 365 | 350 | 339 | 326 |
| Two-engine | 975 | 994 | 1 057 | 1 052 | 1 069 | 1 106 | 1 153 | 1 225 | 1 355 | 1 461 | 1 584 |
| Total | 1 416 | 1 404 | 1 454 | 1 470 | 1 485 | 1 513 | 1 540 | 1 590 | 1 705 | 1 800 | 1 910 |
| PISTON-ENGINE AIRCRAFT | | | | | | | | | | | |
| Four-engine | 328 | 278 | 237 | 213 | 199 | 186 | 162 | 139 | 125 | 124 | 110 |
| Two-engine | 941 | 835 | 767 | 732 | 707 | 692 | 647 | 597 | 537 | 500 | 480 |
| Total | 1 269 | 1 113 | 1 004 | 945 | 906 | 878 | 809 | 736 | 662 | 624 | 590 |
| TOTAL AIRCRAFT IN SERVICE | | | | | | | | | | | |
| | 8 380 | 8 460 | 8 700 | 8 770 | 8 987 | 9 123 | 9 167 | 9 365 | 9 723 | 10 145 | 10 600 |

1. International and domestic scheduled and non-scheduled, fixed-wing aircraft of over 9 000 kg. maximum take-off weight.

2. Excluding China and the USSR.

3. 1988 data are preliminary.

Source:

ATR Form H and various aviation reports.

**Appendix 2. Total commercial transport fleet¹ — 1978-1988
(ICAO Contracting States; as at December 31 of each year)²**

A. Distribution by region of registration

| Region of registration ³ | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ⁴ |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------------------|
| Africa (51) | | | | | | | | | | | |
| Jets | 250 | 250 | 285 | 298 | 337 | 355 | 384 | 398 | 400 | 409 | 410 |
| Total | 570 | 563 | 530 | 542 | 563 | 573 | 590 | 605 | 610 | 620 | 620 |
| Asia and Pacific (32) | | | | | | | | | | | |
| Jets | 620 | 640 | 659 | 694 | 705 | 710 | 720 | 742 | 775 | 787 | 830 |
| Total | 1 120 | 1 123 | 1 100 | 1 145 | 1 146 | 1 130 | 1 128 | 1 189 | 1 195 | 1 210 | 1 250 |
| Europe (29) | | | | | | | | | | | |
| Jets | 1 610 | 1 637 | 1 735 | 1 750 | 1 725 | 1 702 | 1 657 | 1 659 | 1 699 | 1 750 | 1 780 |
| Total | 2 100 | 2 050 | 2 120 | 2 135 | 2 135 | 2 137 | 2 140 | 2 167 | 2 290 | 2 340 | 2 480 |
| Latin America and Caribbean (30) | | | | | | | | | | | |
| Jets | 430 | 430 | 479 | 520 | 573 | 583 | 560 | 550 | 570 | 570 | 580 |
| Total | 1 040 | 1 028 | 1 030 | 1 065 | 1 047 | 1 035 | 951 | 950 | 965 | 969 | 970 |
| Middle East (14) | | | | | | | | | | | |
| Jets | 230 | 236 | 245 | 250 | 287 | 295 | 305 | 320 | 330 | 335 | 350 |
| Total | 290 | 286 | 290 | 303 | 313 | 315 | 335 | 340 | 360 | 372 | 380 |
| North America (2) | | | | | | | | | | | |
| Jets | 2 555 | 2 750 | 2 839 | 2 843 | 2 969 | 3 087 | 3 192 | 3 399 | 3 490 | 3 870 | 4 150 |
| Total | 3 260 | 3 410 | 3 630 | 3 580 | 3 783 | 3 933 | 4 023 | 4 207 | 4 303 | 4 634 | 4 900 |
| World total (158) | | | | | | | | | | | |
| Jets | 5 695 | 5 943 | 6 242 | 6 355 | 6 596 | 6 732 | 6 818 | 7 068 | 7 264 | 7 721 | 8 100 |
| Total | 8 380 | 8 460 | 8 700 | 8 770 | 8 987 | 9 123 | 9 167 | 9 458 | 9 723 | 10 145 | 10 600 |

B. Distribution of jet aircraft by category

| Region of registration ³ | SST | Wide-bodied | Narrow-bodied | Total jets |
|-------------------------------------|-----|-------------|---------------|------------|
| Africa (51) | | | | |
| 1978 | - | 25 | 225 | 250 |
| 1983 | - | 54 | 301 | 355 |
| 1988 | - | 65 | 345 | 410 |
| Asia and Pacific (32) | | | | |
| 1978 | - | 150 | 470 | 620 |
| 1983 | - | 310 | 400 | 710 |
| 1988 | - | 430 | 400 | 830 |
| Europe (29) | | | | |
| 1978 | 11 | 200 | 1 396 | 1 607 |
| 1983 | 14 | 330 | 1 358 | 1 702 |
| 1988 | 14 | 450 | 1 316 | 1 780 |

| <i>Region of registration</i> ³ | SST | Wide- bodied | Narrow- bodied | Total jets |
|---|-----|-----------------|-------------------|---------------|
| Latin America and Caribbean (30) | | | | |
| 1978 | - | 18 | 412 | 430 |
| 1983 | - | 64 | 519 | 583 |
| 1988 | - | 75 | 505 | 580 |
| Middle East (14) | | | | |
| 1978 | - | 44 | 186 | 230 |
| 1983 | - | 100 | 195 | 295 |
| 1988 | - | 140 | 210 | 350 |
| North America (2) | | | | |
| 1978 | - | 363 | 2 192 | 2 555 |
| 1983 | - | 546 | 2 541 | 3 087 |
| 1988 | - | 709 | 3 441 | 4 150 |
| World total (158) | | | | |
| 1978 | 11 | 800 | 4 881 | 5 692 |
| 1983 | 14 | 1 404 | 5 314 | 6 732 |
| 1988 | 14 | 1 869 | 6 217 | 8 100 |

1. Fixed-wing aircraft of over 9 000 kg. maximum take-off weight.
2. Excluding China and the USSR.
3. Numbers within parentheses indicate number of countries in each region.
4. 1988 data are preliminary.

Source:

ATR Forms H and various aviation reports.

**Appendix 3. Aircraft distribution between scheduled and non-scheduled air carriers — 1978-1988
(ICAO Contracting States¹; as at December 31 of each year)**

| End of year | Jet aircraft ² | | | | | | | | All aircraft ² | | | | | |
|-------------------|---------------------------|-----------|-------------|-------|-------------------------|-------------|-------|------------|---------------------------|-------|-------------------------|-------|---------------|-------|
| | Scheduled airlines | | | | Non-scheduled operators | | | | Scheduled airlines | | Non-scheduled operators | | All operators | |
| | SST | Wide-body | Narrow-body | Total | Wide-body | Narrow-body | Total | Total jets | Number | % jet | Number | % jet | Number | % jet |
| 1978 | 11 | 773 | 4 470 | 5 254 | 27 | 414 | 441 | 5 695 | 7 147 | 74 | 1 233 | 36 | 8 380 | 68 |
| 1979 | 12 | 892 | 4 590 | 5 494 | 40 | 409 | 449 | 5 943 | 7 330 | 75 | 1 130 | 40 | 8 460 | 70 |
| 1980 | 14 | 1 068 | 4 681 | 5 763 | 31 | 448 | 479 | 6 242 | 7 577 | 76 | 1 123 | 43 | 8 700 | 72 |
| 1981 | 14 | 1 165 | 4 748 | 5 927 | 35 | 393 | 428 | 6 355 | 7 727 | 77 | 1 043 | 39 | 8 770 | 72 |
| 1982 | 14 | 1 272 | 4 787 | 6 073 | 42 | 481 | 523 | 6 596 | 7 851 | 77 | 1 136 | 46 | 8 987 | 73 |
| 1983 | 14 | 1 359 | 4 774 | 6 147 | 45 | 540 | 585 | 6 732 | 7 891 | 78 | 1 232 | 47 | 9 123 | 74 |
| 1984 | 14 | 1 430 | 4 772 | 6 216 | 57 | 545 | 602 | 6 818 | 7 947 | 78 | 1 220 | 49 | 9 167 | 74 |
| 1985 | 14 | 1 502 | 4 886 | 6 402 | 57 | 580 | 637 | 7 039 | 8 124 | 79 | 1 241 | 51 | 9 365 | 75 |
| 1986 | 14 | 1 606 | 5 068 | 6 688 | 63 | 605 | 668 | 7 356 | 8 447 | 79 | 1 276 | 52 | 9 723 | 76 |
| 1987 | 14 | 1 679 | 5 248 | 6 941 | 75 | 705 | 780 | 7 721 | 8 759 | 79 | 1 386 | 56 | 10 145 | 76 |
| 1988 ³ | 14 | 1 789 | 5 502 | 7 305 | 80 | 715 | 795 | 8 100 | 9 196 | 79 | 1 404 | 57 | 10 600 | 76 |

1. Excluding China and the USSR.
2. Fixed-wing aircraft of over 9 000 kg maximum take-off weight.
3. 1988 data are preliminary.

Source:

ATR Forms D-1, D-2, AD-3, H; and various aviation reports.

Appendix 4. Aircraft of scheduled airlines: 1978-1988
(ICAO Contracting States¹; as at 31 December of each year)

| Aircraft type ² (listed alphabetically according to number of engines) | Year of first entry into service | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ³ |
|---|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|
| <i>TURBO-JETS</i> | | | | | | | | | | | | |
| SST Aircraft | | | | | | | | | | | | |
| <i>Aerospatiale/BAe-Concorde</i> | 1976 | 11 | 12 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Wide-bodied aircraft | | | | | | | | | | | | |
| Airbus A300 (two-engined) | 1974 | 52 | 76 | 112 | 153 | 190 | 205 | 222 | 235 | 248 | 253 | 268 |
| Airbus A310 (two-engined) | 1983 | - | - | - | - | - | 17 | 41 | 68 | 85 | 99 | 129 |
| Boeing 747 (four-engined) | 1969 | 322 | 376 | 437 | 480 | 512 | 532 | 538 | 546 | 589 | 600 | 620 |
| Boeing 767 (two-engined) | 1982 | - | - | - | - | 20 | 66 | 98 | 120 | 148 | 184 | 227 |
| Douglas DC-10 (three-engined) | 1971 | 248 | 280 | 326 | 331 | 337 | 327 | 323 | 325 | 328 | 335 | 340 |
| Lockheed L-1011 (three-engined) | 1972 | 151 | 160 | 193 | 201 | 213 | 212 | 208 | 208 | 208 | 208 | 205 |
| Total wide-bodied | | 773 | 892 | 1 068 | 1 165 | 1 272 | 1 359 | 1 430 | 1 502 | 1 606 | 1 679 | 1 789 |
| Narrow-bodied aircraft | | | | | | | | | | | | |
| BAe 146 | 1983 | - | - | - | - | - | 7 | 16 | 32 | 48 | 64 | 80 |
| Boeing 707 (all series) | 1958 | 564 | 515 | 493 | 430 | 375 | 300 | 260 | 225 | 190 | 176 | 160 |
| Boeing 720, B | 1960 | 95 | 90 | 77 | 50 | 47 | 42 | 34 | 24 | 17 | 13 | 10 |
| Douglas DC-8 (all series) | 1959 | 413 | 392 | 335 | 310 | 295 | 264 | 245 | 230 | 182 | 160 | 130 |
| Ilyushin IL-62 | 1968 | 28 | 30 | 32 | 39 | 37 | 40 | 42 | 42 | 43 | 44 | 45 |
| Ilyushin IL-76 | 1977 | 4 | 4 | 11 | 16 | 25 | 26 | 35 | 35 | 45 | 45 | 45 |
| Miscellaneous | - | 77 | 59 | 50 | 18 | 18 | 16 | 15 | 15 | 15 | 14 | 14 |
| Total (four-engined) | | 1 181 | 1 090 | 998 | 863 | 797 | 695 | 647 | 603 | 540 | 516 | 484 |
| BAe Hawker HS-121 Trident | 1963 | 60 | 55 | 53 | 53 | 52 | 31 | 26 | 12 | 6 | 5 | 4 |
| Boeing 727 | 1963 | 1 336 | 1 451 | 1 550 | 1 600 | 1 590 | 1 570 | 1 550 | 1 550 | 1 542 | 1 533 | 1 530 |
| Dassault 50 Falcon | 1981 | - | - | - | 5 | 8 | 10 | 10 | 12 | 12 | 12 | 12 |
| Tupolev TU-154 | 1971 | 25 | 26 | 35 | 41 | 44 | 47 | 48 | 48 | 50 | 62 | 65 |
| Yakovlev YAK-40/42 | 1969 | 40 | 42 | 43 | 51 | 52 | 55 | 56 | 56 | 56 | 54 | 54 |
| Total (three-engined) | | 1 461 | 1 574 | 1 681 | 1 750 | 1 746 | 1 713 | 1 690 | 1 678 | 1 666 | 1 666 | 1 665 |
| Airbus A-320 | 1988 | - | - | - | - | - | - | - | - | - | - | 15 |
| BAC One-Eleven | 1965 | 150 | 150 | 143 | 140 | 140 | 140 | 138 | 135 | 135 | 130 | 110 |
| BAC Hawker HS-125 | 1964 | 33 | 35 | 35 | 36 | 36 | 36 | 35 | 35 | 35 | 35 | 30 |
| Boeing 737 | 1967 | 465 | 525 | 610 | 689 | 770 | 816 | 880 | 963 | 1 100 | 1 155 | 1 308 |
| Boeing 757 | 1982 | - | - | - | - | 2 | 26 | 41 | 76 | 110 | 142 | 185 |
| Dassault-Mystère 20/Falcon | 1965 | 70 | 70 | 70 | 72 | 72 | 70 | 55 | 50 | 45 | 45 | 40 |
| Douglas DC-9//MD-80 | 1965 | 794 | 830 | 840 | 896 | 925 | 970 | 990 | 1 040 | 1 120 | 1 221 | 1 320 |
| Fokker F-28 Fellowship | 1969 | 90 | 95 | 103 | 113 | 120 | 132 | 140 | 150 | 160 | 175 | 175 |
| Fokker 100 | 1988 | - | - | - | - | - | - | - | - | - | - | 10 |
| Marcel Dassault Mercure | 1974 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 |
| Sud Aviation SE-210 | 1959 | 140 | 130 | 105 | 90 | 82 | 80 | 60 | 50 | 40 | 32 | 25 |
| Tupolev TU-134 | 1967 | 47 | 52 | 62 | 65 | 65 | 66 | 66 | 66 | 66 | 66 | 66 |
| Miscellaneous | - | 29 | 29 | 24 | 24 | 22 | 20 | 20 | 30 | 40 | 54 | 58 |
| Total (two-engined) | | 1 828 | 1 926 | 2 002 | 2 135 | 2 244 | 2 366 | 2 435 | 2 605 | 2 862 | 3 066 | 3 353 |
| Total turbo-jets | | 5 254 | 5 494 | 5 763 | 5 927 | 6 073 | 6 147 | 6 216 | 6 402 | 6 688 | 6 941 | 7 305 |

| Aircraft type ² (listed alphabetically according to number of engines) | Year of first entry into service | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ³ |
|---|--|--------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------|
| | | <i>TURBO-PROPS</i> | | | | | | | | | | |
| BAC (Vickers) 700 Viscount | 1953 | 54 | 50 | 35 | 30 | 26 | 25 | 22 | 20 | 15 | 6 | 5 |
| BAC (Vickers) 800 Viscount | 1957 | 45 | 45 | 40 | 38 | 32 | 30 | 28 | 26 | 22 | 20 | 20 |
| BAC (Vickers) 950 Vanguard | 1960 | 20 | 20 | 17 | 15 | 12 | 12 | 10 | 8 | 8 | 8 | 3 |
| De Havilland DHC-7 Dash | 1978 | 2 | 8 | 24 | 40 | 58 | 59 | 60 | 66 | 66 | 66 | 68 |
| Ilyushin IL-18 | 1959 | 42 | 42 | 47 | 48 | 49 | 49 | 46 | 44 | 44 | 42 | 41 |
| Lockheed L-188 Electra | 1958 | 58 | 56 | 52 | 50 | 45 | 42 | 42 | 40 | 35 | 35 | 35 |
| Lockheed L-100/380 Hercules | 1965 | 31 | 32 | 32 | 32 | 32 | 33 | 33 | 34 | 34 | 35 | 37 |
| Miscellaneous | - | 42 | 40 | 39 | 39 | 39 | 35 | 32 | 30 | 26 | 25 | 20 |
| Total (four-engined) | | 294 | 293 | 286 | 292 | 293 | 285 | 273 | 268 | 250 | 237 | 229 |
| Aerospatiale N-262 | 1963 | 26 | 22 | 22 | 20 | 20 | 18 | 15 | 15 | 12 | 10 | 10 |
| Aerospatiale/Aeritalia ATR-42 | 1985 | - | - | - | - | - | - | - | 2 | 20 | 50 | 90 |
| Antonov AN-24/26/30/32 | 1963 | 50 | 55 | 75 | 95 | 114 | 119 | 126 | 130 | 135 | 140 | 142 |
| BAC (Handley Page) Herald | 1961 | 31 | 31 | 31 | 30 | 30 | 27 | 24 | 15 | 15 | 12 | 10 |
| BAC (Hawker) HS-748/ATP | 1962 | 105 | 100 | 100 | 100 | 95 | 95 | 100 | 100 | 90 | 85 | 90 |
| CASA/Nurtanio CN-235 | 1987 | - | - | - | - | - | - | - | - | - | 3 | 5 |
| Convair CV-340/440 Turbo | 1971 | 55 | 60 | 70 | 70 | 70 | 65 | 65 | 60 | 55 | 50 | 45 |
| Convair CV-540/580/600/640 | 1959 | 50 | 45 | 45 | 45 | 40 | 40 | 38 | 35 | 30 | 30 | 25 |
| De Havilland DHC-8 | 1984 | - | - | - | - | - | - | 2 | 15 | 32 | 55 | 85 |
| Embraer EMB-120 | 1985 | - | - | - | - | - | - | - | 6 | 20 | 35 | 75 |
| Fokker/Fairchild F-27/FH-227 | 1958 | 424 | 405 | 380 | 376 | 370 | 370 | 372 | 375 | 370 | 370 | 365 |
| Fokker 50 | 1987 | - | - | - | - | - | - | - | - | - | 5 | 30 |
| NAMCO YS-11 | 1965 | 105 | 100 | 100 | 95 | 90 | 85 | 78 | 70 | 62 | 60 | 50 |
| Saab SF-340 | 1984 | - | - | - | - | - | - | 10 | 35 | 60 | 85 | 110 |
| Shorts 330 | 1976 | 10 | 22 | 35 | 48 | 62 | 62 | 65 | 65 | 66 | 66 | 65 |
| Shorts 360 | 1982 | - | - | - | - | 2 | 25 | 32 | 39 | 70 | 90 | 90 |
| Miscellaneous | - | 24 | 24 | 23 | 23 | 22 | 22 | 20 | 20 | 15 | 12 | 10 |
| Total (two-engined) | | 880 | 864 | 881 | 902 | 915 | 928 | 947 | 982 | 1 052 | 1 158 | 1 297 |
| Total turbo-props | | 1 174 | 1 157 | 1 167 | 1 194 | 1 208 | 1 213 | 1 220 | 1 250 | 1 302 | 1 395 | 1 526 |
| <i>PISTON-ENGINE</i> | | | | | | | | | | | | |
| Douglas DC-4/C-54 | 1939 | 55 | 50 | 45 | 35 | 30 | 25 | 25 | 25 | 24 | 20 | 15 |
| Douglas DC-6, A, B | 1947 | 80 | 79 | 75 | 70 | 65 | 62 | 60 | 55 | 54 | 50 | 40 |
| Miscellaneous | - | 68 | 61 | 51 | 43 | 35 | 35 | 32 | 30 | 30 | 30 | 25 |
| Total (four-engined) | | 203 | 190 | 171 | 148 | 130 | 122 | 117 | 110 | 108 | 100 | 80 |
| Convair CV-340/440 | 1952 | 42 | 38 | 35 | 35 | 34 | 30 | 30 | 25 | 25 | 22 | 20 |
| Curtiss C-46 Commando | 1941 | 53 | 50 | 50 | 47 | 47 | 40 | 40 | 35 | 35 | 33 | 30 |
| Douglas DC-3/C-47 | 1936 | 315 | 305 | 299 | 290 | 281 | 270 | 262 | 244 | 240 | 225 | 205 |
| Ilyushin IL-14 | 1954 | 30 | 25 | 22 | 20 | 15 | 12 | 10 | 10 | 6 | 5 | 5 |
| Martin 202/404 | 1947 | 17 | 15 | 15 | 15 | 15 | 12 | 10 | 8 | 8 | 8 | 5 |
| Miscellaneous | - | 59 | 56 | 55 | 51 | 48 | 45 | 42 | 38 | 35 | 30 | 20 |
| Total (two-engined) | | 516 | 489 | 476 | 458 | 440 | 409 | 394 | 360 | 349 | 323 | 285 |
| Total piston-engined | | 719 | 679 | 647 | 606 | 570 | 531 | 511 | 470 | 457 | 423 | 365 |
| TOTAL ALL TYPES | | 7 147 | 7 330 | 7 577 | 7 727 | 7 851 | 7 891 | 7 947 | 8 122 | 8 447 | 8 759 | 9 196 |

1. Excluding China and the USSR.
2. Fixed-wing aircraft of over 9 000 kg. maximum take-off weight.
3. 1988 data are preliminary.

Sources:

ATR Forms D-1, AD-3 and H; aircraft manufacturer's and other reports.

Appendix 5. Fleet, personnel and productivity data for the international scheduled airlines — 1978-1988
(ICAO Contracting States)¹

| Item | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ² |
|--|---------|---------|---------|---------|---------|---------|---------|---------|-----------|-----------|-------------------|
| 1. Number of airlines | 236 | 236 | 245 | 253 | 253 | 251 | 269 | 303 | 309 | 327 | 343 |
| 2. Number of aircraft in fleet | 6 130 | 6 290 | 6 460 | 6 530 | 6 600 | 6 630 | 6 690 | 6 860 | 7 050 | 7 110 | 7 300 |
| 3. Number of aircraft over 9 tonnes maximum take-off weight | 5 680 | 5 850 | 6 030 | 6 150 | 6 260 | 6 290 | 6 360 | 6 570 | 6 760 | 6 850 | 7 100 |
| 4. Large aircraft as percentage of total fleet | 92.7 | 93.0 | 93.3 | 94.2 | 94.8 | 94.9 | 95.1 | 95.8 | 95.9 | 96.3 | 97.3 |
| 5. Number of flight crew ³ | 96 500 | 99 700 | 102 500 | 103 000 | 103 000 | 103 500 | 104 500 | 106 700 | 111 500 | 113 800 | 115 000 |
| 6. Number of flight crew per aircraft | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| 7. Total number of employees (including flight crew personnel) | 953 500 | 960 000 | 980 000 | 980 000 | 982 000 | 985 000 | 989 000 | 995 000 | 1 015 000 | 1 087 000 | 1 150 000 |
| 8. Employees per aircraft | 156 | 153 | 152 | 150 | 149 | 149 | 148 | 145 | 144 | 153 | 159 |
| 9. Aircraft hours flown (thousands) | 13 032 | 13 988 | 14 076 | 13 578 | 13 348 | 13 685 | 14 310 | 14 950 | 16 613 | 18 302 | 19 870 |
| 10. Average hours flown per aircraft (thousands) | 2 126 | 2 224 | 2 179 | 2 079 | 2 022 | 2 064 | 2 139 | 2 179 | 2 356 | 2 574 | 2 722 |
| 11. Tonne-kilometres performed (TKP) (millions) | 99 114 | 110 281 | 113 692 | 116 107 | 118 691 | 124 140 | 134 188 | 142 070 | 154 766 | 174 039 | 195 919 |
| 12. Tonne-kilometres available (TKA) (millions) | 174 392 | 191 525 | 204 598 | 206 538 | 208 549 | 214 496 | 227 074 | 242 513 | 266 599 | 291 745 | 325 676 |
| 13. Weight load factor (per cent) | 57 | 58 | 56 | 56 | 57 | 58 | 59 | 59 | 58 | 60 | 60 |
| 14. TKA per aircraft (thousands) | 28 449 | 30 449 | 31 332 | 31 629 | 31 599 | 32 352 | 33 942 | 35 352 | 37 815 | 41 033 | 44 613 |
| 15. TKA per employee (thousands) | 183 | 200 | 209 | 211 | 212 | 218 | 230 | 244 | 263 | 268 | 283 |

1. Excluding China and the USSR.

2. 1988 data are preliminary.

3. Excluding cabin attendants.

**Appendix 6. Indicators of the changing structure of scheduled air traffic — 1978-1988
(ICAO Contracting States)¹**

| Year | Stage distance (km) | | | Average speed (km/h) | | | Payload capacity (tonnes) | | | Weight load factor (%) | | |
|-------------------|---------------------|----------|----------|----------------------|----------|----------|---------------------------|----------|----------|------------------------|----------|----------|
| | Total | Inter- | | Total | Inter- | | Total | Inter- | | Total | Inter- | |
| | | national | Domestic | | national | Domestic | | national | Domestic | | national | Domestic |
| 1978 | 819 | 1 542 | 629 | 608 | 666 | 575 | 20.5 | 27.3 | 16.1 | 60 | 58 | 55 |
| 1979 | 858 | 1 586 | 666 | 614 | 668 | 585 | 21.1 | 28.8 | 16.3 | 61 | 59 | 56 |
| 1980 | 875 | 1 612 | 679 | 619 | 673 | 589 | 21.9 | 30.3 | 16.6 | 58 | 58 | 53 |
| 1981 | 890 | 1 645 | 686 | 617 | 671 | 586 | 23.0 | 32.0 | 17.2 | 58 | 59 | 52 |
| 1982 | 881 | 1 614 | 684 | 617 | 670 | 587 | 23.5 | 33.1 | 17.4 | 58 | 58 | 53 |
| 1983 | 868 | 1 629 | 674 | 612 | 673 | 579 | 23.7 | 33.6 | 17.5 | 59 | 60 | 54 |
| 1984 | 884 | 1 683 | 690 | 613 | 675 | 581 | 23.8 | 34.4 | 17.6 | 58 | 62 | 53 |
| 1985 | 891 | 1 703 | 696 | 616 | 678 | 585 | 24.1 | 35.3 | 17.5 | 59 | 61 | 54 |
| 1986 | 910 | 1 717 | 720 | 617 | 676 | 588 | 24.1 | 35.5 | 17.6 | 59 | 60 | 54 |
| 1987 | 928 | 1 741 | 732 | 617 | 677 | 587 | 24.1 | 35.5 | 17.7 | 59 | 63 | 54 |
| 1988 ² | 938 | 1 755 | 734 | 616 | 679 | 584 | 24.8 | 36.1 | 18.0 | 60 | 64 | 54 |

1. Excluding the USSR.
2. 1988 data are preliminary.

Appendix 7. Development of world scheduled revenue traffic — total of international and domestic operations — 1978-1988¹
(Scheduled Airlines of ICAO Contracting States)

| Year | Aircraft kilometres (millions) | Aircraft departures (millions) | Aircraft hours (millions) | Passengers carried (millions) | Passenger kilometres performed (millions) | Seat kilometres available (millions) | Passenger load factor (%) | Passengers including baggage (millions) | Tonne-kilometres performed | | | Tonne-km available (millions) | Weight load factor (%) |
|-----------------------|--------------------------------|--------------------------------|---------------------------|-------------------------------|---|--------------------------------------|---------------------------|---|----------------------------|-----------------|------------------|-------------------------------|------------------------|
| | | | | | | | | | Freight (millions) | Mail (millions) | Total (millions) | | |
| <i>TOTAL</i> | | | | | | | | | | | | | |
| <i>Excluding USSR</i> | | | | | | | | | | | | | |
| 1978 | 8 500 | 10.4 | 14.0 | 581 | 797 000 | 1 277 000 | 62 | 71 750 | 23 610 | 2 740 | 98 110 | 174 210 | 56 |
| 1979 | 9 150 | 10.7 | 14.9 | 652 | 910 000 | 1 423 000 | 64 | 81 860 | 25 670 | 2 870 | 110 400 | 192 640 | 57 |
| 1980 | 9 350 | 10.7 | 15.1 | 645 | 929 000 | 1 526 000 | 61 | 83 500 | 26 870 | 3 110 | 113 470 | 205 330 | 55 |
| 1981 | 9 110 | 10.2 | 14.7 | 643 | 948 000 | 1 550 000 | 61 | 85 390 | 28 400 | 3 200 | 116 990 | 209 760 | 56 |
| 1982 | 9 120 | 10.3 | 14.8 | 656 | 969 000 | 1 584 000 | 61 | 87 490 | 29 090 | 3 300 | 119 880 | 214 450 | 56 |
| 1983 | 9 400 | 10.8 | 15.4 | 688 | 1 013 000 | 1 641 000 | 62 | 91 400 | 32 460 | 3 480 | 127 340 | 222 430 | 57 |
| 1984 | 10 090 | 11.4 | 16.5 | 735 | 1 094 000 | 1 754 000 | 62 | 98 650 | 36 900 | 3 790 | 139 340 | 240 390 | 58 |
| 1985 | 10 570 | 11.9 | 17.1 | 786 | 1 178 000 | 1 857 000 | 63 | 106 440 | 37 130 | 3 880 | 147 450 | 254 610 | 58 |
| 1986 | 11 460 | 12.6 | 18.6 | 843 | 1 256 000 | 2 007 000 | 63 | 113 450 | 40 530 | 3 980 | 157 960 | 275 490 | 57 |
| 1987 | 12 210 | 13.2 | 19.8 | 907 | 1 386 000 | 2 134 000 | 65 | 125 190 | 45 450 | 4 140 | 174 790 | 296 070 | 59 |
| 1988 ¹ | 12 800 | 13.6 | 20.7 | 948 | 1 482 000 | 2 259 000 | 66 | 133 590 | 50 880 | 4 260 | 188 730 | 316 990 | 60 |
| <i>Including USSR</i> | | | | | | | | | | | | | |
| 1978 | - | - | - | 679 | 936 000 | 1 451 000 | 65 | 84 330 | 25 940 | 3 270 | 113 540 | 193 060 | 59 |
| 1979 | - | - | - | 754 | 1 060 000 | 1 607 000 | 66 | 95 420 | 28 010 | 3 430 | 126 860 | 212 310 | 60 |
| 1980 | - | - | - | 748 | 1 089 000 | 1 724 000 | 63 | 97 920 | 29 380 | 3 680 | 130 980 | 226 460 | 58 |
| 1981 | - | - | - | 752 | 1 119 000 | 1 756 000 | 64 | 100 810 | 30 880 | 3 800 | 135 490 | 232 520 | 58 |
| 1982 | - | - | - | 764 | 1 142 000 | 1 793 000 | 64 | 102 990 | 31 540 | 3 870 | 138 400 | 237 270 | 58 |
| 1983 | - | - | - | 798 | 1 190 000 | 1 852 000 | 64 | 107 280 | 35 110 | 4 000 | 146 390 | 245 500 | 60 |
| 1984 | - | - | - | 847 | 1 277 000 | 1 971 000 | 65 | 115 150 | 39 640 | 4 300 | 159 090 | 264 060 | 60 |
| 1985 | - | - | - | 898 | 1 366 000 | 2 079 000 | 66 | 123 330 | 39 810 | 4 390 | 167 530 | 278 390 | 60 |
| 1986 | - | - | - | 958 | 1 451 000 | 2 233 000 | 65 | 130 950 | 43 180 | 4 530 | 178 650 | 299 550 | 60 |
| 1987 | - | - | - | 1 025 | 1 587 000 | 2 364 000 | 67 | 143 200 | 48 280 | 4 670 | 196 150 | 320 730 | 61 |
| 1988 ¹ | - | - | - | 1 072 | 1 696 000 | 2 506 000 | 68 | 152 770 | 53 600 | 4 780 | 211 150 | 347 360 | 61 |
| <i>INTERNATIONAL</i> | | | | | | | | | | | | | |
| <i>Excluding USSR</i> | | | | | | | | | | | | | |
| 1978 | 3 320 | 2.2 | 5.0 | 140 | 376 000 | 610 000 | 62 | 34 410 | 16 720 | 1 290 | 52 420 | 90 900 | 58 |
| 1979 | 3 530 | 2.2 | 5.3 | 156 | 431 000 | 681 000 | 63 | 39 360 | 18 690 | 1 350 | 59 400 | 101 000 | 59 |
| 1980 | 3 610 | 2.2 | 5.4 | 161 | 458 000 | 746 000 | 61 | 41 700 | 20 000 | 1 440 | 63 140 | 109 820 | 57 |
| 1981 | 3 590 | 2.2 | 5.3 | 170 | 484 000 | 774 000 | 63 | 44 300 | 21 460 | 1 490 | 67 250 | 114 890 | 59 |
| 1982 | 3 550 | 2.2 | 5.3 | 167 | 486 000 | 780 000 | 63 | 44 690 | 22 360 | 1 570 | 68 620 | 117 550 | 58 |
| 1983 | 3 590 | 2.2 | 5.3 | 170 | 500 000 | 799 000 | 63 | 45 950 | 24 900 | 1 640 | 72 500 | 120 790 | 60 |
| 1984 | 3 750 | 2.2 | 5.6 | 181 | 544 000 | 834 000 | 65 | 49 950 | 28 630 | 1 780 | 80 360 | 129 010 | 62 |
| 1985 | 3 920 | 2.3 | 5.8 | 191 | 578 000 | 888 000 | 65 | 53 220 | 29 180 | 1 810 | 84 210 | 138 370 | 61 |
| 1986 | 4 120 | 2.4 | 6.1 | 195 | 591 000 | 938 000 | 63 | 54 490 | 32 010 | 1 840 | 88 340 | 146 160 | 60 |
| 1987 | 4 450 | 2.6 | 6.6 | 218 | 673 000 | 1 004 000 | 67 | 61 990 | 36 420 | 1 900 | 100 310 | 158 380 | 63 |
| 1988 ¹ | 4 790 | 2.7 | 7.0 | 228 | 741 000 | 1 091 000 | 68 | 68 050 | 40 890 | 1 940 | 110 880 | 173 060 | 64 |
| <i>Including USSR</i> | | | | | | | | | | | | | |
| 1978 | - | - | - | 143 | 385 000 | 624 000 | 62 | 35 160 | 16 930 | 1 350 | 53 440 | 92 470 | 58 |
| 1979 | - | - | - | 158 | 440 000 | 696 000 | 63 | 40 210 | 18 940 | 1 410 | 60 560 | 102 750 | 59 |
| 1980 | - | - | - | 163 | 466 000 | 761 000 | 61 | 42 510 | 20 260 | 1 510 | 64 280 | 111 580 | 58 |
| 1981 | - | - | - | 173 | 494 000 | 790 000 | 63 | 45 200 | 21 700 | 1 570 | 68 470 | 116 750 | 59 |
| 1982 | 3 680 | 2.2 | 5.4 | 170 | 497 000 | 796 000 | 62 | 45 610 | 22 620 | 1 640 | 69 870 | 119 450 | 58 |
| 1983 | 3 720 | 2.3 | 5.5 | 173 | 511 000 | 815 000 | 63 | 46 880 | 25 200 | 1 700 | 73 780 | 122 700 | 60 |
| 1984 | 3 870 | 2.3 | 5.7 | 184 | 555 000 | 851 000 | 65 | 50 970 | 28 940 | 1 840 | 81 750 | 131 050 | 62 |

| Year | Aircraft kilometres (millions) | Aircraft departures (millions) | Aircraft hours (millions) | Passengers carried (millions) | Passenger kilometres performed (millions) | Seat kilometres available (millions) | Passenger load factor (%) | Passengers including baggage (millions) | Tonne-kilometres performed | | | Tonne-km available (millions) | Weight load factor (%) |
|-------------------|--------------------------------|--------------------------------|---------------------------|-------------------------------|---|--------------------------------------|---------------------------|---|----------------------------|-----------------|------------------|-------------------------------|------------------------|
| | | | | | | | | | Freight (millions) | Mail (millions) | Total (millions) | | |
| 1985 | 4 030 | 2.3 | 5.9 | 194 | 589 000 | 905 000 | 65 | 54 280 | 29 380 | 1 860 | 85 520 | 140 210 | 61 |
| 1986 | 4 230 | 2.4 | 6.2 | 198 | 602 000 | 955 000 | 63 | 55 530 | 32 220 | 1 890 | 89 640 | 148 070 | 61 |
| 1987 | 4 570 | 2.6 | 6.7 | 222 | 686 000 | 1 023 000 | 67 | 63 210 | 36 720 | 1 940 | 101 860 | 160 610 | 63 |
| 1988 ¹ | 4 930 | 2.8 | 7.2 | 232 | 756 000 | 1 112 000 | 68 | 69 350 | 41 240 | 1 980 | 112 570 | 175 520 | 64 |

DOMESTIC

| Excluding USSR | | | | | | | | | | | | | |
|-------------------|-------|------|------|-----|---------|-----------|----|--------|-------|-------|--------|---------|----|
| 1978 | 5 170 | 8.2 | 9.0 | 441 | 420 000 | 667 000 | 63 | 37 340 | 6 890 | 1 450 | 45 680 | 83 310 | 55 |
| 1979 | 5 620 | 8.4 | 9.6 | 497 | 479 000 | 742 000 | 65 | 42 500 | 6 970 | 1 520 | 51 000 | 91 630 | 56 |
| 1980 | 5 740 | 8.5 | 9.7 | 484 | 471 000 | 780 000 | 60 | 41 800 | 6 860 | 1 670 | 50 330 | 95 510 | 53 |
| 1981 | 5 530 | 8.1 | 9.4 | 473 | 463 000 | 776 000 | 60 | 41 090 | 6 940 | 1 710 | 49 740 | 94 870 | 52 |
| 1982 | 5 570 | 8.1 | 9.5 | 489 | 483 000 | 804 000 | 60 | 42 800 | 6 730 | 1 730 | 51 270 | 96 910 | 53 |
| 1983 | 5 802 | 8.6 | 10.0 | 519 | 513 000 | 842 000 | 61 | 45 450 | 7 540 | 1 830 | 54 830 | 101 640 | 54 |
| 1984 | 6 340 | 9.2 | 10.9 | 554 | 550 000 | 920 000 | 60 | 48 700 | 8 270 | 2 000 | 58 980 | 111 380 | 53 |
| 1985 | 6 650 | 9.6 | 11.4 | 595 | 601 000 | 969 000 | 62 | 53 220 | 7 950 | 2 070 | 63 240 | 116 250 | 54 |
| 1986 | 7 330 | 10.2 | 12.5 | 648 | 666 000 | 1 069 000 | 62 | 58 970 | 8 520 | 2 140 | 69 620 | 129 340 | 54 |
| 1987 | 7 760 | 10.6 | 13.2 | 689 | 714 000 | 1 130 000 | 63 | 63 200 | 9 030 | 2 250 | 74 480 | 137 690 | 54 |
| 1988 ¹ | 8 000 | 10.9 | 13.7 | 720 | 741 000 | 1 168 000 | 63 | 65 540 | 9 980 | 2 320 | 77 840 | 143 930 | 54 |

| Including USSR | | | | | | | | | | | | | |
|-------------------|---|---|---|-----|---------|-----------|----|--------|--------|-------|--------|---------|----|
| 1978 | - | - | - | 536 | 552 000 | 827 000 | 67 | 49 170 | 9 000 | 1 920 | 60 100 | 100 590 | 60 |
| 1979 | - | - | - | 596 | 620 000 | 911 000 | 68 | 55 220 | 9 070 | 2 020 | 66 300 | 109 540 | 61 |
| 1980 | - | - | - | 585 | 622 000 | 963 000 | 65 | 55 420 | 9 110 | 2 170 | 66 700 | 114 880 | 58 |
| 1981 | - | - | - | 579 | 626 000 | 966 000 | 65 | 55 610 | 9 180 | 2 230 | 67 020 | 115 770 | 58 |
| 1982 | - | - | - | 594 | 645 000 | 997 000 | 65 | 57 380 | 8 910 | 2 240 | 68 530 | 117 820 | 58 |
| 1983 | - | - | - | 625 | 679 000 | 1 037 000 | 65 | 60 160 | 9 830 | 2 300 | 73 000 | 122 160 | 59 |
| 1984 | - | - | - | 663 | 722 000 | 1 120 000 | 64 | 63 650 | 10 570 | 2 470 | 76 690 | 131 600 | 58 |
| 1985 | - | - | - | 704 | 777 000 | 1 174 000 | 66 | 69 050 | 10 430 | 2 530 | 82 010 | 138 180 | 59 |
| 1986 | - | - | - | 760 | 848 000 | 1 277 000 | 66 | 75 420 | 10 950 | 2 650 | 89 010 | 151 480 | 59 |
| 1987 | - | - | - | 803 | 900 000 | 1 341 000 | 67 | 79 990 | 11 570 | 2 730 | 94 280 | 160 120 | 59 |
| 1988 ¹ | - | - | - | 840 | 940 000 | 1 394 000 | 67 | 83 410 | 12 360 | 2 810 | 98 580 | 171 840 | 57 |

1. Owing to rounding of figures, total tonne-kilometres performed do not always correspond exactly to the sum of the passenger, freight and mail traffic. All 1988 data are preliminary.

**Appendix 8. Seasonal variations of international scheduled traffic — 1978-1988
(for 13 major airlines)¹**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year | Peak/ trough factor |
|--|------------|---------------|--------|--------|--------|--------|--------|---------------|--------|------------|--------|--------|---------------|---------------------------|
| <i>Passenger-kilometres performed (millions)</i> | | | | | | | | | | | | | | |
| 1978 | 13 873 | 11 733 | 14 566 | 14 803 | 16 531 | 18 653 | 21 580 | 22 058 | 20 465 | 17 385 | 14 611 | 15 976 | 202 234 | 1.88 |
| 1979 | 15 919 | 13 450 | 16 039 | 17 724 | 18 860 | 21 311 | 23 956 | 25 044 | 22 327 | 19 566 | 15 954 | 16 366 | 226 516 | 1.86 |
| 1980 | 16 786 | 14 855 | 17 952 | 17 364 | 18 829 | 20 876 | 23 540 | 25 005 | 21 483 | 19 077 | 16 414 | 16 675 | 228 856 | 1.68 |
| 1981 | 16 876 | 14 842 | 17 340 | 18 453 | 20 056 | 20 754 | 23 528 | 25 123 | 22 181 | 20 137 | 16 851 | 17 007 | 233 148 | 1.69 |
| 1982 | 17 502 | 14 846 | 17 778 | 18 764 | 19 803 | 21 091 | 23 761 | 24 731 | 21 930 | 20 302 | 15 802 | 16 676 | 232 986 | 1.67 |
| 1983 | 17 172 | 14 302 | 17 617 | 17 978 | 19 247 | 21 159 | 24 565 | 25 108 | 22 911 | 21 286 | 16 342 | 17 581 | 235 268 | 1.76 |
| 1984 | 17 846 | 15 169 | 18 272 | 19 810 | 21 431 | 23 550 | 25 550 | 27 169 | 25 173 | 22 076 | 18 098 | 19 122 | 253 266 | 1.79 |
| 1985 | 17 841 | 16 195 | 20 557 | 20 602 | 22 916 | 25 935 | 27 669 | 28 776 | 25 519 | 22 625 | 18 635 | 19 616 | 266 886 | 1.78 |
| 1986 | 19 669 | 16 221 | 20 190 | 19 380 | 20 129 | 22 267 | 25 568 | 28 025 | 24 327 | 21 826 | 19 191 | 20 143 | 256 936 | 1.73 |
| 1987 | 20 924 | 17 745 | 21 471 | 22 420 | 24 273 | 26 474 | 30 203 | 32 032 | 27 418 | 26 023 | 21 361 | 21 945 | 292 289 | 1.81 |
| 1988 | 23 369 | 20 374 | 24 507 | 24 642 | 25 930 | 28 841 | 32 863 | 33 779 | 30 171 | 28 751 | 23 505 | 24 612 | 321 344 | 1.66 |
| <i>Percentage distribution²</i> | | | | | | | | | | | | | | |
| 1978 | 6.9 | 5.8 | 7.2 | 7.3 | 8.2 | 9.2 | 10.7 | 10.9 | 10.1 | 8.6 | 7.2 | 7.9 | 100 | |
| 1979 | 7.0 | 5.9 | 7.1 | 7.8 | 8.3 | 9.4 | 10.6 | 11.1 | 9.9 | 8.6 | 7.1 | 7.2 | 100 | |
| 1980 | 7.3 | 6.5 | 7.8 | 7.6 | 8.2 | 9.1 | 10.3 | 11.0 | 9.4 | 8.3 | 7.2 | 7.3 | 100 | |
| 1981 | 7.2 | 6.4 | 7.4 | 8.0 | 8.6 | 8.9 | 10.1 | 10.8 | 9.5 | 8.6 | 7.2 | 7.3 | 100 | |
| 1982 | 7.5 | 6.4 | 7.6 | 8.1 | 8.5 | 9.0 | 10.2 | 10.6 | 9.4 | 8.7 | 6.8 | 7.2 | 100 | |
| 1983 | 7.3 | 6.1 | 7.5 | 7.6 | 8.2 | 9.0 | 10.4 | 10.7 | 9.7 | 9.1 | 6.9 | 7.5 | 100 | |
| 1984 | 7.1 | 6.0 | 7.2 | 7.8 | 8.5 | 9.3 | 10.1 | 10.7 | 9.9 | 8.7 | 7.1 | 7.6 | 100 | |
| 1985 | 6.7 | 6.1 | 7.7 | 7.7 | 8.6 | 9.7 | 10.4 | 10.8 | 9.5 | 8.5 | 7.0 | 7.3 | 100 | |
| 1986 | 7.7 | 6.3 | 7.9 | 7.5 | 7.8 | 8.7 | 10.0 | 10.9 | 9.5 | 8.5 | 7.4 | 7.8 | 100 | |
| 1987 | 7.2 | 6.0 | 7.3 | 7.7 | 8.3 | 9.1 | 10.3 | 11.0 | 9.4 | 8.9 | 7.3 | 7.5 | 100 | |
| 1988 | 7.3 | 6.3 | 7.6 | 7.7 | 8.0 | 9.0 | 10.2 | 10.5 | 9.4 | 8.9 | 7.3 | 7.7 | 100 | |
| <i>Passenger load factors (per cent)</i> | | | | | | | | | | | | | | |
| 1978 | 56.9 | 53.0 | 57.1 | 58.9 | 59.0 | 64.9 | 70.1 | 71.8 | 69.4 | 61.4 | 57.3 | 59.0 | 62.1 | |
| 1979 | 59.6 | 56.2 | 60.4 | 63.1 | 61.6 | 71.6 | 71.9 | 73.8 | 69.9 | 63.6 | 58.2 | 57.8 | 64.5 | |
| 1980 | 57.3 | 54.4 | 60.8 | 57.9 | 58.3 | 64.0 | 66.5 | 69.4 | 64.7 | 60.3 | 57.6 | 58.2 | 61.1 | |
| 1981 | 58.9 | 56.9 | 59.1 | 61.5 | 61.9 | 64.4 | 66.9 | 71.1 | 66.6 | 63.5 | 59.6 | 60.6 | 62.9 | |
| 1982 | 60.4 | 57.0 | 61.1 | 62.0 | 60.8 | 63.8 | 66.2 | 68.9 | 65.2 | 62.1 | 56.6 | 58.4 | 62.2 | |
| 1983 | 58.8 | 56.1 | 61.1 | 60.1 | 59.5 | 64.6 | 69.1 | 71.3 | 69.0 | 65.4 | 58.4 | 61.2 | 63.3 | |
| 1984 | 60.9 | 57.2 | 62.4 | 65.1 | 66.4 | 70.4 | 71.6 | 74.7 | 72.8 | 66.9 | 61.8 | 63.7 | 66.6 | |
| 1985 | 62.5 | 59.7 | 71.0 | 66.5 | 64.6 | 71.1 | 71.3 | 72.7 | 69.2 | 63.6 | 59.1 | 60.6 | 66.3 | |
| 1986 | 60.4 | 57.4 | 64.1 | 58.8 | 55.8 | 62.1 | 67.0 | 72.7 | 68.4 | 64.1 | 61.2 | 63.0 | 63.2 | |
| 1987 | 63.7 | 60.8 | 65.5 | 66.3 | 66.0 | 70.9 | 74.9 | 78.0 | 72.4 | 70.1 | 63.4 | 64.0 | 68.4 | |
| 1988 | 64.4 | 61.4 | 68.7 | 66.0 | 63.9 | 70.4 | 75.0 | 74.8 | 72.9 | 70.7 | 64.2 | 65.6 | 68.5 | |
| <i>Freight tonne-kilometres performed (millions)</i> | | | | | | | | | | | | | | |
| 1978 | 622 | 661 | 757 | 715 | 734 | 753 | 762 | 736 | 773 | 854 | 804 | 803 | 8 974 | 1.37 |
| 1979 | 688 | 726 | 843 | 793 | 842 | 799 | 849 | 801 | 869 | 913 | 861 | 841 | 9 825 | 1.33 |
| 1980 | 728 | 797 | 897 | 831 | 837 | 824 | 844 | 805 | 826 | 933 | 892 | 874 | 10 088 | 1.28 |
| 1981 | 751 | 797 | 957 | 872 | 891 | 842 | 909 | 848 | 885 | 992 | 958 | 929 | 10 631 | 1.32 |
| 1982 | 800 | 851 | 965 | 876 | 920 | 863 | 897 | 839 | 873 | 971 | 941 | 958 | 10 754 | 1.21 |

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year | Peak/ trough factor |
|------|--------------|-------|-------|-------|-------|-------|-------|-------|-------|--------------|-------|-------|--------|---------------------------|
| 1983 | 792 | 846 | 1 003 | 930 | 949 | 950 | 996 | 940 | 1 017 | 1 143 | 1 100 | 1 118 | 11 784 | 1.44 |
| 1984 | 817 | 894 | 1 191 | 1 114 | 1 106 | 1 101 | 1 160 | 1 097 | 1 161 | 1 219 | 1 204 | 1 177 | 13 241 | 1.49 |
| 1985 | 989 | 1 094 | 1 201 | 1 097 | 1 130 | 1 136 | 1 140 | 1 092 | 1 154 | 1 325 | 1 298 | 1 275 | 13 931 | 1.33 |
| 1986 | 1 054 | 1 174 | 1 340 | 1 252 | 1 245 | 1 254 | 1 299 | 1 221 | 1 264 | 1 412 | 1 411 | 1 339 | 15 265 | 1.34 |
| 1987 | 1 139 | 1 265 | 1 500 | 1 397 | 1 434 | 1 364 | 1 444 | 1 353 | 1 437 | 1 599 | 1 554 | 1 461 | 16 947 | 1.40 |
| 1988 | 1 306 | 1 457 | 1 599 | 1 516 | 1 550 | 1 534 | 1 587 | 1 480 | 1 578 | 1 759 | 1 673 | 1 673 | 18 713 | 1.35 |

Percentage distribution²

| | | | | | | | | | | | | | |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1978 | 6.9 | 7.4 | 8.4 | 8.0 | 8.2 | 8.4 | 8.5 | 8.2 | 8.6 | 9.5 | 9.0 | 8.9 | 100 |
| 1979 | 7.0 | 7.4 | 8.6 | 8.1 | 8.6 | 8.1 | 8.6 | 8.1 | 8.8 | 9.3 | 8.8 | 8.6 | 100 |
| 1980 | 7.2 | 7.9 | 8.9 | 8.2 | 8.3 | 8.2 | 8.4 | 8.0 | 8.2 | 9.2 | 8.8 | 8.7 | 100 |
| 1981 | 7.1 | 7.5 | 9.0 | 8.2 | 8.4 | 7.9 | 8.6 | 8.0 | 8.3 | 9.3 | 9.0 | 8.7 | 100 |
| 1982 | 7.4 | 7.9 | 9.0 | 8.2 | 8.6 | 8.0 | 8.3 | 7.8 | 8.1 | 9.0 | 8.8 | 8.9 | 100 |
| 1983 | 6.7 | 7.2 | 8.5 | 7.9 | 8.1 | 8.1 | 8.4 | 8.0 | 8.6 | 9.7 | 9.3 | 9.5 | 100 |
| 1984 | 6.2 | 6.7 | 9.0 | 8.4 | 8.3 | 8.3 | 8.8 | 8.3 | 8.8 | 9.2 | 9.1 | 8.9 | 100 |
| 1985 | 7.1 | 7.9 | 8.6 | 7.9 | 8.1 | 8.2 | 8.2 | 7.8 | 8.3 | 9.5 | 9.3 | 9.1 | 100 |
| 1986 | 6.9 | 7.7 | 8.8 | 8.2 | 8.2 | 8.2 | 8.5 | 8.0 | 8.3 | 9.2 | 9.2 | 8.8 | 100 |
| 1987 | 6.7 | 7.5 | 8.8 | 8.2 | 8.5 | 8.1 | 8.5 | 8.0 | 8.5 | 9.4 | 9.2 | 8.6 | 100 |
| 1988 | 7.0 | 7.8 | 8.5 | 8.1 | 8.3 | 8.2 | 8.5 | 7.9 | 8.4 | 9.4 | 8.9 | 8.9 | 100 |

1. Airlines included: Air Canada, Air France, Alitalia, British Airways, Japan Air Lines, Iberia, KLM, Lufthansa, Pan Am, Qantas, SAS, Swissair, TWA.

2. The average month is 8.3%.

**Appendix 9A. International scheduled traffic in 1978 and 1988
(by region of airline registration)**

| | World | Europe | Africa | Middle East | Asia and Pacific | North America | Latin America and Caribbean |
|--|---------|---------|--------|-------------|------------------|---------------|-----------------------------|
| <i>Passenger kilometres (millions)</i> | | | | | | | |
| 1978 | 384 831 | 163 301 | 18 673 | 20 694 | 78 036 | 78 240 | 25 887 |
| Distribution (per cent) | 100 | 42.4 | 4.9 | 5.4 | 20.3 | 20.3 | 6.7 |
| 1988 ¹ | 756 000 | 260 600 | 29 200 | 36 200 | 209 100 | 175 400 | 45 500 |
| Distribution (per cent) | 100 | 34.5 | 3.9 | 4.8 | 27.6 | 23.2 | 6.0 |
| Average annual growth (per cent) | 7.0 | 4.8 | 4.6 | 5.8 | 10.4 | 8.4 | 5.8 |
| <i>Freight tonne-kilometres (millions)</i> | | | | | | | |
| 1978 | 16 934 | 7 281 | 568 | 1 089 | 3 556 | 3 331 | 1 109 |
| Distribution (per cent) | 100 | 43.0 | 3.4 | 6.4 | 21.0 | 19.7 | 6.5 |
| 1988 ¹ | 41 250 | 15 280 | 1 130 | 2 230 | 12 940 | 7 610 | 2 060 |
| Distribution (per cent) | 100 | 37.0 | 2.7 | 5.4 | 31.4 | 18.5 | 5.0 |
| Average annual growth (per cent) | 9.3 | 7.7 | 7.1 | 7.4 | 13.8 | 8.6 | 6.4 |
| <i>Mail tonne-kilometres (millions)</i> | | | | | | | |
| 1978 | 1 347 | 547 | 35 | 23 | 176 | 528 | 38 |
| Distribution (per cent) | 100 | 40.6 | 2.6 | 1.7 | 13.1 | 39.2 | 2.8 |
| 1988 ¹ | 1 975 | 750 | 50 | 45 | 395 | 685 | 50 |
| Distribution (per cent) | 100 | 38.0 | 2.5 | 2.3 | 20.0 | 34.7 | 2.5 |
| Average annual growth (per cent) | 3.9 | 3.2 | 3.6 | 6.9 | 8.4 | 2.6 | 2.8 |
| <i>Total tonne-kilometres performed (millions)</i> | | | | | | | |
| 1978 | 53 444 | 22 664 | 2 305 | 2 988 | 10 998 | 10 961 | 3 528 |
| Distribution (per cent) | 100 | 42.4 | 4.3 | 5.6 | 20.6 | 20.5 | 6.6 |
| 1988 ¹ | 112 600 | 40 000 | 3 830 | 5 570 | 32 600 | 24 230 | 6 370 |
| Distribution (per cent) | 100 | 35.5 | 3.4 | 4.9 | 29.0 | 21.5 | 5.7 |
| Average annual growth (per cent) | 7.7 | 5.8 | 5.2 | 6.4 | 11.5 | 8.3 | 6.1 |
| <i>Weight load factor (per cent)</i> | | | | | | | |
| 1978 | 58 | 59 | 53 | 49 | 61 | 56 | 58 |
| 1988 ¹ | 64 | 66 | 53 | 56 | 69 | 61 | 61 |

1. 1988 data are preliminary.

**Appendix 9B. Domestic scheduled traffic in 1978 and 1988
(by region of airline registration)**

| | World | Europe | Africa | Middle East | Asia and Pacific | North America | Latin America and Caribbean |
|--|---------|---------|--------|-------------|------------------|---------------|-----------------------------|
| <i>Passenger kilometres (millions)</i> | | | | | | | |
| 1978 | 551 523 | 157 967 | 5 376 | 4 945 | 47 603 | 314 931 | 20 701 |
| Distribution (per cent) | 100 | 28.6 | 1.0 | 0.9 | 8.6 | 57.1 | 3.8 |
| 1988 ¹ | 939 700 | 247 300 | 7 600 | 8 200 | 99 200 | 543 500 | 33 900 |
| Distribution (per cent) | 100 | 26.3 | 0.8 | 0.9 | 10.6 | 57.8 | 3.6 |
| Average annual growth (per cent) | 5.5 | 4.6 | 3.5 | 5.2 | 7.6 | 5.6 | 5.1 |
| <i>Freight tonne-kilometres (millions)</i> | | | | | | | |
| 1978 | 9 005 | 2 379 | 65 | 28 | 511 | 5 686 | 336 |
| Distribution (per cent) | 100 | 26.4 | 0.7 | 0.3 | 5.7 | 63.2 | 3.7 |
| 1988 ¹ | 12 360 | 2 800 | 120 | 80 | 1 480 | 7 340 | 540 |
| Distribution (per cent) | 100 | 22.6 | 1.0 | 0.6 | 12.0 | 59.4 | 4.4 |
| Average annual growth (per cent) | 3.2 | 1.6 | 6.3 | 11.1 | 11.2 | 2.6 | 4.9 |
| <i>Mail tonne-kilometres (millions)</i> | | | | | | | |
| 1978 | 1 918 | 544 | 7 | 2 | 53 | 1 302 | 10 |
| Distribution (per cent) | 100 | 28.4 | 0.4 | 0.1 | 2.8 | 67.9 | 0.5 |
| 1988 ¹ | 2 815 | 560 | 10 | 5 | 180 | 2 030 | 30 |
| Distribution (per cent) | 100 | 19.9 | 0.3 | 0.2 | 6.4 | 72.1 | 1.1 |
| Average annual growth (per cent) | 3.9 | 0 | 3.6 | 9.6 | 13.0 | 4.5 | 11.6 |
| <i>Total tonne-kilometres performed (millions)</i> | | | | | | | |
| 1978 | 60 095 | 17 049 | 552 | 475 | 4 350 | 35 563 | 2 106 |
| Distribution (per cent) | 100 | 28.4 | 0.9 | 0.8 | 7.2 | 59.2 | 3.5 |
| 1988 ¹ | 98 580 | 25 470 | 790 | 830 | 9 480 | 58 680 | 3 330 |
| Distribution (per cent) | 100 | 25.8 | 0.8 | 0.9 | 9.6 | 59.5 | 3.4 |
| Average annual growth (per cent) | 5.1 | 4.1 | 3.6 | 5.7 | 8.1 | 5.1 | 4.7 |
| <i>Weight load factor (per cent)</i> | | | | | | | |
| 1978 | 60 | 78 | 58 | 58 | 61 | 54 | 60 |
| 1988 ¹ | 57 | 71 | 55 | 54 | 60 | 53 | 55 |

1. 1988 data are preliminary.

**Appendix 10. World international scheduled traffic
(ranking of States with respect to tonne-kilometres performed)**

| State or group of States | Rank number in | | International tonne-kilometres performed (passenger, freight, mail) | | | | |
|------------------------------|----------------|------|---|--|--------------------|--|---|
| | 1988 | 1978 | 1988 (millions) | 1988 percentage distribution (per cent) | 1978 (millions) | 1978 percentage distribution (per cent) | Average annual increase (per cent) |
| United States | 1 | 1 | 21 345 | 19.0 | 9 297 | 17.4 | 8.7 |
| United Kingdom | 2 | 2 | 10 810 | 9.6 | 5 269 | 9.9 | 7.5 |
| Japan | 3 | 4 | 8 485 | 7.5 | 2 973 | 5.6 | 11.1 |
| Germany, Federal Republic of | 4 | 5 | 6 595 | 5.9 | 2 821 | 5.3 | 8.9 |
| France | 5 | 3 | 6 448 | 5.7 | 3 799 | 7.1 | 5.4 |
| Netherlands, Kingdom of the | 6 | 6 | 4 190 | 3.7 | 1 998 | 3.7 | 7.7 |
| Singapore | 7 | 10 | 4 100 | 3.6 | 1 347 | 2.5 | 11.8 |
| Australia | 8 | 8 | 3 382 | 3.0 | 1 540 | 2.9 | 8.2 |
| Canada | 9 | 7 | 2 880 | 2.6 | 1 663 | 3.1 | 5.6 |
| Republic of Korea | 10 | 14 | 2 870 | 2.5 | 1 084 | 2.0 | 10.2 |
| Italy | 11 | 9 | 2 288 | 2.0 | 1 489 | 2.8 | 4.4 |
| Switzerland | 12 | 11 | 2 239 | 2.0 | 1 329 | 2.5 | 5.4 |
| Thailand | 13 | 25 | 2 002 | 1.8 | 500 | 0.9 | 14.9 |
| Spain | 14 | 13 | 1 871 | 1.7 | 1 159 | 2.2 | 4.9 |
| USSR | 15 | 15 | 1 687 | 1.5 | 1 023 | 1.9 | 5.1 |
| Brazil | 16 | 16 | 1 585 | 1.4 | 829 | 1.6 | 6.7 |
| Scandinavia ¹ | 17 | 12 | 1 415 | 1.3 | 1 232 | 2.3 | 1.4 |
| India | 18 | 17 | 1 385 | 1.2 | 791 | 1.5 | 5.8 |
| Indonesia | 19 | 43 | 1 370 | 1.2 | 195 | 0.4 | 21.5 |
| Israel | 20 | 21 | 1 343 | 1.2 | 642 | 1.2 | 7.7 |
| Saudi Arabia | 21 | 26 | 1 330 | 1.2 | 440 | 0.8 | 11.7 |
| Belgium | 22 | 17 | 1 265 | 1.1 | 791 | 1.5 | 4.8 |
| New Zealand | 23 | 22 | 1 204 | 1.1 | 536 | 1.0 | 8.4 |
| Philippines | 24 | 28 | 1 135 | 1.0 | 393 | 0.7 | 11.2 |
| Malaysia | 25 | 35 | 1 021 | 0.9 | 256 | 0.5 | 14.8 |
| Pakistan | 26 | 23 | 950 | 0.8 | 511 | 1.0 | 6.4 |
| Gulf States ² | 27 | 38 | 830 | 0.7 | 224 | 0.4 | 14.0 |
| Mexico | 28 | 24 | 757 | 0.7 | 510 | 1.0 | 4.0 |
| South Africa | 29 | 19 | 731 | 0.6 | 671 | 1.3 | 0.9 |
| Greece | 30 | 27 | 663 | 0.6 | 394 | 0.7 | 5.3 |
| Total 30 States | | | 98 176 | 87.2 | 45 706 | 85.5 | |
| Other States | | | 14 394 | 12.8 | 7 738 | 14.5 | |
| Total all States | | | 112 570 | 100.0 | 53 444 | 100.0 | 7.7 |

1. Denmark, Norway and Sweden.

2. Bahrain, Oman, Qatar and United Arab Emirates.

**Appendix 11. Major international scheduled airlines
(ranked with respect to international tonne-kilometres performed)**

| Airline | State | Rank number in | | International scheduled tonne-kilometres performed (passengers, freight, mail) | | | | |
|------------------------|-----------------------------|----------------|------|--|--|--------------------|--|--|
| | | 1988 | 1978 | 1988 (millions) | Percentage distribution (per cent) | 1978 (millions) | Percentage distribution (per cent) | Average annual increase (per cent) |
| JAL | Japan | 1 | 4 | 6 994 | 6.2 | 2 872 | 5.4 | 9.3 |
| British Airways | United Kingdom | 2 | 1 | 6 740 | 6.0 | 4 148 | 7.8 | 5.0 |
| Lufthansa | Federal Republic of Germany | 3 | 5 | 6 596 | 5.9 | 2 821 | 5.3 | 8.9 |
| Air France | France | 4 | 3 | 4 980 | 4.4 | 2 973 | 5.6 | 5.3 |
| Pan Am | United States | 5 | 2 | 4 322 | 3.8 | 3 950 | 7.4 | 0.9 |
| KLM | Kingdom of the Netherlands | 6 | 6 | 4 115 | 3.7 | 1 957 | 3.7 | 7.7 |
| SIA | Singapore | 7 | 10 | 4 100 | 3.6 | 1 346 | 2.5 | 11.8 |
| Northwest | United States | 9 | 25 | 3 837 | 3.4 | 576 | 1.1 | 20.9 |
| Qantas | Australia | 8 | 8 | 3 382 | 3.0 | 1 540 | 2.9 | 8.2 |
| Cathay Pacific | United Kingdom | 10 | 24 | 3 084 | 2.7 | 610 | 1.1 | 17.6 |
| Korean Air | Republic of Korea | 11 | 15 | 2 870 | 2.5 | 1 084 | 2.0 | 10.2 |
| Flying Tiger | United States | 12 | 21 | 2 686 | 2.4 | 691 | 1.3 | 14.5 |
| TWA | United States | 13 | 7 | 2 560 | 2.3 | 1 701 | 3.2 | 4.2 |
| Alitalia | Italy | 14 | 9 | 2 270 | 2.0 | 1 488 | 2.8 | 4.3 |
| Swissair | Switzerland | 15 | 11 | 2 229 | 2.0 | 1 329 | 2.5 | 5.3 |
| Iberia | Spain | 16 | 13 | 1 871 | 1.7 | 1 159 | 2.2 | 4.9 |
| Thai International | Thailand | 17 | 28 | 1 836 | 1.6 | 497 | 0.9 | 14.0 |
| American Airlines | United States | 18 | 29 | 1 817 | 1.6 | 463 | 0.9 | 14.7 |
| Aeroflot | USSR | 19 | 16 | 1 687 | 1.5 | 1 023 | 1.9 | 5.1 |
| Air Canada | Canada | 20 | 14 | 1 586 | 1.4 | 1 107 | 2.1 | 3.7 |
| Varig | Brazil | 21 | 19 | 1 563 | 1.4 | 789 | 1.5 | 7.1 |
| SAS | Denmark, Norway, Sweden | 22 | 12 | 1 415 | 1.3 | 1 233 | 2.3 | 1.4 |
| El Al | Israel | 23 | 23 | 1 343 | 1.2 | 642 | 1.2 | 7.7 |
| Saudia | Saudi Arabia | 24 | 30 | 1 330 | 1.2 | 440 | 0.8 | 11.7 |
| Air India | India | 25 | 20 | 1 322 | 1.2 | 777 | 1.5 | 5.5 |
| Sabena | Belgium | 26 | 18 | 1 265 | 1.1 | 791 | 1.5 | 4.8 |
| Canadian Airlines Intl | Canada | 27 | 26 | 1 198 | 1.1 | 548 | 1.0 | 8.1 |
| Air New Zealand | New Zealand | 28 | 27 | 1 189 | 1.1 | 536 | 1.0 | 8.3 |
| MAS | Malaysia | 29 | 41 | 1 021 | 0.9 | 256 | 0.5 | 14.8 |
| UTA | France | 30 | 17 | 1 015 | 0.9 | 826 | 1.5 | 2.1 |
| Total 30 airlines | | | | 82 223 | 73.0 | 40 173 | 75.2 | |
| Other airlines | | | | 30 347 | 27.0 | 13 271 | 24.8 | |
| Total all airlines | | | | 112 570 | 100.0 | 53 444 | 100.0 | 7.7 |

Appendix 12. Operating revenues and expenses — 1978-1988
(the scheduled airlines of ICAO Contracting States¹, total domestic and international services)

| Description | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ² |
|--|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|-------------------|
| TOTAL FIGURES (millions of dollars) | | | | | | | | | | | |
| <i>OPERATING REVENUES</i> | | | | | | | | | | | |
| Scheduled services | | | | | | | | | | | |
| Passenger | 46 625 | 56 483 | 69 930 | 74 433 | 74 860 | 77 600 | 81 720 | 87 000 | 94 900 | 111 820 | 125 800 |
| Freight | 6 463 | 7 709 | 9 468 | 9 523 | 9 560 | 10 830 | 12 560 | 13 300 | 15 200 | 17 450 | 20 000 |
| Mail | 974 | 1 141 | 1 501 | 1 425 | 1 480 | 1 470 | 1 500 | 1 700 | 1 800 | 1 970 | 2 200 |
| Total scheduled services | 54 062 | 65 333 | 80 899 | 85 381 | 85 900 | 89 900 | 95 780 | 102 000 | 111 900 | 131 240 | 148 000 |
| Non-scheduled services | 2 076 | 2 418 | 3 149 | 3 682 | 3 100 | 2 800 | 3 010 | 3 500 | 4 500 | 5 410 | 5 600 |
| Incidental | 2 630 | 3 003 | 3 628 | 3 929 | 4 240 | 5 600 | 6 610 | 6 700 | 8 200 | 10 350 | 12 400 |
| Total operating revenues | 58 769 | 70 755 | 87 676 | 92 992 | 93 240 | 98 300 | 105 400 | 112 200 | 124 600 | 147 000 | 166 000 |
| <i>OPERATING EXPENSES</i> | | | | | | | | | | | |
| Flight operations | 16 700 | 24 045 | 34 345 | 36 677 | 34 600 | 33 050 | 33 350 | 34 930 | 32 710 | 36 790 | 40 500 |
| Flight crew salaries and expenses | 4 756 | 5 687 | 6 856 | 6 792 | 6 800 | 6 870 | 6 900 | 7 250 | 8 300 | 9 480 | 10 600 |
| Aircraft fuel and oil | 10 220 | 15 995 | 24 881 | 27 318 | 25 420 | 23 610 | 23 370 | 23 780 | 19 100 | 20 740 | 22 700 |
| Other (insurance, rental, training, etc.) | 1 724 | 2 362 | 2 608 | 2 567 | 2 380 | 2 570 | 3 080 | 3 900 | 5 300 | 6 570 | 7 200 |
| Maintenance and overhaul | 6 854 | 8 013 | 9 283 | 9 640 | 9 150 | 9 620 | 10 120 | 11 070 | 13 850 | 15 900 | 18 200 |
| Depreciation and amortization | 4 380 | 4 699 | 5 449 | 5 968 | 6 330 | 6 920 | 7 240 | 7 770 | 9 070 | 11 050 | 12 200 |
| User charges and station expenses (total) | 9 920 | 11 895 | 13 713 | 13 828 | 14 540 | 15 260 | 16 080 | 17 340 | 21 340 | 24 770 | 27 800 |
| Landing and associated airport charges | 2 208 | 2 679 | 3 099 | 3 241 | 3 100 | 3 160 | 3 040 | 3 540 | 4 270 | 5 100 | 5 800 |
| Route facility charges | 668 | 798 | 992 | 1 096 | 1 410 | 1 430 | 1 400 | 1 620 | 1 890 | 2 170 | 2 300 |
| Station expenses | 7 044 | 8 418 | 9 622 | 9 490 | 10 030 | 10 670 | 11 640 | 12 180 | 15 180 | 17 500 | 19 700 |
| Passenger services | 5 618 | 6 718 | 7 967 | 8 085 | 8 540 | 8 810 | 9 190 | 10 310 | 12 140 | 14 540 | 16 400 |
| Ticketing, sales and promotion | 8 601 | 10 390 | 12 484 | 13 800 | 14 510 | 15 810 | 16 560 | 18 470 | 21 480 | 24 440 | 27 500 |
| General, administrative and other operating expenses | 3 595 | 4 258 | 5 069 | 5 687 | 5 730 | 6 730 | 7 760 | 8 210 | 9 410 | 12 310 | 13 900 |
| Total operating expenses | 55 669 | 70 109 | 88 310 | 93 684 | 93 400 | 96 200 | 100 300 | 108 100 | 120 000 | 139 800 | 156 500 |
| Operating result (profit or loss (-)) | 3 100 | 736 | -635 | -692 | -160 | 2 100 | 5 100 | 4 100 | 4 600 | 7 200 | 9 500 |
| Operating result as percentage of operating revenue | 5.3% | 1.0% | -0.7% | -0.7% | -0.2% | 2.1% | 4.8% | 3.7% | 3.7% | 4.9% | 5.7% |
| Net result | 2 412 | 588 | -919 | -1150 | -1300 | -700 | 2 000 | 2 100 | 1 500 | 2 500 | - |
| Net result as percentage of operating revenue | 4.1% | 0.8% | -1.0% | -1.2% | -1.4% | -0.7% | 1.9% | 1.9% | 1.2% | 1.7% | - |

PERCENTAGE DISTRIBUTION OF TOTAL OPERATING REVENUES AND EXPENSES

OPERATING REVENUES

| | | | | | | | | | | | |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Scheduled services | | | | | | | | | | | |
| Passenger | 79.3 | 79.8 | 79.8 | 80.1 | 80.2 | 78.9 | 77.5 | 77.5 | 76.2 | 76.1 | 75.8 |
| Freight | 11.0 | 10.9 | 10.8 | 10.2 | 10.3 | 11.0 | 11.9 | 11.9 | 12.2 | 11.9 | 12.0 |
| Mail | 1.7 | 1.6 | 1.7 | 1.5 | 1.6 | 1.5 | 1.4 | 1.5 | 1.4 | 1.3 | 1.3 |
| Total scheduled services | 92.0 | 92.3 | 92.3 | 91.8 | 92.1 | 91.4 | 90.8 | 90.9 | 89.8 | 89.3 | 89.1 |
| Non-scheduled services | 3.5 | 3.4 | 3.6 | 4.0 | 3.3 | 2.9 | 2.9 | 3.1 | 3.6 | 3.7 | 3.4 |
| Incidental | 4.5 | 4.2 | 4.1 | 4.2 | 4.6 | 5.7 | 6.3 | 6.0 | 6.6 | 7.0 | 7.5 |
| Total operating revenues | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

| Description | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ² |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|
| OPERATING EXPENSES | | | | | | | | | | | |
| Flight operations | 30.0 | 34.3 | 38.9 | 39.1 | 37.0 | 34.3 | 33.3 | 32.3 | 27.3 | 26.3 | 25.9 |
| Flight crew salaries and expenses | 8.5 | 8.1 | 7.8 | 7.2 | 7.3 | 7.1 | 6.9 | 6.7 | 6.9 | 6.8 | 6.8 |
| Aircraft fuel and oil | 18.4 | 22.8 | 28.2 | 29.2 | 27.2 | 24.5 | 23.3 | 22.0 | 15.9 | 14.8 | 14.5 |
| Other (insurance, rental, training, etc.) | 3.1 | 3.4 | 2.9 | 2.7 | 2.6 | 2.7 | 3.1 | 3.6 | 4.5 | 4.7 | 4.6 |
| Maintenance and overhaul | 12.3 | 11.4 | 10.5 | 10.3 | 9.8 | 10.0 | 10.1 | 10.2 | 11.5 | 11.4 | 11.5 |
| Depreciation and amortization | 7.9 | 6.7 | 6.2 | 6.4 | 6.8 | 7.2 | 7.2 | 7.2 | 7.6 | 7.9 | 7.8 |
| User charges and station expenses (total) | 17.8 | 17.0 | 15.5 | 14.8 | 15.6 | 15.9 | 16.0 | 16.1 | 17.8 | 17.7 | 17.8 |
| Landing and associated airport charges | 4.0 | 3.8 | 3.5 | 3.5 | 3.3 | 3.3 | 3.0 | 3.3 | 3.6 | 3.7 | 3.7 |
| Route facility charges | 1.2 | 1.1 | 1.1 | 1.2 | 1.5 | 1.5 | 1.4 | 1.5 | 1.6 | 1.5 | 1.5 |
| Station expenses | 12.7 | 12.0 | 10.9 | 10.1 | 10.7 | 11.1 | 11.6 | 11.3 | 12.7 | 12.5 | 12.6 |
| Passenger services | 10.1 | 9.6 | 9.0 | 8.6 | 9.1 | 9.2 | 9.2 | 9.5 | 10.1 | 10.4 | 10.5 |
| Ticketing, sales and promotion | 15.5 | 14.8 | 14.1 | 14.7 | 15.5 | 16.4 | 16.5 | 17.1 | 17.9 | 17.5 | 17.6 |
| General, administrative and other operating expenses | 6.4 | 6.1 | 5.7 | 6.1 | 6.1 | 7.0 | 7.7 | 7.6 | 7.8 | 8.8 | 8.9 |
| Total operating expenses | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

OPERATING REVENUES AND EXPENSES PER TKP (cents)**OPERATING REVENUES**

| | | | | | | | | | | | |
|-------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| Scheduled services | | | | | | | | | | | |
| Passenger | 64.3 | 68.3 | 83.0 | 86.4 | 84.6 | 84.0 | 82.0 | 80.9 | 82.9 | 88.5 | 93.3 |
| Freight | 27.1 | 29.7 | 35.2 | 33.6 | 32.6 | 33.1 | 33.8 | 35.6 | 37.3 | 38.1 | 39.0 |
| Mail | 34.8 | 38.9 | 47.2 | 43.4 | 43.9 | 41.5 | 39.1 | 43.3 | 44.7 | 47.1 | 51.2 |
| Total scheduled services | 54.6 | 58.6 | 70.8 | 72.5 | 70.9 | 69.9 | 68.1 | 68.6 | 70.3 | 74.4 | 77.7 |
| Non-scheduled services | 32.4 | 41.8 | 48.3 | 58.1 | 52.8 | 49.8 | 49.4 | 49.2 | 53.1 | 54.7 | 56.9 |
| Over-all average ³ | 55.7 | 60.3 | 72.5 | 74.9 | 73.4 | 73.2 | 71.8 | 72.0 | 74.3 | 78.9 | 82.9 |

OPERATING EXPENSES

| | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|------|------|
| Flight operations | 15.8 | 20.4 | 28.4 | 29.6 | 27.4 | 24.6 | 22.7 | 22.4 | 19.5 | 19.8 | 20.2 |
| Flight crew salaries and expenses | 4.5 | 4.8 | 5.7 | 5.5 | 5.4 | 5.1 | 4.7 | 4.7 | 4.9 | 5.1 | 5.3 |
| Aircraft fuel and oil | 9.7 | 13.6 | 20.6 | 22.1 | 20.1 | 17.6 | 15.9 | 15.2 | 11.4 | 11.1 | 11.3 |
| Other (insurance, rental, training, etc.) | 1.7 | 2.0 | 2.2 | 2.0 | 1.9 | 1.9 | 2.1 | 2.5 | 3.2 | 3.6 | 3.6 |
| Maintenance and overhaul | 6.5 | 6.8 | 7.7 | 7.8 | 7.3 | 7.2 | 6.9 | 7.1 | 8.3 | 8.6 | 9.1 |
| Depreciation and amortization | 4.2 | 4.0 | 4.5 | 4.8 | 5.0 | 5.2 | 4.9 | 5.0 | 5.4 | 5.9 | 6.1 |
| User charges and station expenses (total) | 9.4 | 10.1 | 11.4 | 11.1 | 11.5 | 11.4 | 11.0 | 11.1 | 12.7 | 13.3 | 13.8 |
| Landing and associated airport charges | 2.1 | 2.3 | 2.6 | 2.6 | 2.5 | 2.4 | 2.1 | 2.3 | 2.5 | 2.7 | 2.9 |
| Route facility charges | 0.6 | 0.7 | 0.8 | 0.9 | 1.1 | 1.1 | 1.0 | 1.0 | 1.1 | 1.2 | 1.1 |
| Station expenses | 6.7 | 7.2 | 8.0 | 7.7 | 7.9 | 7.9 | 7.9 | 7.8 | 9.1 | 9.4 | 9.8 |
| Passenger services | 5.3 | 5.7 | 6.6 | 6.5 | 6.8 | 6.6 | 6.2 | 6.6 | 7.2 | 7.8 | 8.2 |
| Ticketing, sales and promotion | 8.2 | 8.9 | 10.3 | 11.1 | 11.5 | 11.7 | 11.3 | 11.8 | 12.8 | 13.1 | 13.7 |
| General, administrative and other operating expenses | 3.4 | 3.6 | 4.2 | 4.6 | 4.5 | 5.0 | 5.3 | 5.3 | 5.6 | 6.6 | 6.9 |
| Over-all average | 52.8 | 59.5 | 73.1 | 75.5 | 74.0 | 71.7 | 68.3 | 69.3 | 71.5 | 75.1 | 78.1 |

PASSENGER REVENUE PER PASSENGER-KILOMETRE (cents)

| | | | | | | | | | | | |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Scheduled services | 5.8 | 6.2 | 7.5 | 7.8 | 7.7 | 7.6 | 7.4 | 7.3 | 7.5 | 8.0 | 8.4 |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

| Description | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ² |
|--|------|------|------|------|------|------|------|------|------|------|-------------------|
| OPERATING REVENUES AND EXPENSES PER TONNE-KILOMETRE AVAILABLE (cents) | | | | | | | | | | | |
| <i>OPERATING REVENUES</i> | | | | | | | | | | | |
| Scheduled services | 30.8 | 33.6 | 39.2 | 40.5 | 40.0 | 40.1 | 39.5 | 39.8 | 40.3 | 44.0 | 46.3 |
| Non-scheduled services | 22.5 | 27.6 | 31.1 | 37.5 | 33.6 | 31.1 | 32.1 | 30.8 | 36.0 | 37.2 | 38.0 |
| Over-all average ³ | 31.8 | 34.8 | 40.5 | 42.2 | 41.6 | 42.1 | 41.9 | 41.9 | 43.0 | 47.0 | 49.7 |
| <i>OPERATING EXPENSES</i> | | | | | | | | | | | |
| Flight operations | 9.0 | 11.8 | 15.9 | 16.7 | 15.4 | 14.2 | 13.2 | 13.1 | 11.3 | 11.7 | 12.1 |
| Flight crew salaries and expenses | 2.6 | 2.8 | 3.2 | 3.1 | 3.0 | 3.0 | 2.7 | 2.7 | 2.9 | 3.0 | 3.2 |
| Aircraft fuel and oil | 5.5 | 7.9 | 11.5 | 12.4 | 11.3 | 10.1 | 9.3 | 8.9 | 6.6 | 6.6 | 6.8 |
| Other (insurance, rental, training, etc.) | 1.1 | 1.2 | 1.2 | 1.2 | 1.1 | 1.1 | 1.2 | 1.5 | 1.8 | 2.1 | 2.1 |
| Maintenance and overhaul | 3.7 | 3.9 | 4.3 | 4.4 | 4.1 | 4.1 | 4.0 | 4.1 | 4.8 | 5.1 | 5.4 |
| Depreciation and amortization | 2.4 | 2.3 | 2.5 | 2.7 | 2.8 | 3.0 | 2.9 | 2.9 | 3.1 | 3.5 | 3.7 |
| User charges and station expenses (total) | 5.4 | 5.9 | 6.3 | 6.3 | 6.5 | 6.5 | 6.4 | 6.5 | 7.4 | 7.9 | 8.3 |
| Landing and associated airport charges | 1.2 | 1.3 | 1.4 | 1.5 | 1.4 | 1.4 | 1.2 | 1.3 | 1.5 | 1.6 | 1.7 |
| Route facility charges | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 | 0.7 |
| Station expenses | 3.8 | 4.1 | 4.4 | 4.3 | 4.5 | 4.5 | 4.6 | 4.6 | 5.2 | 5.6 | 5.9 |
| Passenger services | 3.0 | 3.3 | 3.7 | 3.7 | 3.8 | 3.7 | 3.6 | 3.8 | 4.2 | 4.6 | 4.9 |
| Ticketing, sales and promotion | 4.7 | 5.1 | 5.8 | 6.2 | 6.5 | 6.8 | 6.6 | 6.9 | 7.4 | 7.8 | 8.2 |
| General, administrative and other operating expenses | 1.9 | 2.1 | 2.3 | 2.5 | 2.6 | 2.9 | 3.1 | 3.1 | 3.2 | 3.9 | 4.2 |
| Over-all average | 30.1 | 34.4 | 40.7 | 42.5 | 41.7 | 41.2 | 39.8 | 40.4 | 41.4 | 44.6 | 46.8 |

1. Excluding domestic operations within the USSR.

2. Preliminary estimates.

3. Includes incidental revenues.

Source

ICAO Digests of Statistics, Series F.

Appendix 13. Estimated operating revenues and expenses — 1978-1987
(the scheduled airlines of ICAO Contracting States; international services only)

| Description | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| TOTAL FIGURES (millions of dollars) | | | | | | | | | | |
| <i>OPERATING REVENUES</i> | | | | | | | | | | |
| Scheduled services | | | | | | | | | | |
| Passenger | 23 552 | 29 371 | 36 465 | 37 772 | 38 123 | 38 703 | 39 540 | 42 530 | 47 450 | 57 730 |
| Freight | 4 678 | 5 770 | 7 094 | 7 213 | 7 119 | 7 305 | 7 945 | 8 310 | 9 580 | 11 300 |
| Mail | 596 | 695 | 818 | 794 | 806 | 780 | 805 | 800 | 900 | 1 150 |
| Total scheduled services | 28 825 | 35 836 | 44 377 | 45 779 | 46 048 | 46 788 | 48 290 | 51 640 | 57 930 | 70 180 |
| Non-scheduled services | 1 929 | 2 014 | 2 755 | 2 854 | 2 572 | 2 475 | 2 640 | 3 170 | 4 520 | 6 020 |
| Incidental | 2 368 | 2 942 | 3 330 | 3 195 | 3 420 | 4 253 | 4 740 | 4 970 | 6 250 | 7 620 |
| Total operating revenues | 33 122 | 40 792 | 50 461 | 51 828 | 52 040 | 53 517 | 55 670 | 59 780 | 68 700 | 83 820 |
| <i>OPERATING EXPENSES</i> | | | | | | | | | | |
| Flight operations | | | | | | | | | | |
| Flight crew salaries and expenses | 2 027 | 2 559 | 2 987 | 2 849 | 2 840 | 2 766 | 2 695 | 2 870 | 3 600 | 4 380 |
| Aircraft fuel and oil | 5 382 | 8 668 | 13 853 | 14 964 | 13 860 | 12 400 | 12 000 | 12 680 | 10 600 | 10 950 |
| Other (insurance, rental, training, etc.) | 1 464 | 1 680 | 1 921 | 1 907 | 1 905 | 2 000 | 2 200 | 2 230 | 2 980 | 3 690 |
| Maintenance and overhaul | 3 819 | 4 480 | 5 258 | 5 039 | 4 974 | 5 217 | 5 404 | 6 090 | 7 610 | 8 850 |
| Depreciation and amortization | 2 561 | 2 726 | 3 244 | 3 419 | 3 502 | 3 689 | 4 002 | 4 140 | 5 280 | 6 090 |
| User charges and station expenses (total) | 5 553 | 6 716 | 7 897 | 7 800 | 7 720 | 7 676 | 7 814 | 8 730 | 11 050 | 12 860 |
| Landing and associated airport charges | 1 616 | 1 835 | 2 287 | 2 211 | 2 120 | 2 060 | 1 974 | 2 350 | 2 810 | 3 340 |
| Route facility charges | 557 | 660 | 755 | 959 | 990 | 1 026 | 1 060 | 1 090 | 1 280 | 1 610 |
| Station expenses | 3 380 | 4 221 | 4 855 | 4 630 | 4 610 | 4 590 | 4 780 | 5 290 | 6 960 | 7 910 |
| Passenger services | 3 231 | 3 893 | 4 705 | 4 671 | 4 674 | 4 775 | 4 975 | 5 820 | 7 100 | 8 650 |
| Ticketing, sales and promotion | 5 476 | 6 577 | 8 278 | 8 690 | 8 677 | 9 223 | 9 501 | 10 380 | 12 550 | 15 000 |
| General, administrative and other operating expenses | 2 474 | 3 015 | 3 539 | 3 448 | 3 598 | 3 898 | 4 189 | 4 440 | 5 150 | 7 400 |
| Total operating expenses | 32 037 | 40 314 | 51 682 | 52 787 | 51 750 | 51 645 | 52 780 | 57 380 | 65 920 | 77 870 |
| Operating result | 1 085 | 478 | -1 221 | -959 | 290 | 1 872 | 2 875 | 2 400 | 2 780 | 5 950 |
| Operating result as percentage of operating revenue | 3.27 | 1.17 | -2.42 | -1.85 | 0.56 | 3.50 | 5.17 | 4.01 | 4.05 | 7.10 |
| Net result | 668 | 280 | -1 696 | -1 565 | -756 | -414 | 1 169 | 1 250 | 1 300 | 2 700 |
| Net result as percentage of operating revenue | 2.02 | 0.69 | -3.36 | -3.02 | -1.45 | 0.77 | 2.10 | 2.09 | 1.89 | 3.22 |

PERCENTAGE DISTRIBUTION OF TOTAL OPERATING REVENUES AND EXPENSES

OPERATING REVENUES

| | | | | | | | | | | |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Scheduled services | | | | | | | | | | |
| Passenger | 71.1 | 72.0 | 72.3 | 72.9 | 73.3 | 72.3 | 71.0 | 71.2 | 69.0 | 68.9 |
| Freight | 14.1 | 14.1 | 14.1 | 13.9 | 13.7 | 13.6 | 14.3 | 13.9 | 14.0 | 13.4 |
| Mail | 1.8 | 1.7 | 1.6 | 1.5 | 1.5 | 1.5 | 1.5 | 1.3 | 1.3 | 1.4 |
| Total scheduled services | 87.0 | 87.9 | 87.9 | 88.3 | 88.5 | 87.4 | 86.8 | 86.4 | 84.3 | 83.7 |
| Non-scheduled services | 5.8 | 4.9 | 5.5 | 5.5 | 4.9 | 4.6 | 4.7 | 5.3 | 6.6 | 7.2 |
| Incidental | 7.2 | 7.2 | 6.6 | 6.2 | 6.6 | 8.0 | 8.5 | 8.3 | 9.1 | 9.1 |
| Total operating revenues | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

| Description | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <i>OPERATING EXPENSES</i> | | | | | | | | | | |
| Flight operations | 27.9 | 32.0 | 36.3 | 37.4 | 36.0 | 33.3 | 32.0 | 31.0 | 26.1 | 24.4 |
| Flight crew salaries and expenses | 6.5 | 6.4 | 5.8 | 5.4 | 5.5 | 5.4 | 5.1 | 5.0 | 5.5 | 5.6 |
| Aircraft fuel and oil | 16.8 | 21.5 | 26.8 | 28.4 | 26.8 | 24.0 | 22.7 | 22.1 | 16.1 | 14.1 |
| Other (insurance, rental, training, etc.) | 4.6 | 4.2 | 3.7 | 3.6 | 3.7 | 3.9 | 4.2 | 3.9 | 4.5 | 4.7 |
| Maintenance and overhaul | 11.9 | 11.1 | 10.2 | 9.5 | 9.6 | 10.1 | 10.2 | 10.6 | 11.5 | 11.4 |
| Depreciation and amortization | 8.0 | 6.7 | 6.3 | 6.5 | 6.7 | 7.1 | 7.6 | 7.2 | 8.0 | 7.8 |
| User charges and station expenses (total) | 17.3 | 16.7 | 15.3 | 14.8 | 14.9 | 14.9 | 14.8 | 15.2 | 16.8 | 16.5 |
| Landing and associated airport charges | 5.0 | 4.6 | 4.4 | 4.2 | 4.1 | 4.0 | 3.8 | 4.1 | 4.3 | 4.3 |
| Route facility charges | 1.7 | 1.6 | 1.5 | 1.8 | 1.9 | 2.0 | 2.0 | 1.9 | 1.9 | 2.1 |
| Station expenses | 10.6 | 10.5 | 9.4 | 8.8 | 8.9 | 8.9 | 9.0 | 9.2 | 10.6 | 10.1 |
| Passenger services | 10.1 | 9.7 | 9.1 | 8.8 | 9.0 | 9.2 | 9.4 | 10.2 | 10.8 | 11.1 |
| Ticketing, sales and promotion | 17.1 | 16.3 | 16.0 | 16.5 | 16.8 | 17.9 | 18.0 | 18.1 | 19.0 | 19.3 |
| General, administrative and other operating expenses | 7.7 | 7.5 | 6.9 | 6.5 | 7.0 | 7.5 | 8.0 | 7.7 | 7.8 | 9.5 |
| Total operating expenses | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| <i>OPERATING REVENUES</i> | | | | | | | | | | |
| Scheduled services | | | | | | | | | | |
| Passenger | 67.1 | 73.4 | 85.8 | 83.6 | 83.6 | 82.7 | 77.8 | 78.4 | 85.5 | 91.4 |
| Freight | 27.6 | 30.5 | 35.0 | 33.2 | 31.5 | 29.1 | 27.6 | 28.3 | 29.7 | 30.8 |
| Mail | 44.2 | 49.3 | 54.2 | 50.6 | 49.3 | 45.9 | 44.0 | 42.8 | 47.5 | 58.6 |
| Total scheduled services | 54.0 | 59.4 | 69.0 | 66.9 | 66.0 | 63.6 | 59.3 | 60.4 | 64.6 | 68.9 |
| Non-scheduled services | 37.6 | 42.3 | 51.2 | 55.5 | 53.7 | 58.0 | 56.5 | 57.0 | 60.2 | 73.3 |
| Over-all average ¹ | 56.6 | 62.7 | 72.4 | 70.4 | 69.7 | 68.7 | 64.6 | 65.6 | 70.7 | 76.2 |
| <i>OPERATING EXPENSES</i> | | | | | | | | | | |
| Flight operations | 15.3 | 19.8 | 26.9 | 26.8 | 25.0 | 22.0 | 19.6 | 19.5 | 17.7 | 17.3 |
| Flight crew salaries and expenses | 3.6 | 3.9 | 4.3 | 3.9 | 3.8 | 3.5 | 3.1 | 3.2 | 3.7 | 4.0 |
| Aircraft fuel and oil | 13.3 | 19.9 | 20.3 | 18.6 | 15.9 | 13.9 | 13.9 | 13.9 | 10.9 | 10.0 |
| Other (insurance, rental, training, etc.) | 2.5 | 2.6 | 2.8 | 2.6 | 2.6 | 2.6 | 2.6 | 2.4 | 3.1 | 3.3 |
| Maintenance and overhaul | 6.5 | 6.9 | 7.6 | 6.9 | 6.7 | 6.7 | 6.3 | 6.7 | 7.8 | 8.0 |
| Depreciation and amortization | 4.4 | 4.2 | 4.7 | 4.6 | 4.7 | 4.7 | 4.6 | 4.5 | 5.4 | 5.5 |
| User charges and station expenses (total) | 9.5 | 10.3 | 11.3 | 10.6 | 10.3 | 9.9 | 9.1 | 9.6 | 11.4 | 11.7 |
| Landing and associated airport charges | 2.7 | 2.8 | 3.3 | 3.0 | 2.8 | 2.7 | 2.3 | 2.6 | 2.9 | 3.0 |
| Route facility charges | 1.0 | 1.0 | 1.1 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.3 | 1.5 |
| Station expenses | 5.8 | 6.5 | 7.0 | 6.3 | 6.2 | 5.9 | 5.6 | 5.8 | 7.2 | 7.2 |
| Passenger services | 5.5 | 6.0 | 6.8 | 6.4 | 6.3 | 6.1 | 5.8 | 6.4 | 7.3 | 7.9 |
| Ticketing, sales and promotion | 9.4 | 10.1 | 11.9 | 11.8 | 11.6 | 11.8 | 11.0 | 11.4 | 12.9 | 13.6 |
| General, administrative and other operating expenses | 4.3 | 4.6 | 5.1 | 4.7 | 4.8 | 5.0 | 4.9 | 4.9 | 5.3 | 6.7 |
| Over-all average ¹ | 54.8 | 62.0 | 74.2 | 71.7 | 69.4 | 66.3 | 61.3 | 63.0 | 67.8 | 70.7 |
| PASSENGER REVENUE PER PASSENGER-KILOMETRE (cents) | | | | | | | | | | |
| Scheduled services | 6.04 | 6.61 | 7.78 | 7.52 | 7.68 | 7.58 | 7.12 | 7.21 | 7.88 | 8.42 |

| Description | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|--|------|------|------|------|------|------|------|------|------|------|
| OPERATING REVENUES AND EXPENSES PER TONNE-KILOMETRE AVAILABLE (cents) | | | | | | | | | | |
| <i>OPERATING REVENUES</i> | | | | | | | | | | |
| Scheduled services | 31.2 | 35.0 | 39.8 | 39.2 | 38.6 | 38.2 | 36.7 | 36.8 | 39.1 | 43.8 |
| Non-scheduled services | 23.4 | 27.8 | 33.4 | 36.9 | 34.4 | 36.9 | 36.2 | 36.3 | 41.4 | 51.4 |
| Over-all average ² | 32.9 | 37.2 | 42.2 | 41.6 | 41.0 | 41.4 | 40.1 | 40.1 | 43.2 | 48.8 |
| <i>OPERATING EXPENSES</i> | | | | | | | | | | |
| Flight operations | 8.9 | 11.8 | 15.7 | 15.8 | 14.7 | 13.3 | 12.2 | 11.9 | 10.8 | 11.1 |
| Flight crew salaries and expenses | 2.1 | 2.3 | 2.5 | 2.3 | 2.3 | 2.1 | 1.9 | 1.9 | 2.3 | 2.6 |
| Aircraft fuel and oil | 5.4 | 7.9 | 11.6 | 12.0 | 10.9 | 9.6 | 8.7 | 8.5 | 6.6 | 6.4 |
| Other (insurance, rental, training, etc.) | 1.5 | 1.5 | 1.6 | 1.5 | 1.5 | 1.6 | 1.6 | 1.5 | 1.9 | 2.1 |
| Maintenance and overhaul | 3.8 | 4.1 | 4.4 | 4.1 | 3.9 | 4.0 | 3.9 | 4.1 | 4.8 | 5.1 |
| Depreciation and amortization | 2.5 | 2.5 | 2.7 | 2.8 | 2.8 | 2.9 | 2.9 | 2.8 | 3.3 | 3.5 |
| User charges and station expenses (total) | 5.5 | 6.1 | 6.6 | 6.3 | 6.1 | 6.0 | 5.6 | 5.8 | 6.9 | 7.5 |
| Landing and associated airport charges | 1.6 | 1.7 | 1.9 | 1.8 | 1.7 | 1.6 | 1.4 | 1.6 | 1.7 | 2.0 |
| Route facility charges | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 | 0.8 | 0.9 |
| Station expenses | 3.3 | 3.9 | 4.1 | 3.7 | 3.6 | 3.6 | 3.4 | 3.5 | 4.4 | 4.6 |
| Passenger services | 3.2 | 3.6 | 3.9 | 3.8 | 3.7 | 3.7 | 3.6 | 3.9 | 4.5 | 5.0 |
| Ticketing, sales and promotion | 5.4 | 6.0 | 6.9 | 7.0 | 6.8 | 7.1 | 6.8 | 7.0 | 7.9 | 8.7 |
| General, administrative and other | | | | | | | | | | |
| Operating expenses | 2.5 | 2.8 | 3.0 | 2.8 | 2.8 | 3.0 | 3.0 | 3.0 | 3.2 | 4.3 |
| Over-all average | 31.8 | 36.8 | 43.2 | 42.4 | 40.8 | 40.0 | 38.0 | 38.5 | 41.4 | 45.2 |

1. Includes incidental revenues.

Source:

ICAO Digests of Statistics, Series F.

Appendix 14. Consolidated balance sheet — 1978-1988
(scheduled airlines of ICAO Contracting States¹; in millions of U.S. dollars)

| Assets and liabilities | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ² |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-------------------|
| <i>ASSETS</i> | | | | | | | | | | | |
| 1. Current assets | 18 894 | 21 655 | 24 418 | 23 846 | 25 101 | 28 990 | 32 518 | 36 060 | 40 850 | 47 460 | 53 200 |
| 2. Equipment purchase funds | 2 073 | 2 416 | 2 494 | 1 936 | 1 753 | 1 590 | 1 684 | 2 490 | 2 420 | 3 550 | 3 700 |
| 3. Other special funds | 125 | 368 | 369 | 1 362 | 540 | 421 | 660 | 990 | 1 390 | 1 530 | 1 800 |
| 4. Flight equipment before depreciation | 50 801 | 59 211 | 68 645 | 73 251 | 76 719 | 80 709 | 85 018 | 90 200 | 106 420 | 124 590 | 139 500 |
| 4.1 Less: reserve for depreciation | -23 849 | -28 011 | -28 293 | -28 942 | -31 580 | -31 065 | -33 993 | -35 860 | -41 070 | -49 020 | -54 600 |
| 4.2 Flight equipment after depreciation | 26 952 | 31 200 | 40 352 | 44 309 | 45 139 | 49 644 | 51 025 | 54 340 | 65 350 | 75 570 | 84 900 |
| 5. Ground property and equipment before depreciation | 10 291 | 11 926 | 14 113 | 15 720 | 17 210 | 18 674 | 20 515 | 22 450 | 25 970 | 29 730 | 33 500 |
| 5.1 Less: reserve for depreciation | -5 036 | -4 277 | -6 112 | -7 220 | -7 911 | -8 453 | -9 575 | -10 190 | -11 680 | -13 680 | -15 500 |
| 5.2 Ground property and equipment after depreciation | 5 255 | 7 649 | 8 001 | 8 500 | 9 299 | 10 221 | 10 940 | 12 260 | 14 290 | 16 050 | 18 000 |
| 6. Land | 230 | 230 | 328 | 254 | 411 | 401 | 602 | 420 | 500 | 740 | 900 |
| 7. Investments in affiliated companies | 1 325 | 1 469 | 1 080 | 2 110 | 1 921 | 1 265 | 1 543 | 1 460 | 1 960 | 2 760 | 2 800 |
| 8. Deferred charges | 605 | 974 | 1 210 | 1 089 | 1 353 | 1 868 | 1 768 | 2 550 | 3 710 | 4 410 | 5 000 |
| 8.1 Development and pre-operating costs | 106 | 172 | 160 | 323 | 373 | 449 | 363 | 260 | 370 | 780 | 700 |
| 8.2 Other deferred charges | 498 | 802 | 1 049 | 766 | 980 | 1 419 | 1 405 | 2 290 | 3 340 | 3 630 | 4 300 |
| 9. Intangible assets | 191 | 283 | 156 | 303 | 333 | 627 | 720 | 500 | 600 | 760 | 900 |
| 10. Other assets | 1 893 | 3 161 | 4 248 | 3 535 | 3 526 | 3 594 | 3 525 | 4 010 | 5 310 | 5 790 | 6 800 |
| 11. Total assets | 57 543 | 69 404 | 82 655 | 87 244 | 89 376 | 98 621 | 104 985 | 115 080 | 136 380 | 158 620 | 178 000 |
| <i>LIABILITIES</i> | | | | | | | | | | | |
| 12. Current liabilities | 12 727 | 15 214 | 18 539 | 22 104 | 22 082 | 24 926 | 26 490 | 29 430 | 32 930 | 37 930 | 42 200 |
| 13. Unearned transportation revenues | 4 527 | 6 040 | 7 110 | 6 594 | 6 908 | 7 526 | 7 457 | 8 480 | 9 580 | 10 540 | 12 300 |
| 14. Deferred credits | 2 337 | 2 801 | 3 043 | 3 417 | 3 399 | 3 776 | 4 146 | 5 180 | 6 800 | 8 400 | 9 600 |
| 15. Operating reserves | 468 | 953 | 849 | 846 | 923 | 884 | 1 066 | 1 700 | 2 800 | 3 290 | 3 700 |
| 16. Self insurance reserve | 285 | 407 | 431 | 460 | 423 | 500 | 516 | 430 | 740 | 1 080 | 1 100 |
| 17. Other reserves | 3 414 | 3 781 | 2 993 | 3 035 | 2 272 | 3 542 | 4 566 | 5 280 | 6 210 | 8 110 | 8 900 |
| 18. Advances from affiliated companies | 283 | 450 | 331 | 1 170 | 1 027 | 212 | 190 | 300 | 530 | 320 | 500 |
| 19. Other liabilities | 1 063 | 721 | 2 587 | 1 418 | 1 403 | 1 179 | 1 262 | 1 770 | 2 780 | 2 830 | 3 400 |

| Assets and liabilities | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 ² |
|---|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|-------------------|
| 20. Long-term debt | 18 963 | 23 856 | 30 516 | 32 575 | 36 335 | 39 009 | 38 212 | 40 070 | 46 380 | 52 840 | 59 100 |
| 21. Capital stock | 5 696 | 7 045 | 7 601 | 7 813 | 6 966 | 8 702 | 9 597 | 9 900 | 12 350 | 13 880 | 15 800 |
| 22. Capital surplus | 3 778 | 4 043 | 4 793 | 4 669 | 5 397 | 7 077 | 8 477 | 9 490 | 10 690 | 13 460 | 15 000 |
| 23. Net balance of unappropriated retained earnings | 4 001 | 4 093 | 3 861 | 3 143 | 2 241 | 1 288 | 3 006 | 3 050 | 4 590 | 5 940 | 6 400 |
| 24. Total liabilities | 57 543 | 69 404 | 82 655 | 87 244 | 89 376 | 98 621 | 104 985 | 115 080 | 136 380 | 158 620 | 178 000 |

RATIOS

| | | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|------|------|
| 25. Current ratio (1/12 + 13) | 1.10 | 1.02 | 0.95 | 0.83 | 0.87 | 0.89 | 0.96 | 0.95 | 0.96 | 0.98 | 0.98 |
| 26. Debt:Equity ratio (20/21 + 22 + 23) | 1.41 | 1.57 | 1.88 | 2.08 | 2.49 | 2.29 | 1.81 | 1.79 | 1.68 | 1.59 | 1.51 |

1. Excluding domestic operations within the USSR.

2. Data are preliminary.

Source:

ICAO Digests of Statistics, Series F.

Appendix 15. Flight crew productivity and costs, 1978-1987
(international scheduled airlines of ICAO Contracting States)¹

| Year | Total number of flight crew | Flight crew costs (millions \$) | Aircraft hours flown (thousands) | Number of crew employed per thousand hours flown | Crew cost per hour flown (\$) | Crew cost per tonne-km available (cents) |
|------|-----------------------------|---------------------------------|----------------------------------|--|-------------------------------|--|
| 1978 | 96 500 | 4 498 | 13 032 | 7.4 | 345 | 2.6 |
| 1979 | 99 700 | 5 654 | 13 988 | 7.1 | 404 | 2.8 |
| 1980 | 102 500 | 6 822 | 14 076 | 7.3 | 485 | 3.2 |
| 1981 | 103 000 | 6 761 | 13 578 | 7.6 | 498 | 3.1 |
| 1982 | 103 000 | 6 300 | 13 348 | 7.7 | 472 | 3.0 |
| 1983 | 103 500 | 6 200 | 13 685 | 7.6 | 453 | 2.9 |
| 1984 | 104 500 | 6 100 | 14 310 | 7.3 | 426 | 2.7 |
| 1985 | 106 700 | 6 500 | 14 950 | 7.1 | 435 | 2.7 |
| 1986 | 111 500 | 7 600 | 16 613 | 6.7 | 457 | 2.9 |
| 1987 | 113 800 | 8 800 | 18 302 | 6.2 | 481 | 3.0 |

1. Excluding China and the USSR.

Source:

ICAO Digest of Statistics, Series F and T.

Appendix 16. Selected indicators of scheduled airline personnel productivity in 1978 and 1988¹

| Selected scheduled airlines category of personnel ² | Number of personnel | | Remuneration (dollars) | | | | Per cent change + or - | Total TKA ³ (millions) | | Productivity of personnel | | Per cent change + or - | Total TKA per dollar of remuneration | | Per cent change + or - |
|--|---------------------|--------|--------------------------------|-----------|----------------------|--------|------------------------|-----------------------------------|--------|------------------------------------|--------|------------------------|--------------------------------------|-------|------------------------|
| | | | Total remuneration (thousands) | | Average per employee | | | | | Total TKA per employee (thousands) | | | 1978 1988 | | |
| | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | 1978 | 1988 | |
| Air Canada | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 1 506 | 1 734 | 54 567 | 111 552 | 36 233 | 64 332 | 78 | n/a | n/a | 3 432 | 2 995 | -13 | 95 | 47 | -51 |
| Other flight crew | - | - | - | - | - | - | - | n/a | n/a | - | - | - | - | - | - |
| All other personnel | 19 183 | 19 636 | 311 402 | 529 505 | 16 233 | 26 966 | 66 | n/a | n/a | 269 | 264 | -2 | 17 | 10 | -41 |
| Total | 20 689 | 21 370 | 365 969 | 641 057 | 17 689 | 29 998 | 70 | 5 169 | 5 193 | 250 | 243 | -3 | 14 | 8 | -43 |
| Air India | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 273 | 303 | 2 695 | 3 198 | 9 872 | 10 554 | 7 | n/a | n/a | 6 678 | 6 980 | 5 | 676 | 661 | -2 |
| Other flight crew | 202 | 149 | 1 171 | 513 | 5 797 | 10 154 | 75 | n/a | n/a | 9 025 | 14 195 | 57 | 1 557 | 1 398 | -10 |
| All other personnel | 13 760 | 16 876 | 52 654 | 91 417 | 3 827 | 5 417 | 42 | n/a | n/a | 132 | 125 | -5 | 35 | 23 | -34 |
| Total personnel | 14 235 | 17 328 | 56 520 | 96 128 | 3 970 | 5 548 | 40 | 1 823 | 2 115 | 128 | 122 | -5 | 32 | 22 | -31 |
| Avianca | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 180 | 224 | 2 826 | 2 747 | 15 700 | 12 263 | -22 | n/a | n/a | 5 611 | 3 478 | -38 | 357 | 284 | -21 |
| Other flight crew | 114 | 114 | 1 034 | 1 011 | 9 070 | 8 868 | -2 | n/a | n/a | 8 860 | 6 833 | -23 | 977 | 771 | -21 |
| All other personnel | 8 609 | 4 676 | 20 713 | 15 325 | 2 406 | 3 277 | 36 | n/a | n/a | 117 | 167 | 43 | 49 | 51 | 4 |
| Total personnel | 8 903 | 5 014 | 24 573 | 19 083 | 2 760 | 3 806 | 38 | 1 010 | 779 | 113 | 155 | 37 | 41 | 41 | - |
| British Airways | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 2 661 | 2 010 | 65 020 | 128 235 | 24 434 | 63 799 | 161 | n/a | n/a | 2 590 | 4 252 | 64 | 106 | 67 | -37 |
| Other flight crew | 600 | 455 | 10 825 | 20 907 | 18 042 | 45 949 | 155 | n/a | n/a | 11 487 | 18 782 | 64 | 637 | 409 | -36 |
| All other personnel | 51 382 | 38 568 | 547 708 | 853 563 | 10 660 | 22 131 | 108 | n/a | n/a | 134 | 222 | 66 | 13 | 10 | -20 |
| Total personnel | 54 643 | 41 033 | 623 553 | 1 002 705 | 11 411 | 24 437 | 114 | 6 892 | 8 546 | 126 | 208 | 65 | 11 | 9 | -23 |
| CSA | | | | | | | | | | | | | | | |
| Pilots and co-pilots ⁴ | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Other flight crew | 418 | 306 | 3 690 | 3 640 | 8 828 | 11 895 | 35 | n/a | n/a | 644 | 1 157 | 80 | 73 | 97 | 33 |
| All other personnel | 5 588 | 5 261 | 16 765 | 23 379 | 3 000 | 4 444 | 48 | n/a | n/a | 48 | 67 | 40 | 16 | 15 | -6 |
| Total personnel | 6 006 | 5 567 | 20 455 | 27 019 | 3 406 | 4 853 | 43 | 269 | 354 | 45 | 64 | 42 | 13 | 13 | - |
| Eastern⁵ | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 2 873 | 3 311 | 162 226 | 241 545 | 56 466 | 72 952 | 29 | n/a | n/a | 2 797 | 3 134 | 12 | 50 | 43 | -14 |
| Other flight crew | 965 | 1 674 | 32 781 | 33 504 | 33 970 | 20 014 | -41 | n/a | n/a | 8 327 | 6 200 | -26 | 245 | 310 | 27 |
| All other personnel | 32 061 | 38 791 | 653 995 | 1 026 003 | 20 398 | 26 450 | 30 | n/a | n/a | 251 | 268 | 7 | 12 | 10 | -17 |
| Total personnel | 35 899 | 43 776 | 1 039 802 | 1 695 355 | 28 965 | 38 728 | 34 | 8 036 | 10 378 | 224 | 237 | 6 | 8 | 6 | -25 |
| Egyptair⁶ | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 189 | 263 | 1 842 | 10 614 | 9 746 | 40 357 | 314 | n/a | n/a | 2 810 | 4 384 | 56 | 288 | 109 | -62 |
| Other flight crew | 56 | 78 | 411 | 2 704 | 7 339 | 34 667 | 372 | n/a | n/a | 9 482 | 14 782 | 56 | 1 292 | 426 | -67 |
| All other personnel | 9 144 | 11 429 | 17 897 | 68 138 | 1 957 | 5 962 | 205 | n/a | n/a | 58 | 101 | 74 | 30 | 17 | -43 |
| Total personnel | 9 389 | 11 770 | 20 150 | 81 456 | 2 146 | 6 921 | 222 | 531 | 1 153 | 57 | 98 | 72 | 26 | 14 | -46 |
| Ethiopian | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 109 | 139 | 1 803 | 1 521 | 16 541 | 10 942 | -34 | n/a | n/a | 2 073 | 2 957 | 43 | 125 | 270 | 116 |
| Other flight crew | 15 | 15 | 91 | 89 | 6 067 | 5 933 | -2 | n/a | n/a | 15 067 | 27 400 | 82 | 2 484 | 4 618 | 86 |
| All other personnel | 3 129 | 3 321 | 16 656 | 19 218 | 5 323 | 5 787 | 9 | n/a | n/a | 72 | 124 | 72 | 14 | 21 | 50 |
| Total personnel | 3 253 | 3 475 | 18 550 | 20 828 | 5 702 | 5 994 | 5 | 226 | 411 | 69 | 118 | 71 | 12 | 20 | 67 |

| Selected scheduled airlines category of personnel ² | Number of personnel | | Remuneration (dollars) | | | | | | Productivity of personnel | | | | | | |
|--|---------------------|--------|--------------------------------|-----------|----------------------|---------|------------------------|-----------------------------------|---------------------------|------------------------------------|--------|------------------------|--------------------------------------|------|------------------------|
| | | | Total remuneration (thousands) | | Average per employee | | Per cent change + or - | Total TKA ³ (millions) | | Total TKA per employee (thousands) | | Per cent change + or - | Total TKA per dollar of remuneration | | Per cent change + or - |
| | | | 1978 | 1988 | 1978 | 1988 | | 1978 | 1988 | 1978 | 1988 | | 1978 | 1988 | |
| Faucett | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 66 | 56 | 414 | 1 851 | 6 273 | 33 054 | 427 | n/a | n/a | 1 379 | 3 625 | 163 | 220 | 110 | -50 |
| Other flight crew | 17 | 20 | 60 | 494 | 3 529 | 24 700 | 600 | n/a | n/a | 54 353 | 10 150 | 90 | 1 517 | 411 | -73 |
| All other personnel | 191 | 1 551 | 504 | 10 622 | 2 639 | 6 848 | 160 | n/a | n/a | 476 | 131 | -73 | 181 | 19 | -90 |
| Total personnel | 274 | 1 627 | 978 | 12 967 | 3 569 | 7 970 | 123 | 91 | 203 | 332 | 125 | -62 | 93 | 16 | -83 |
| Gulf Air⁶ | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 210 | 236 | 12 773 | 10 923 | 60 824 | 46 284 | -24 | n/a | n/a | 2 248 | 4 127 | 84 | 37 | 89 | 141 |
| Other flight crew | 54 | 74 | 3 191 | 3 239 | 59 093 | 43 770 | -26 | n/a | n/a | 8 741 | 13 162 | 51 | 148 | 301 | 103 |
| All other personnel | 3 107 | 4 167 | 40 130 | 59 786 | 12 916 | 14 347 | 11 | n/a | n/a | 152 | 234 | 54 | 12 | 16 | 33 |
| Total personnel | 3 371 | 4 477 | 56 094 | 73 948 | 16 640 | 16 517 | -1 | 472 | 974 | 140 | 218 | 56 | 8 | 13 | 63 |
| Japan Air Lines | | | | | | | | | | | | | | | |
| Pilots and co-pilots ⁴ | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Other flight crew | 1 947 | 2 173 | 131 685 | 325 854 | 67 635 | 149 956 | 122 | n/a | n/a | 3 025 | 4 938 | 63 | 45 | 33 | -27 |
| All other personnel | 18 961 | 18 657 | 541 771 | 1 278 561 | 28 573 | 68 530 | 140 | n/a | n/a | 311 | 575 | 85 | 11 | 8 | -27 |
| Total personnel | 20 908 | 20 830 | 673 456 | 1 604 415 | 32 210 | 77 024 | 139 | 5 890 | 10 731 | 282 | 515 | 83 | 9 | 7 | -22 |
| Qantas | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 536 | 749 | 33 397 | 54 930 | 62 308 | 73 338 | 18 | n/a | n/a | 5 896 | 5 708 | -3 | 95 | 78 | -18 |
| Other flight crew | 164 | 194 | 9 247 | 13 426 | 56 384 | 69 206 | 23 | n/a | n/a | 19 268 | 22 036 | 14 | 342 | 318 | -7 |
| All other personnel | 12 748 | 13 686 | 234 644 | 349 264 | 18 406 | 25 520 | 39 | n/a | n/a | 248 | 312 | 26 | 13 | 12 | -8 |
| Total personnel | 13 448 | 14 629 | 277 288 | 417 620 | 20 619 | 28 547 | 38 | 3 160 | 4 275 | 235 | 292 | 24 | 11 | 10 | -9 |
| SAS | | | | | | | | | | | | | | | |
| Pilots and co-pilots ⁴ | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Other flight crew | 1 203 | 1 363 | 83 735 | 138 190 | 69 605 | 101 387 | 46 | n/a | n/a | 1 994 | 1 793 | -10 | 29 | 18 | -38 |
| All other personnel | 15 028 | 19 579 | 334 723 | 725 306 | 22 273 | 37 045 | 66 | n/a | n/a | 160 | 125 | -22 | 7 | 3 | -57 |
| Total personnel | 16 231 | 20 942 | 418 458 | 863 496 | 25 781 | 41 233 | 60 | 2 399 | 2 444 | 148 | 117 | -21 | 6 | 3 | -50 |
| Tunis Air | | | | | | | | | | | | | | | |
| Pilots and co-pilots ⁴ | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Other flight crew | 123 | 153 | 5 490 | 6 914 | 44 634 | 45 190 | 1 | n/a | n/a | 3 024 | 2 248 | -26 | 68 | 50 | -27 |
| All other personnel | 3 021 | 4 320 | 21 712 | 39 413 | 7 187 | 9 123 | 27 | n/a | n/a | 123 | 80 | -35 | 17 | 9 | -47 |
| Total personnel | 3 144 | 4 473 | 27 202 | 46 327 | 8 652 | 10 357 | 20 | 372 | 344 | 118 | 77 | -35 | 14 | 7 | -50 |
| TWA⁵ | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 2 477 | 2 243 | 138 163 | 166 719 | 55 778 | 74 329 | 33 | n/a | n/a | 3 289 | 4 543 | 38 | 59 | 61 | 3 |
| Other flight crew | 1 140 | 726 | 46 638 | 36 124 | 40 911 | 49 758 | 22 | n/a | n/a | 7 147 | 14 036 | 96 | 175 | 282 | 61 |
| All other personnel | 32 283 | 27 120 | 636 799 | 764 045 | 19 726 | 28 173 | 43 | n/a | n/a | 252 | 376 | 49 | 13 | 13 | - |
| Total personnel | 35 900 | 30 089 | 1 053 630 | 1 220 806 | 29 349 | 40 573 | 38 | 8 148 | 10 190 | 227 | 339 | 49 | 8 | 8 | - |
| UTA⁶ | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 252 | 200 | 17 429 | 32 962 | 69 163 | 164 810 | 138 | n/a | n/a | 6 675 | 8 470 | 27 | 97 | 51 | -47 |
| Other flight crew | 150 | 107 | 8 902 | 12 758 | 59 347 | 119 234 | 101 | n/a | n/a | 11 213 | 15 832 | 41 | 189 | 133 | -30 |
| All other personnel | 6 610 | 6 258 | 117 436 | 270 159 | 17 766 | 43 170 | 143 | n/a | n/a | 254 | 271 | 7 | 14 | 6 | -57 |
| Total personnel | 7 012 | 6 565 | 143 767 | 315 879 | 20 503 | 48 116 | 135 | 1 682 | 1 694 | 240 | 258 | 8 | 12 | 5 | -64 |

| Selected scheduled airlines category of personnel ² | Number of personnel | | Remuneration (dollars) | | | | | | Productivity of personnel | | | | | | | | | |
|--|------------------------|--------|--------------------------------------|---------|-------------------------|--------|---------------------------------|--------------------------------------|---------------------------|--|-------|---------------------------------|--|------|---------------------------------|------|------|--|
| | | | Total remuneration (thousands) | | Average per employee | | Per cent change + or - | Total TKA ³ (millions) | | Total TKA per employee (thousands) | | Per cent change + or - | Total TKA per dollar of remuneration | | Per cent change + or - | | | |
| | | | 1978 | 1988 | 1978 | 1988 | | 1978 | 1988 | 1978 | 1988 | | 1978 | 1988 | | 1978 | 1988 | |
| Varig | | | | | | | | | | | | | | | | | | |
| Pilots and co-pilots | 641 | 1 065 | 24 854 | 31 702 | 38 774 | 29 767 | -23 | n/a | n/a | 4 237 | 3 476 | -18 | 109 | 117 | 7 | | | |
| Other flight crew | 301 | 401 | 7 331 | 11 936 | 24 355 | 29 766 | 22 | n/a | n/a | 9 023 | 9 232 | 2 | 370 | 310 | -16 | | | |
| All other personnel | 14 778 | 21 890 | 90 213 | 149 892 | 6 105 | 6 848 | 12 | n/a | n/a | 184 | 169 | -8 | 30 | 25 | -17 | | | |
| Total personnel | 15 720 | 23 356 | 122 398 | 193 530 | 7 786 | 8 286 | 6 | 2 716 | 3 702 | 173 | 159 | -8 | 22 | 19 | -14 | | | |

- The figures shown against the year 1988 are those reported for 31 December of the previous year.
- Definitions of terms:
 - Pilots and co-pilots: self-explanatory.
 - Other flight crew: flight engineers, radio operators, and navigators, but not cabin attendants.
 - All other personnel: personnel not included in the above categories, but including cabin attendants.
- Total international and domestic, scheduled and non-scheduled.
- Separate data for pilots and co-pilots are unavailable, however their numbers are included under all other personnel and total personnel.
- Eastern and TWA — remuneration totals include employee benefits, payroll taxes and pensions.
- Due to non-availability of 1978 data, 1979 traffic data were used for Gulf Air, 1979 fleet and remuneration data were used for Egyptair, and 1977 fleet and remuneration data were used for Gulf Air and UTA.

n/a Not applicable.

- Nil.

Sources:

Data reported to ICAO on ATR Forms D-1 (Fleet and Personnel) and A-1 (Traffic) of scheduled airlines.

Appendix 17. Econometric models of demand for world scheduled air traffic

The basic models form assumed was:

$$y = a x_1^{b_1} \cdot x_2^{b_2}$$

For the model of passenger traffic,

$$y = \text{passenger-kilometres performed (PKP)}$$

$$x_1 = \text{gross domestic product in real terms (GDP)}$$

$$x_2 = \text{passenger revenue per passenger-kilometre in real terms (PYIELD)}$$

For the model of freight traffic,

$$y = \text{freight tonne-kilometres (FTK)}$$

$$x_1 = \text{world exports in real terms (EXP)}$$

$$x_2 = \text{freight revenue per freight tonne-kilometre in real terms (FYIELD)}$$

The a, b₁ and b₂ are constant coefficients whose values were obtained by statistical estimation, using econometric analysis. The b₁ and b₂ are equal to the elasticities of demand with respect to the corresponding x₁ and x₂.

Annual data were used in the estimations, covering a period of 29 years excluding USSR and China. ICAO and the International Monetary Fund (IMF) were the sources of the airline and general economic data, respectively, used in the models.

Estimated passenger model:

$$\ln \text{PKP} = 1.65 + 2.08 \ln \text{GDP} - 0.67 \ln \text{PYIELD} \quad R^2 = 0.999$$

(22.7) (5.7)

Estimated freight model:

$$\ln \text{FTK} = 1.09 + 1.47 \ln \text{EXP} - 0.55 \ln \text{FYIELD} \quad R^2 = 0.995$$

(18.7) (6.6)

The figures in brackets are the 't' statistics of the corresponding coefficient estimates.

— END —

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