ICAO CIRCULAR

CIRCULAR 73-AT/10

JUNE 1965

A REVIEW OF THE ECONOMIC SITUATION OF AIR TRANSPORT

with Special Reference to the Economic Effects of the Long-range Jets and the Possible Future Market for Supersonic Aircraft

Prepared by the Secretariat and published by authority
of the Secretary General for the information of Contracting States

INTERNATIONAL
CIVIL AVIATION
ORGANIZATION
MONTREAL • CANADA

Published in separate English, French and Spanish editions by the International Civil Aviation Organization. All correspondence, except orders and subscriptions, should be addressed to the Secretary General of ICAO, International Aviation Building, 1080 University Street, Montreal 3 (Quebec), Canada.

Orders for this publication should be sent to one of the following addresses, together with the appropriate remittance (by bank draft or post office money order) in U.S. dollars or the currency of the country in which the order is placed or in a freely convertible currency:

Regional Offices

France: Représentant de l'OACI, Bureau Europe, 60 bis, avenue d'Iéna, Paris, XVIe.

Peru: Representante de la OACI, Oficina Sudamérica, Apartado 4127, Lima.

Senegal: Représentant de l'OACI, Bureau Afrique, Boîte postale 2356, Dakar.

Thailand: ICAO Representative, Far East and Pacific Office, P.O. Box 614, Bangkok.

United Arab Republic: ICAO Representative, Middle East Office, 16 Hassan Sabri, Zamalek, Cairo.

Sales Agencies

Argentina: Editorial Sudamericana S.A., Calle Alsina 500, Buenos Aires.

Australia: Robertson and Mullens, 107 Elizabeth Street, Melbourne, C. 1.

Canada: Department of Public Printing and Stationery, Ottawa (Ontario).

India: Oxford Book & Stationery Co., Scindia House, New Delhi *or* 17 Park Street, Calcutta.

Mexico: Editorial Hermes S.A., Ignacio Mariscal 41, México 4, D.F.

New Zealand: Government Printer, Government Printing Office, 20 Molesworth Street, Wellington.

United Kingdom: Her Majesty's Stationery Office, P.O. Box 569, London, S.E. 1.

International Civil Aviation Organization (Attention: Distribution Officer), International Aviation Building, 1080 University Street, Montreal 3 (Quebec), Canada.

TABLE OF CONTENTS

Page

DIAGRAMS - (Contd.)

TABLES -

Page

TABLES - (Contd.)

A REVIEW OF THE ECONOMIC SITUATION OF AIR TRANSPORT

with Special Reference to the Economic Effects of the Long-range Jets and the Possible Future Market for Supersonic Air Transport

JUNE - 1965

I. INTRODUCTION

Terms of reference

1. This analysis has been prepared pursuant to directives in Assembly Resolutions A14-33 and A14-7. A14-33 arose out of the consideration by the Economic Commission of the unsatisfactory economic situation of international air transport in virtually all parts of the world*, particularly in view of the possibly serious future economic effects of the introduction of supersonic airliners. The Resolution reads:

> 1) That, in carrying out the work programme of the Organization in the economic field, especially in matters concerning supersonic transports, the Council shall give full regard to the discussions on this subject in the Fourteenth Session of the Assembly; and
>
> 2) That, in so far as practicable, the economic studies contained within the work programme shall include conclusions in this field for the consideration of Member States.

2. The reference to "matters concerning supersonic transports" in the economic work programme related to Resolution A14-7. This Resolution directed the Council "to keep developments in the economics of air transport under review and, as desirable and feasible, to collect and disseminate data concerning traffic volume and patterns as well as information with respect to the development of world demand for air transport that might be helpful in various aspects of planning for both subsonic and supersonic operations."

3. The discussions in the Fourteenth Session of the Assembly referred to in Resolution A14-33 took place in the Economic Commission (see Minutes of Meetings 1, 2, 4, 5, 15 and 16). They covered a wide range of economic problems of air transport including excess capacity, the high cost of introducing the jet aircraft, the unsatisfactory competitive position of some airlines, the need for reduced fares and freight rates to expand the volume of traffic and bring air transport within the reach of more people, the burden for governments of providing airport and route

---

* Here and throughout this analysis "world" or "global" statistics relate to the airlines registered in the Contracting States of ICAO, that is to say, excluding the People's Republic of China, the USSR, and other States not members of ICAO.

facilities at less than cost, and the fear that at some future date airlines would be forced, for competitive reasons, to re-equip with supersonic aircraft whose high operating costs and excessive productive capacity would cause them to suffer heavy losses.

4. Also to be taken into account was a continued requirement in the Organization's work programme to keep States informed of the economic effects of the introduction of the long-range jet airliners as a follow-up to the study made in 1958 (Doc 7894).

5. This analysis deals with three main aspects of the matter:

Part I. The economic situation of scheduled airlines of the world at the present time, showing how it has changed from the time of the Fourteenth Session of the Assembly.

Part II. The economic effects of the introduction of the subsonic jet airliners, past, present and future.

Part III. The future global market for supersonic air transport as indicated by the most up-to-date information available on trends and developments.

6. It should be emphasized that these are only three aspects of the economic situation of air transport that are of immediate interest and on which a sufficient volume of statistics is available to be worth analysis and publication. It is proposed to deal with other aspects of the matter in due course when material becomes available covering, particularly, the analysis of stage lengths operated on various routes and by various types of aircraft; more detailed figures relating to operating costs for different airlines analysed by stage length, type of aircraft, and volume of traffic; and the economics of bus-type and short-stage operations, of very large aircraft of 500-700 seat capacity, and of possible DC-3 replacements.

Statistical coverage

7. The statistical material in this analysis relates to the operations of scheduled airlines registered in the Contracting States of ICAO. A scheduled airline means an airline operating a scheduled air service following the definitions of a scheduled air service utilized by the governments concerned. (In general these are similar to the definition proposed by the Council in Doc 7278-C/841. The special inclusive tour flights that have developed so rapidly in Europe, many of which would be classified as scheduled services according to the Council definition, are, however, classified as non-scheduled operations.) Most of the statistics cover domestic and international operations of domestic and international airlines since the financial material filed with ICAO does not make a separation between international and domestic. (At a future date it may be possible to prepare some analyses separately, at least for some of the main international routes, but this is a separate study of some complexity.) The non-scheduled operations of scheduled airlines are included, together with their operating costs and revenues. Where necessary to obtain global totals, estimates have been made for the opertions of the non-scheduled airlines (operators that do not operate any scheduled

services). Since only airlines registered in ICAO Contracting States are included, the figures exclude airlines registered in the People's Republic of China, the USSR, and certain other States not members of ICAO. The operations of the airlines of ICAO Member States into the territory of these other States are, however, included. Where data is given in miles, the unit referred to is the statute mile.

References

8. The statistics used in these analyses stem largely from the ICAO Digests of Statistics, particularly the Financial Series F, Nos. 1 to 16, and Traffic Series T, Nos. 1 to 22. The following references may also be useful:

The Economic Implications of the Introduction into Service of Long-range Jet Aircraft (Doc 7894-C/907)

The Technical, Economic and Social Consequences of the Introduction into Commercial Service of Supersonic Aircraft (Doc 8087-C/925)

Air Freight Study (Doc 8235-C/937)

Report of the Economic Commission, Fourteenth Session of the Assembly (Doc 8286)

Minutes of the Economic Commission, Fourteenth Session of the Assembly (Doc A14-WP/162)

THIS PAGE INTENTIONALLY LEFT BLANK

II. SUMMARY

The economic situation of air transport in 1965

9. Improved operating margin. - A significant improvement in the economic situation of the world's scheduled airlines appears to have taken place since 1962. Evidence of this may be seen in the overall operating margin achieved by these airlines on all of their services--scheduled and non-scheduled, international and domestic. From 1951 to 1962 total operating revenues fluctuated above and below total operating expenses, but never exceeded that figure by 3 per cent. In 1963, however, there was a positive margin of nearly 5 per cent, and in 1964 this margin increased to almost 8 per cent (about $600 million). The airlines' net profit figures were, of course, much lower owing to various non-operating items, including interest on loans and income taxes.

10. Decline in operating costs. - The most important factor in this economic improvement has been the introduction of larger, more productive aircraft--particularly the long-range jets. As average aircraft size has increased, unit operating expenses have declined; and since they have declined more rapidly than have unit operating revenues, break-even load factors have also declined. Thus it has been possible to produce operating profits in spite of the fact that actual load factors have fallen concurrently.

11. Falling load factors. - The weakness in the present economic situation of the airlines--also related to the characteristics of the long-range jets--is that capacity has continued to expand more rapidly than traffic, and current orders suggest that this trend will continue unless fares are reduced more than seems probable. The result is that the overall weight load factor has fallen from nearly 60 per cent in 1955 to probably not much more than 50 per cent in 1965. Thus, although the airlines as a whole have achieved an operating profit, about 50 per cent of the seats and cargo capacity they offer remains unsold. Unless aircraft purchases are slowed down, or fares and rates are reduced faster, this situation is likely to continue.

Economic effects of the introduction of subsonic jets

12. Importance of jets. - The subsonic jets began to come into service towards the end of 1958, so that there is now over six years of experience on which to base opinions of their performance and effects. So far they have been predominantly long-range aircraft and, as a result, their effect has

been felt mainly on international and United States domestic trunk routes. The full effect of the medium- and short-range types now entering service will not appear until 1966 and later. At the end of 1964, there were over a thousand jets in service with the scheduled airlines of ICAO States--21 per cent of the fleet--and it is estimated that about 72 per cent of all capacity was offered in these aircraft. By the end of 1966 this proportion will have increased to about 80 per cent.

13. Differentiating characteristics of jets. - The effects of the jets on the economic situation of air transport result from those of their characteristics that differentiate them from the aircraft they have replaced. Compared with the late-model long-range piston aircraft, the long-range jets are about three times as expensive to purchase, almost twice as fast, can carry approximately twice the payload, and cost about 40 per cent less to operate per unit of capacity available. In addition, being almost free from interior noise and vibration, they are more comfortable for the passenger; also, because their maximum take-off weight, optimum cruising altitude and speed are all about double those of the piston-engine aircraft, they are more demanding in terms of air navigation facilities, including airports.

14. Effects of jet characteristics. - These characteristics in various combinations have affected the air transport situation in many ways. The airlines have experienced financial difficulties as they re-equipped, because of the high initial cost of each long-range jet (although the price of the jets in terms of cost per unit of productivity is lower than that of the aircraft they replaced) and because of the rapid fall in the price of second-hand aircraft as large numbers of older aircraft were offered for sale. Large new expenditures on air navigation facilities, including airports, have been necessitated by the requirements of the jets. The comfort and speed of the jets have resulted in a public appeal that, because airline competition is largely restricted to the quality of service, has exerted pressure on all of the airlines operating on any particular long-haul route to provide jet services as soon as one of their number introduced these aircraft. Problems of scheduling have resulted from the fact that the jets can perform a flight in about half the time required by piston-engine aircraft, and the increased size of the jets has called for improved traffic handling facilities at airports and emphasized the need for the greatest possible degree of facilitation.

15. High productivity. - The most important economic effects of the jets, however, have resulted from their high productivity and low operating costs. Dealing first with the question of productivity, it may be pointed out that, typically, the long-range jet, because of its speed and payload capacity, can, in any given period, carry between three and four times as much traffic as the

piston-engine aircraft it replaced. Given the public appeal of the jets, the competitive situation that led operators to re-equip more rapidly than they might have wished, and the difficulties encountered in disposing of long-range piston aircraft, and in the absence of a sufficient increase in traffic, this productivity has led inevitably to a situation of excess capacity and falling load factors. In fact, in each of the four years 1960 to 1963, capacity did increase at a greater rate than traffic and the overall weight load factor fell from 58 to 52 per cent. The situation was reversed in 1964, but it seems likely that in 1965 and 1966 capacity will again increase at a greater rate than traffic, and load factors will fall still lower. Actual as distinct from potential productivity is, of course, related to utilization, as well as to speed and pay-load capacity, and low utilization could cancel the effect of the other two factors. In practice, by 1961 the average daily utilization of the long-range jets was over 8 hours, and it has increased since then. On the other hand, the utilization of the long-range piston aircraft--which had been 8 hours a day or more until 1959--fell sharply after that year, as these aircraft ceased to be predominant on the long-haul routes.

16. Low operating expenses. - The characteristic of the long-range jets that has been most responsible for the improved economic situation of the airlines since 1962 has been their low unit operating costs. Since the introduction of these aircraft in 1958, average direct operating expenses per tonne-kilometre available on all services of scheduled airlines have dropped nearly 27 per cent. Over the same period, 1958 to 1964, unit operating revenues fell only 5 per cent. Comparing the two indicators, it appears that for all services unit operating revenues exceeded expenses every year but 1961. In other terms, it may be seen that since unit expenses fell more rapidly than revenues, the break-even load factor also declined--specifically, from 57 per cent in 1958 to 49 per cent in 1964--and the overall weight load factor has been above the break-even point every year but 1961. When international and domestic services are considered separately, a clear distinction appears which may be attributed to the greater use of the long-range jets on international services. Thus, from 1958, unit operating expenses fell about 30 per cent on international, but only 4 per cent on domestic services, and, by 1964, had come to about the same level on both sectors. In the same period, unit revenues fell 15 per cent on international services, but rose 7 per cent on domestic, coming also, by 1964, to nearly the same level on both sectors.

Future trends in world demand for air transport

17. Factors affecting demand. - In recent years two factors have become apparent that bear directly on the probable future development of demand for air transport. The first is the relative inflexibility of fares; the second, the continuing strength of demand. In spite of a significant decline in

unit operating expenses and falling load factors, fares have fallen less than was expected; furthermore, contrary to many predictions, demand has continued to grow at the rate of about 12 per cent per year. If these two factors remain operative, it may be possible by, say, 1972 to introduce supersonic transports on a profitable basis, even with direct operating costs somewhat above those of the subsonic jets.

18. Rate trends. - World average passenger fares are now approximately twice the airlines' operating cost per seat-kilometre, with the result that the break-even load factor is about 50 per cent. Against this, the actual passenger load factor was 56 per cent in 1964 and will probably be about 53 per cent in 1965. In this situation, where fares are double costs and half the seats offered remain unsold, there will inevitably be pressure to reduce fares both in the public interest and in order to stimulate demand, and this pressure will be strengthened by the continuing tendency of unit operating costs to decline. These costs have, in fact, fallen at the rate of about 5 per cent per year since 1960 and will probably continue to fall as more jets, both larger and smaller than the present long-range types, come into service. It is here assumed, therefore, that the decline in unit costs will continue, less rapidly than in the recent past, at about 2 per cent per year.

19. Many airlines, however, have higher than average operating costs, and for these the rise in break-even load factors that would result from a fare reduction might, at least temporarily, worsen the operating margin. Furthermore, the high seasonality of passenger traffic poses an obstacle to traffic growth, and fare reductions would need to be applied primarily at off-peak periods when the elasticity of demand is low. In these circumstances, it is assumed in this analysis that the level of passenger fares will fall rather slowly, averaging a reduction of about 1 per cent per year. For scheduled cargo and mail and non-scheduled traffic, it is assumed that the average rates, which tend to follow average unit costs, will fall 2 per cent per year.

20. Traffic trends. - The annual rate of increase in passenger traffic has remained remarkably steady, falling slightly from averages of about 16 per cent in the 1940's and early 1950's to about 12 per cent in recent years. On the assumption that the average fare level will fall 1 per cent per year, it is estimated that passenger demand will continue to increase at the average rate of 12 per cent per year until 1975. In addition, on the assumption that the rates for scheduled cargo and mail and for non-scheduled traffic will fall 2 per cent per year, it is estimated that the annual rates of increase for these categories of traffic will continue as in the past--averaging about 15 per cent for scheduled cargo and non-scheduled traffic, and 12 per cent for mail. The product of these various growth rates is about 13 per cent for all traffic of scheduled airlines.

21. Future capacity requirements. - In estimating the potential market for supersonic airliners, it is helpful to calculate the numbers of long-range subsonic jets that would be required if the supersonic types were not introduced. Both will operate on similar routes and, on the basis of present thinking, they will be of similar size (about 120 and 250 seats). There are now about 780 long-range jets in service, and it is calculated that this number will increase to 1,500 in 1972 and 1,750 in 1974, if neither supersonic aircraft nor very large subsonic jets (over 500 seats) have been introduced. If supersonic airliners prove able to operate on about half the routes served by the long-range subsonic jets, it is estimated that to meet an annual 12 per cent increase in demand there will be a requirement for seat capacity equal in 1972 to sixty 120-seat Mach 2.2 supersonic transports and, in 1974, to twenty-four 250-seat Mach 3 supersonic transports. It is further calculated that if a supersonic airliner introduced in 1972 had unit operating costs 20 per cent above those of subsonic jets in 1963, its break-even load factor (without surcharge) would be about 65 per cent, if fares fall at 1 per cent per year, or about 76 per cent if the decline in fares should prove to be 3 per cent per year. A supersonic airliner introduced in 1974, with unit operating costs 10 per cent above the subsonic jets of 1963, would have a break-even load factor (without surcharge) of 60 per cent, if fares fall at 1 per cent per year, or 74 per cent if fares fall at 3 per cent per year.

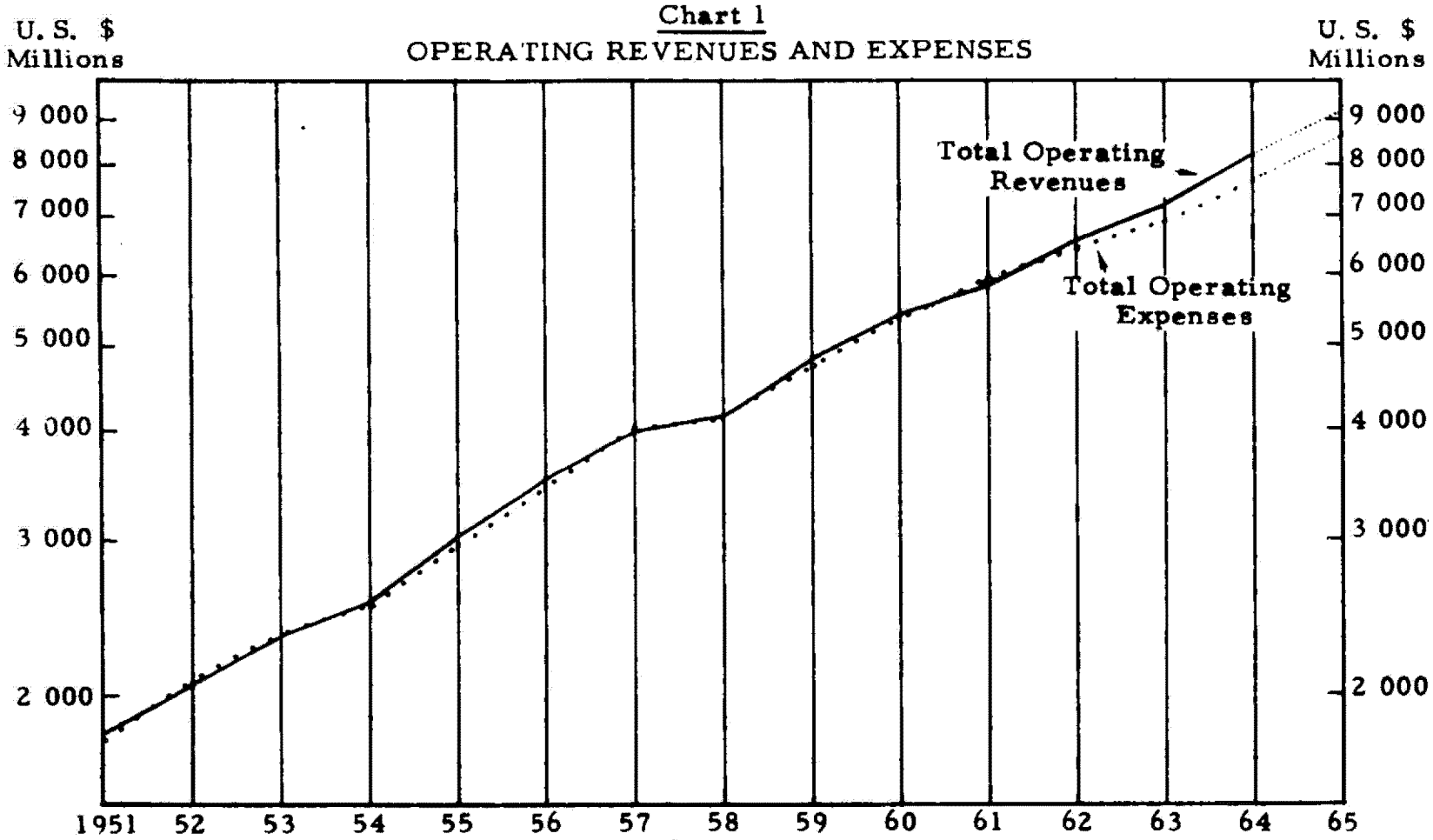
22. All of these estimates of future demand and the capacity required to meet it are based on stated assumptions concerning the average level of rates. Other assumptions would, of course, lead to other results. For example, if the level of passenger fares remained stationary over the next decade, traffic expansion might average only 10 per cent per year (the probable minimum rate), whereas if fares decreased at 3 per cent per year instead of 1 per cent as assumed, traffic might increase at 16 per cent per year (the probable maximum rate). The resultant capacity requirements can be calculated by the same method, whichever assumptions are adopted.

DIAGRAM 1

OPERATING REVENUES, EXPENSES AND LOAD FACTORS
Scheduled and non-Scheduled Services of the Scheduled Airlines

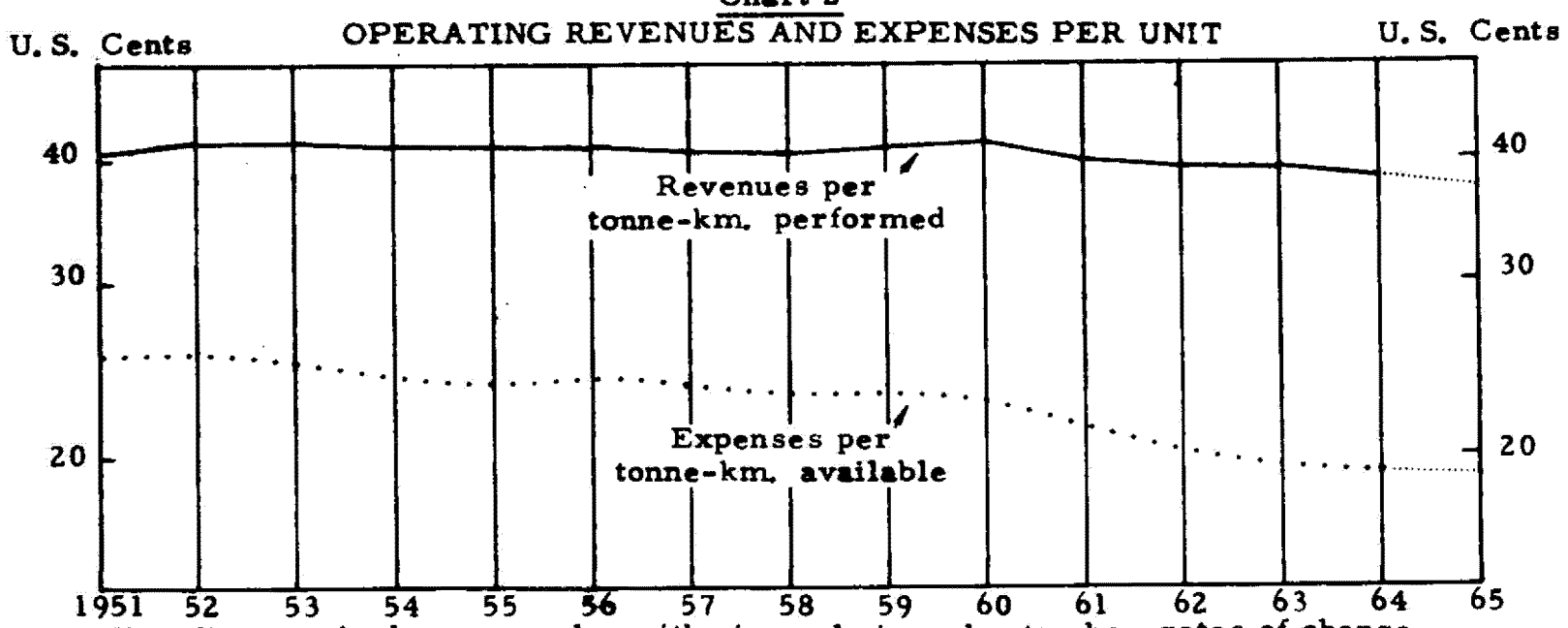
WORLD DOMESTIC AND INTERNATIONAL SERVICES
Years 1951-1963; Estimates for 1964 and 1965

Chart 1



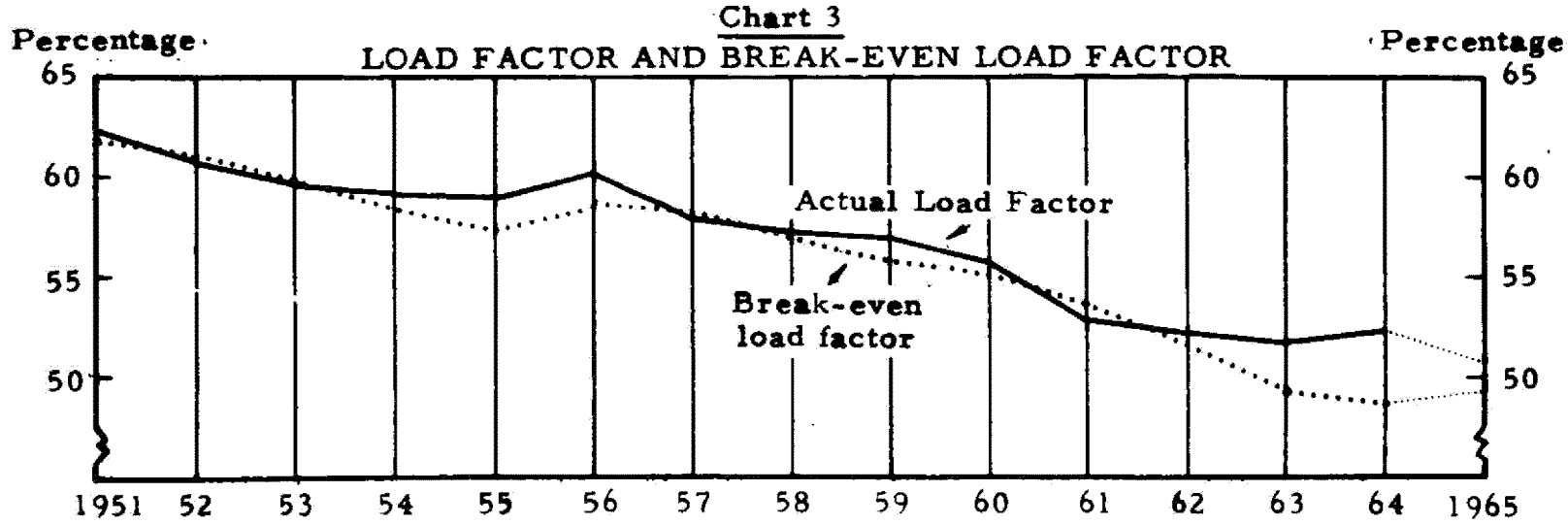
This diagram is drawn on a logarithmic scale in order to show rates of change.

Chart 2



This diagram is drawn on a logarithmic scale in order to show rates of change.

Chart 3



This graph is drawn on an arithmetical scale.

See Table 7 for basic data.

ICAO Economics & Statistics Branch (May 1965)

III. THE ECONOMIC SITUATION OF AIR TRANSPORT UP TO 1965

The operating margin

23. The graphs in Diagram 1, opposite, illustrate the trends over the last 15 years of the main economic indicators for the operations of the scheduled airlines registered in the Contracting States of ICAO. Table 1, over the page, summarizes the estimates and forecasts for the years 1964 and 1965, as at present seen from preliminary figures and apparent trends.

24. The figures suggest that the economic situation of world air transport as a whole has improved. In the past, total operating revenues have always been below or only fractionally above total operating expenses, but a positive margin was established in 1962 and had increased by 1964 to an estimated $600 million. The forecast for 1965 is for a fall in this overall operating margin, but this is based on an expected recurrence of the condition of excess capacity due chiefly to large purchases of medium-range jet airliners (see Table 17, page 69). The prospects for the more distant future seem moderately healthy so long as traffic volume can be expanded by fare reductions or other means to give reasonable load factors in spite of the constant tendency to over-purchase new aircraft. The estimated global operating margins for the five years 1961 to 1965 are:

Estimated Total Operating Margin of Scheduled Airlines of ICAO States

	US$ million	Per cent of total revenues
1961	-118	-2.0
1962	+ 97	+1.5
1963	+326	+4.5
1964 (Preliminary)	+600	+7.3
1965 (Forecast)	+400	+4.4

25. These figures of the total operating margin of the airlines are a good indication of the economic situation of the air transport industry, but they should not be confused with the airlines' net profit and loss figures. The net profit or loss of an airline is affected by a number of non-operating items such as interest on loans, payments to affiliated companies and income tax. Where the final result is a loss, it is often made up by the government of the airline concerned by a direct subsidy payment (see Table 12, item 17), which may

TABLE 1

WORLD SCHEDULED AIRLINE ECONOMIC STATISTICS 1964 AND 1965

Preliminary Figures and Estimates Based on Trends

		1964	1965
1	Total tonne-kms performed in millions	21,520	24,400
2	Unit revenue in ¢ per t-km performed	38.3¢	37.3¢
3	Operating revenue in $ million	8,238	9,100
4	Load factor	52.6%	50.9%
5	Break-even load factor	49%	49%
6	Total tonne-kms available in millions	40,900	48,000
7	Unit expenses in ¢ per t-km available	18.6¢	18.1¢
8	Operating expenses in $ million	7,637	8,700
9	Operating margin in $ million	600	400
10	Operating margin as per cent of revenues	7.3%	4.4%
11	Total assets in $ million	9,500	10,000
12	Operating margin as per cent of assets	6.3%	4.4%

obscure the true loss situation as shown in the airline's published accounts. If these direct subsidies are excluded, it will be seen that the airlines made a net loss even in the year 1963 when they achieved an operating margin of over $300 million. Net profit and loss figures are more unpredictable than operating margins, but it seems probable that the global financial figures for 1964 and 1965 will show small net profits, perhaps of the order of about 2 per cent of the airlines' total revenues. The figures for 1961 to 1963 were as follows:

Global Profit and Loss Situation of the Scheduled Airlines, 1961-1963
(excluding direct subsidies)

	US$ million	Per cent of total revenues
1961	-263	-4.5
1962	-169	-2.6
1963	- 30	-0.4

Load factors

26. Charts 2 and 3 and Table 1 show that the improved economic situation of world air transport is not due to increased revenue yields nor to higher load factors. On the contrary, it has been associated with falling average revenue yield per tonne-kilometre performed and a falling world average load factor. The more satisfactory margin of operating revenues over expenses has been made possible because unit operating costs have fallen more than unit operating revenues. The break-even load factor has thus fallen to about 49 per cent, so that an actual load factor as low as 50 per cent can produce an operating profit.

27. As can be seen from Chart 3 in Diagram 1, break-even load factors have shown a tendency to decline since 1951 as the introduction of larger aircraft caused unit operating costs to fall. Actual load factors also fell because the expansion in the volume of passenger, freight, and mail traffic, although substantial each year, was not fast enough to keep pace with the increases in capacity offered by the new aircraft.

28. It may be argued that even if the industry is making an operating profit, it is economically unsound for the airlines to be operating at such low load factors that on the average throughout the year they carry around 50 per cent of empty seats and freight space, and this is certainly a serious weakness in the situation. It must be remembered, however, that the annual average load factor is reduced by the low load factors encountered in the off-seasons and off-peak times

of the day and week. As world air transport expands, it caters to an ever-increasing extent for the tourist trade which is liable to great variations, and these can be only partly ironed out by special fares at off-peak times. Moreover, as the larger low-operating cost aircraft are introduced, the desire to maintain service frequencies and achieve high utilization of the new aircraft inevitably tends to produce excess capacity. Nevertheless, even allowing for these factors, purchases of new aircraft have undoubtedly often been greater than was warranted by trends in traffic volume. Current orders for both long-range and medium-range jets suggest that there will continue to be a condition of global excess capacity for some time unless passenger fares are reduced much more than seems probable. (See Diagram 3 and Table 20).

Aircraft size

29. It is interesting to note that the fall in unit operating costs over the past 15 years has correlated closely with the increase in the size of aircraft used. In 1951 the average number of seats per aircraft on world scheduled air services was about 35. In 1965 it will be close to 100. World average unit operating costs fell from 25 cents per tonne-kilometre available in 1951, to about 18 cents in 1965, which is about the difference in unit operating costs between an aircraft with 35 seats and one with 100 seats.

30. Both the strength and the weakness of the present economic situation of world air transport are directly due to the characteristics of the large long-range jet airliners that now dominate the picture. Their low unit operating cost has brought down the world average figure and made possible the present extremely low break-even load factors. On the other hand, their large capacity and high productivity compared with previous aircraft has produced the excess capacity that has caused actual load factors also to be low. These points will be discussed in greater detail in Part IV.

IV. ECONOMIC EFFECTS OF THE INTRODUCTION OF SUBSONIC JETS

Jets in service before 1965 mainly long-range types

31. The subsonic jets were first introduced into airline service (apart from the brief service of the Comet 1 in 1952) late in the fourth quarter of 1958. This means that to the end of 1964 there have been six years of experience on which to base opinions on their performance and economic effects on the air transport situation in ICAO Contracting States. The jet aircraft introduced into service prior to 1965 have been predominantly long-range types--the Boeing 707 and Comet 4 first, followed by the Douglas DC-8, Convair 880, Boeing 720, Convair 990 and the BAC VC-10. Of the medium and short-range jets, the Caravelle was introduced in 1959 and the Boeing 727 and Hawker-Siddeley Trident in 1963, but the full effect of these shorter range aircraft will not be felt until 1965 and later as the BAC 111, Douglas DC-9 and Boeing 737 are brought into service.

Numbers of jets in service and on order

32. The numbers of jet, turbo-prop and piston-engine aircraft, of more than 9,000 kilogrammes maximum take-off weight, in the airline fleets of ICAO States are shown by aircraft type at year end from 1948 to 1964 in Table 17. From these figures it may be seen that the number of jets in service rose from 12 at the end of 1958 to 1,037 at the end of 1964, of this latter total 750 being long-range types and 287 medium and short-range. On a numerical basis, the jets thus came by the end of 1964 to account for about 21 per cent of the fleet, the turbo-props and piston-engine types being 19 and 60 per cent respectively.

33. In addition, by the end of April 1965, as shown in the following tabulation, 713 subsonic jets had been ordered for delivery after 31 December 1964. Of this total 178 were long-range and 535 medium and short-range types.

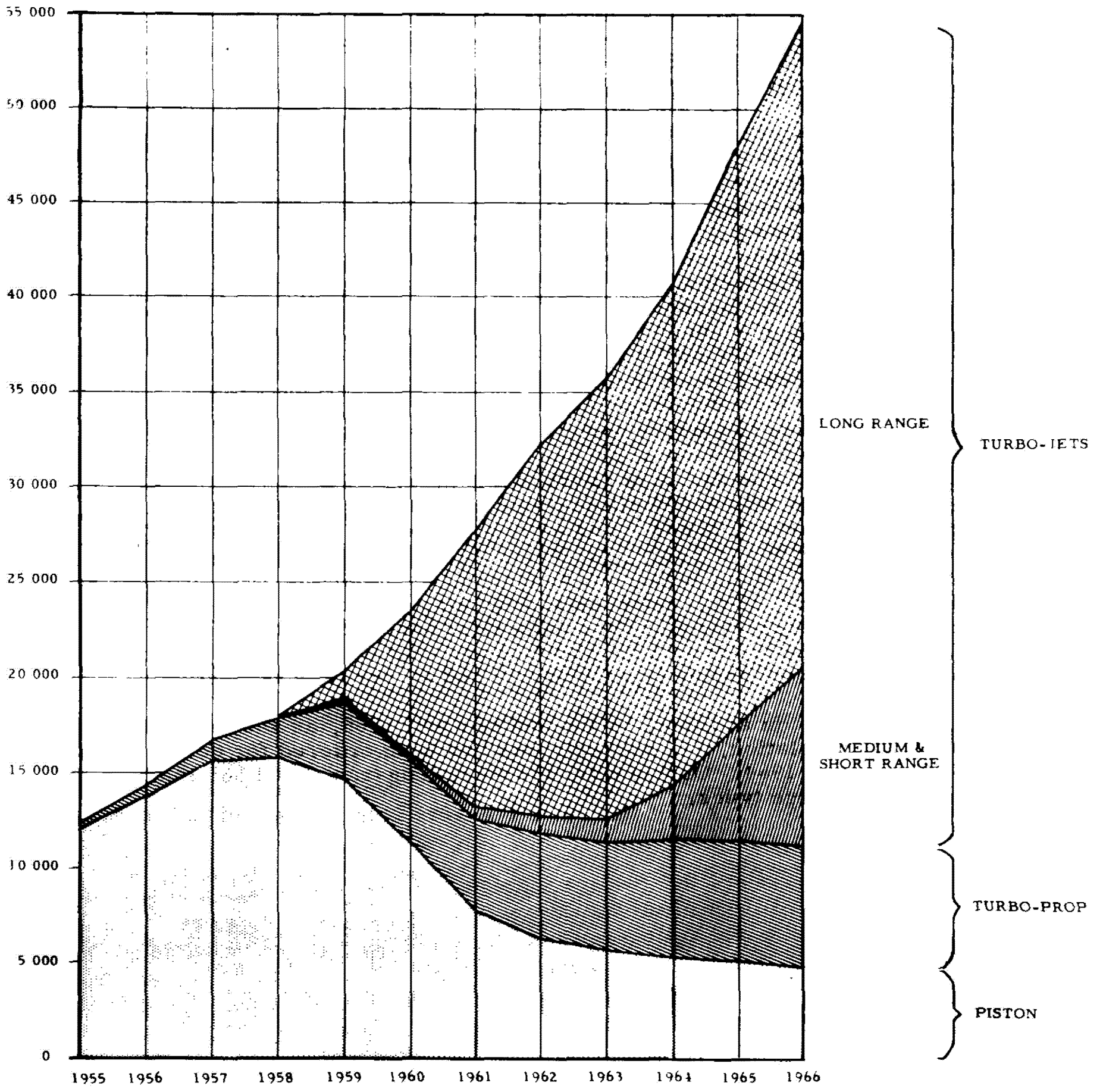
DIAGRAM 2

ESTIMATED CAPACITY OFFERED BY CATEGORY OF AIRCRAFT

International and Domestic, Scheduled and Non-scheduled Services of Scheduled Airlines
(Based on existing fleet and aircraft on order up to 30 April 1965)

Tonne-Kilometres (millions)

Ten Years Estimated 1955-1964, Two Years Forecast 1965-1966



This diagram is drawn on an arithmetical scale.

See TABLE 20 for basic data.

The estimates for capacity for the years 1965 and 1966 are based on known orders up to 30 April 1965. It must be recognized however, that an undetermined number of jets are yet to be ordered for introduction into service in 1966 so that the capacity for that year is underestimated to this extent.

ICAO ECONOMICS AND STATISTICS BRANCH (May 1965)

Subsonic Jets Ordered for Delivery after 31 December 1964 including Orders placed up to 30 April 1965

	Delivered 1 January - 30 April 1965	Remaining for delivery after 30 April 1965	Total for delivery 1965, 1966 and after
Long-Range Types			
Boeing 707	19	72	91
Douglas DC-8	7	46	53
BAC VC-10	5	18	23
Boeing 720	2	9	11
Sub-Total	33	145	178
Medium & Short-Range Types			
Boeing 727	27	197	224 (56)
Hawker Siddeley-DH 121	2	18	20
Sud Caravelle	5	14	19
BAC 111	7	67	74
Douglas DC-9	-	137	137 (89)
Boeing 737	-	61	61 (61)
Sub-Total	41	494	535 (206)
TOTAL	74	639	713 (206)

Note:

( ) Brackets indicate aircraft scheduled for delivery after 1966.

Proportions of capacity offered in different categories of aircraft

34. The effect of the jets on the world air transport situation is, however, much greater than would be indicated by their numbers. Because of their potential productivity, which is the product of their speed and payload, and because of the utilization that operators have achieved with them, about 72 per cent of the capacity offered by the scheduled airlines in 1964 was in jets (65 per cent in long-range types and 7 per cent in medium and short-range). Against this only 15 per cent was offered in turbo-props and 13 per cent in piston-engine aircraft. It is estimated that the proportion of capacity offered in jets will rise to 76 per cent in 1965 and at least to 80 per cent in 1966. The steadily growing importance of the jets in the overall picture is indicated by the figures in the following table and illustrated in Diagram 2.

Approximate Percentage of Capacity Offered
in the Different Categories of Aircraft

(See Table 20 for basic data)

Aircraft Category	1958	1959	1960	1961	1962	1963	1964	1965*	1966*
Jets	--	8	33	54	63	68	72	76	79
Turbo-props	12	19	19	18	17	16	15	13	12
Piston-engine	88	73	48	28	20	16	13	11	9
	100	100	100	100	100	100	100	100	100

*Estimated

Long-range jets used mainly on international services

35. The fact that the jets in service up to the end of 1964 have been mainly long-range types has meant that the effects of their introduction have been felt by international and United States domestic trunk services to a greater extent than by domestic services in general. However, the effect of these aircraft on air transport operations as a whole has been magnified by the fact that over the period since their introduction the relative importance of the international sector has steadily increased. The proportion of total scheduled capacity offered on international services has risen from 34 per cent in 1957 to 46 per in 1964.

Differentiating characteristics of the jets

36. The economic effects following from the introduction of the jets result in the first instance from those of their characteristics that differentiate them sharply from the generation of transport aircraft that they replaced. The most important among these characteristics may be listed (not in any order of priority) as: purchase price, maximum take-off weight, runway requirements, higher optimum cruising altitude, relative freedom from interior noise and vibration, mean cruise speed, payload capacity, and operating costs. Detailed figures on some of these characteristics are given for jets, turbo-props,

and piston-engine transports, both passenger and cargo, in Table 18. To summarize, these characteristics may be compared roughly as follows:

	4-engine long-range jet (1963)	4-engine late-model piston (1960)
Purchase price	$6-7 million	$2-2.5 million
Maximum take-off weight	100-140,000 kg.	60-70,000 kg.
Mean cruise speed	900 km. p. h.	500 km. p. h.
Maximum payload	15-24,000 kg.	10-11,000 kg.
Unit direct operating cost (US international operations)	7.5¢ per t-km available	13¢ per t-km available

Thus compared with the late-model 4-engine piston aircraft, the long-range jets cost nearly three times as much to buy, weigh more than twice as much, cruise almost twice as fast, can carry about double the load, and cost about 40 per cent less to operate per unit of capacity offered.

Purchase price

37. The differential in purchase price is not as important as it might first appear because when the comparison is made on the basis of price per unit of productive capacity, the jets are found to be rather less expensive than the aircraft they replaced. However, some operators encountered financial problems in their re-equipment programmes as a result of the high price of each productive unit. Where one unit takes the place of three or four as in the case of the jets replacing the piston-engine airliners, there is less possibility of flexibility in financing arrangements. For example, the operator may consider it necessary to acquire more productive capacity than he needs. Furthermore, these problems have been aggravated by a situation that will be considered later -- the competitive need felt by many operators to re-equip more rapidly than would have been desirable from the purely economic point of view.

Increased requirements for air navigation facilities, including airports

38. The greatly increased weight of the jets and their requirement for longer and for stronger runways has led to increased expenditure on airports. In some cases it has been possible to lengthen and strengthen existing runways. In others, it has been necessary to build new airports further from the centres of the cities that they serve, which has aggravated the problem of ground transport. The greater size of the jets has called for enlarged apron and hangar facilities, their greater fuel consumption has required enlarged fuel storage facilities, their much higher optimum cruising altitude has necessitated the provision of extended meteorological forecasts, and their greater speed has called for improved air traffic control services.

Comfort and speed: public appeal

39. The relative freedom from interior noise and vibration of the jets, combined with their much greater speed, has given them a public appeal that has had important economic consequences. In an economic milieu where fares and rates are established on a world-wide basis, competition is largely restricted to the quality of the service offered. In air transport the most important elements in this quality are speed and, for passengers, comfort. Thus, because of their greater speed and comfort, when a major operator introduced jet airliners on one of his routes, there was immediately great economic pressure on the competing airlines (in spite of a small fare differential favouring the propellor-driven aircraft) to follow his lead and themselves acquire jets. This situation greatly accelerated the process of re-equipment and, as a consequence, aggravated the problems of financing new aircraft purchases and of disposing of the obsolescent types, and tended to produce conditions of excess capacity and falling load factors. (This was predicted in the ICAO Jet Study of 1958 -- Doc 7894. Chart 8 in that Study may be compared with Diagram 2 in this Study.)

Mean cruising speed

40. The much higher mean cruising speed of the jet airliners, considered as a separate factor, has had the obvious effect of increasing the average speed of all scheduled flights. In fact this average rose from 335 kilometres an hour in 1958 to 445 in 1964--a gain of 33 per cent. By comparison the increase over the previous six years, from 1952 to 1958, had been only about 14 per cent or less than half as much. This greater speed, apart from its effects on air traffic control and on public appeal that have been mentioned and its effect on productivity that will be dealt with later, has resulted in problems of scheduling. The maintenance of flight frequencies is important, particularly because of

the effect on traffic demand, and high rates of utilization are essential if unit operating expenses are to be kept down. Under these circumstances, if demand does not increase fast enough, an airline will be faced with serious difficulties when it has to fit into its operating pattern new aircraft that can complete their flights in about half the time required by the equipment they are replacing.

Payload capacity

41. The fact that the maximum payload of the long-range jets is approximately double that of the piston-engine aircraft they replaced has meant that the average load carried per aircraft on all scheduled services has shown a marked increase. Specifically, the average number of passengers carried has grown from 29 in 1958 to 46 in 1964--a rise of 59 per cent against only 26 per cent over the previous six years. These much greater plane loads have required the expansion of facilities at airports for handling passengers and cargo, and they have, in effect, emphasized the need for the most efficient possible facilitation procedures.

Potential productivity

42. The greater speed and payload of the jets combine to give them a much greater potential productivity than the aircraft they have replaced. In terms of tonne-kilometres per hour, a single long-range jet can provide between three and four times as much capacity as a late-model 4-engine piston aircraft. From this fact there have flowed a number of consequences of considerable economic importance.

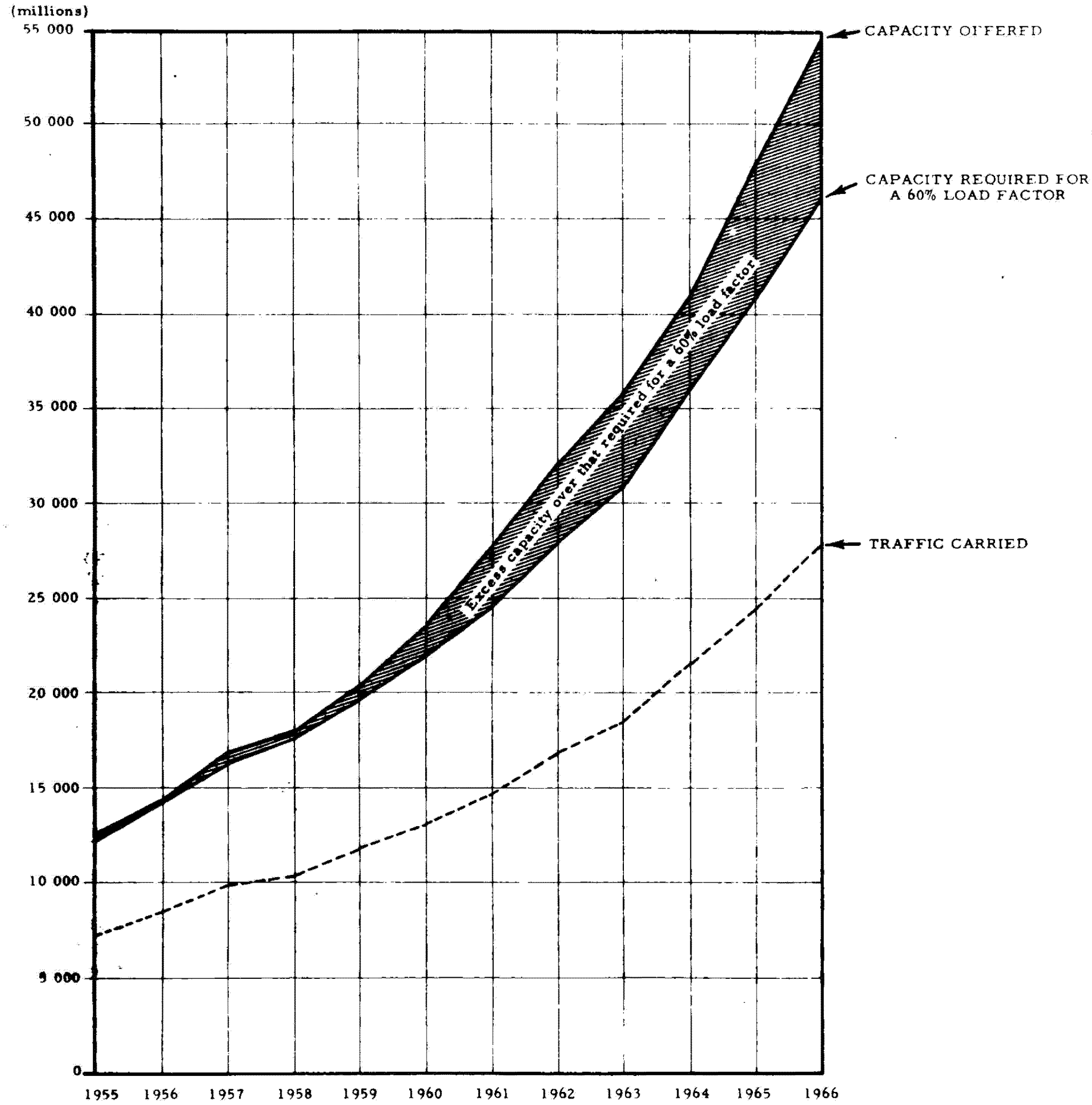
43. Excess capacity.- In the first place, as the re-equipment progressed, rather more rapidly than some operators might have wished because of competitive pressures resulting from the public appeal of the jets, a situation of excess capacity developed. In order to maintain flight frequencies, load factors and aircraft utilization at reasonable economic levels, operators disposed or attempted to dispose of large numbers of piston-engine aircraft. So many of these came onto the second-hand market in a relatively short time, however, that prices fell sharply and operators realized less on their old equipment than they might normally have expected, which accentuated their difficulties in financing the purchase of jets. Through direct sales or trade-ins to the jet manufacturers, a large number of the piston types were nevertheless disposed of, to be used subsequently by smaller scheduled operators and non-scheduled operators mainly on shorter haul and domestic services, or, after conversion, as cargo aircraft. However, a significant number of these piston-engine aircraft were retained by their original owners and employed on passenger services at low utilization rates, or as converted cargo aircraft.

DIAGRAM 3

COMPARISON OF TRAFFIC CARRIED WITH CAPACITY OFFERED AND THE CAPACITY REQUIRED FOR A 60% OVERALL WEIGHT LOAD FACTOR

International and Domestic, Scheduled and Non-Scheduled Services
(Based on existing fleet and aircraft on order up to 30 April 1965)

Ten Years Estimated 1955-1964, Two Years Forecast 1965-1966



This diagram is drawn on an arithmetical scale.

See TABLE 20 for basic data.

The estimates for capacity for the years 1965 and 1966 are based on known orders up to 30 April 1965. It must be recognized however, that an undetermined number of jets are yet to be ordered for introduction into service in 1966 so that the capacity for that year is underestimated to this extent.

ICAO ECONOMICS AND STATISTICS BRANCH (May 1965)

44. Load factors. - The actual capacity situation that developed as the airlines re-equipped with jets may be seen from the following figures extracted from Table 20:

Development of Capacity and Traffic of Scheduled Airlines 1958-1966
(scheduled and non-scheduled services, international and domestic)

	1958	1959	1960	1961	1962	1963	1964	1965*	1966*
Capacity offered (millions t-km)	17,950	20,260	23,480	27,740	32,080	35,700	40,910	48,010	54,540
Traffic carried (millions t-km)	10,250	11,730	13,170	14,705	16,840	18,520	21,520	24,420	27,720
Capacity: annual growth rate (%)	6.8	12.9	15.9	18.1	15.6	11.3	14.6	17.4	13.6
Traffic: annual growth rate (%)	4.5	14.4	12.3	11.7	14.5	10.0	16.2	13.5	13.5
Weight load factor (%)	57.1	57.9	56.1	53.0	52.5	51.9	52.6	50.9	50.8

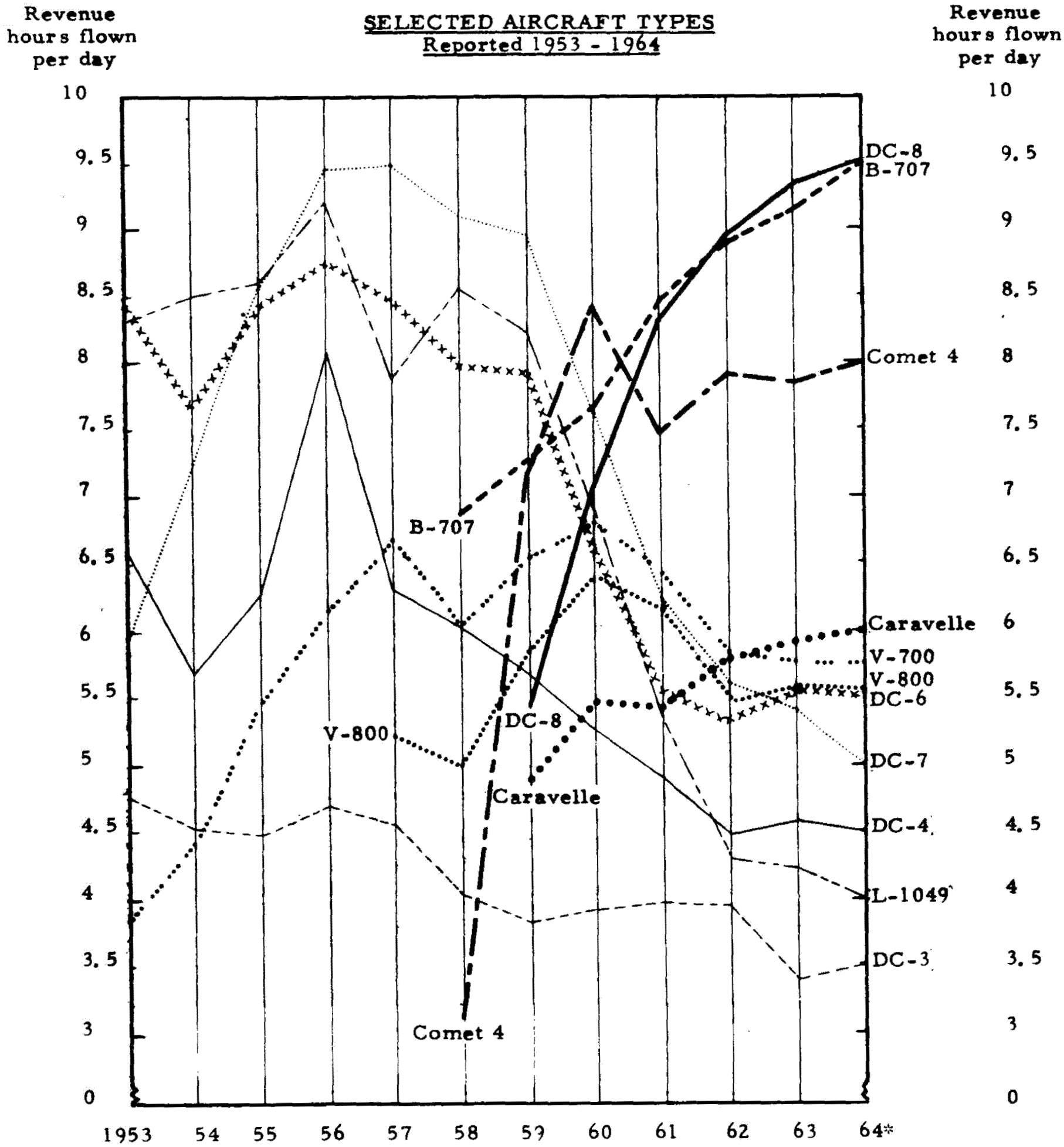
* Estimated

Thus it appears that in each of the four years from 1960 to 1963 capacity increased at a greater rate than traffic with the result that the overall weight load factor fell six points from 57.9 per cent in 1959 to 51.9 in 1963. The worst years were 1960 and 1961 when the load factor fell about five points (from 57.9 to 53 per cent). In 1964, for the first time since 1959, the per cent increase in traffic exceeded that in capacity and the load factor rose slightly to 52.6 per cent; however, it seems probable that in 1965 and 1966 capacity will again grow faster than traffic and the overall load factor will again decline. The effect of this capacity situation may be expressed in other terms as indicated in Diagram 3. From this diagram it may be seen that the excess of capacity offered over that required to achieve an overall weight load factor of 60 per cent has been increasing steadily since 1958.

45. Aircraft utilization. - As the long-range jets with their very high productive potential came into service in increasing numbers and the situation of excess capacity developed, the airlines were faced with the sometimes conflicting needs of maintaining their flight frequencies, keeping load factors above the break-even point, and utilizing their equipment sufficiently to prevent operating costs from rising unduly. In general, frequencies were not reduced. Load factors did fall, as shown in the preceding paragraph (but their relationship to the break-even point will be dealt with later). On the question of utilization, statistical information is presented in Table 19 and some aspects of this are illustrated in Diagram 4.

DIAGRAM 4

UTILIZATION OF AIRCRAFT FLOWN BY INTERNATIONAL SCHEDULED AIRLINES
(In terms of revenue hours flown per day)



Note: This diagram is drawn on an arithmetical scale. * Estimated.

See TABLE 19 for basic data.

ICAO Economics & Statistics Branch (May 1965)

46. From the data presented, it may be seen that high rates of utilization--8 hours a day or more--were achieved at some time with most of the long-range 4-engine piston aircraft. In particular, the Douglas DC-6's and DC-7's, and the Lockheed L-1049's and 1649's, were utilized by scheduled airlines for 8 or more hours a day for varying numbers of years up to and including 1959. After 1959, however, utilization of these aircraft in terms of revenue hours per day, fell sharply. On the other hand, utilization of the long-range jets, which, as has been stated, were introduced late in 1958, did not exceed and maintain 8 hours a day until 1961. By that year, the Boeing 707 and the Douglas DC-8 were both being utilized in excess of 8 hours a day, and by 1964 their utilization was in the vicinity of 9-1/2 hours a day. In 1963 and 1964 daily utilization of the Boeing 720 surpassed 8 hours and the figure for the Comet 4 has fluctuated around the 8-hour mark since 1960. In the year 1960, however, the only aircraft for which the world-wide average daily utilization exceeded 8 hours was the Comet 4.

47. These figures relating to utilization should be considered in the light of the data in the table in paragraph 34 on the proportions of capacity offered in the different categories of aircraft. Up to 1959 the piston-engine aircraft was still the predominant air transport vehicle on all stage lengths, accounting for 73 per cent of the capacity in that year. By 1961, however, the situation had changed and 54 per cent of the total capacity was offered in jets against only 28 per cent in piston-engine aircraft, and on long-haul operations the predominance of the jet by 1961 was considerably greater. Thus utilization of the chief long-range piston aircraft remained above the 8-hour mark only while they remained the predominant vehicles on the long-haul routes. As soon as they were replaced, their utilization declined, and that of the jets exceeded 8 hours, and the excess capacity situation was eased, although by no means eliminated, by under-utilization of older and depreciated equipment.

Operating expenses and revenues

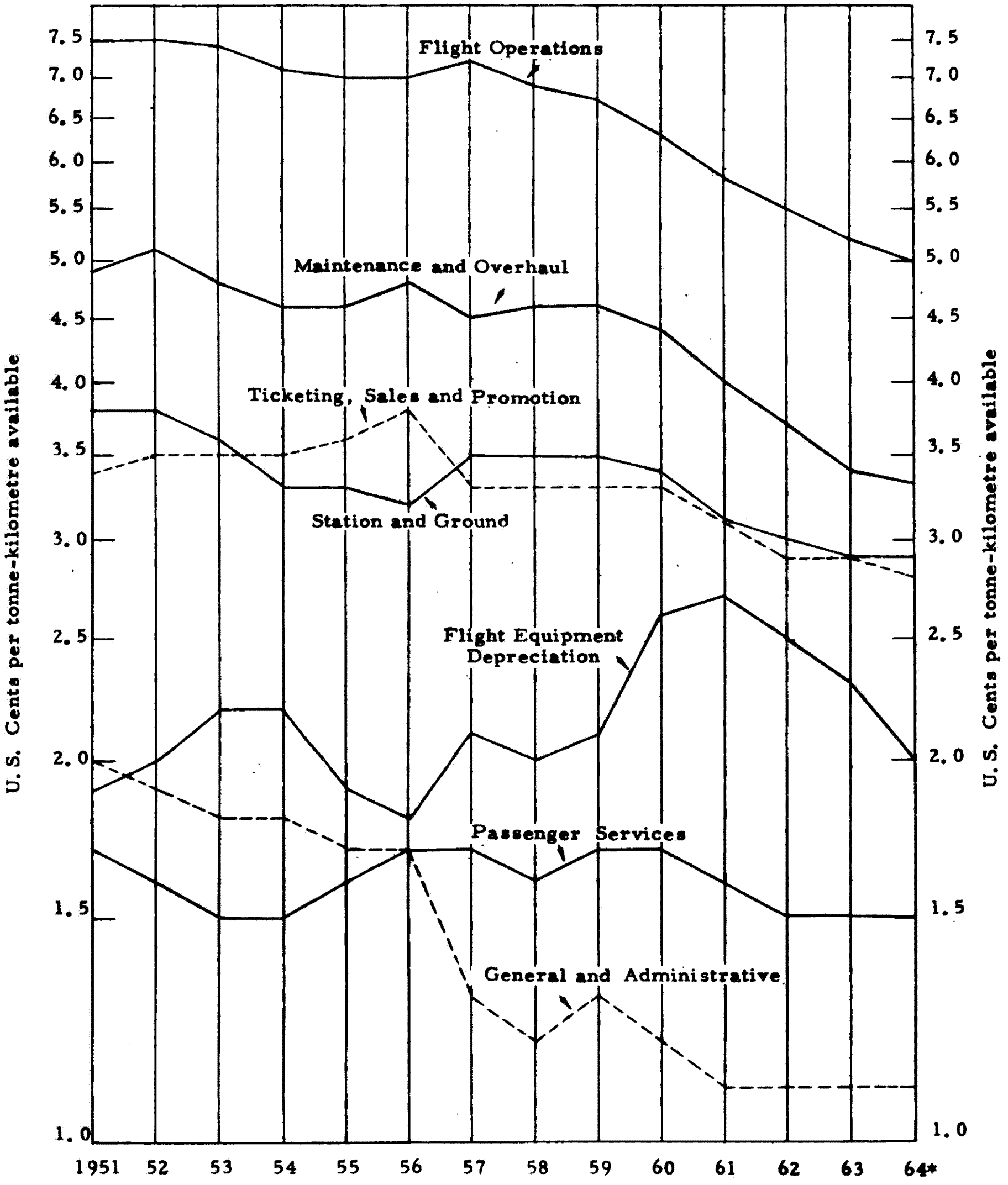
48. Direct unit operating expenses. - Most of the characteristics of the jets that have been referred to were known more or less precisely before the aircraft were introduced into service, but their operating costs were the subject of speculation. There was perhaps a general expectation that they would be somewhat lower than those of the piston-engine aircraft, but a difference of opinion as to how much lower. In the event, and particularly since the adoption of the turbo-fan engine, these costs have been as low as the more optimistic forecasts. In the international operations of United States scheduled carriers in 1963, the average operating cost of all the jet aircraft was

DIAGRAM 5

OPERATING EXPENSES PER TONNE-KILOMETRE AVAILABLE, 1951-1964

Scheduled and non-Scheduled Services of the Scheduled Airlines

TOTAL DOMESTIC AND INTERNATIONAL SERVICES



This diagram is drawn on a logarithmic scale to compare rates of change.
See Table 7 for basic data.

* Estimate.

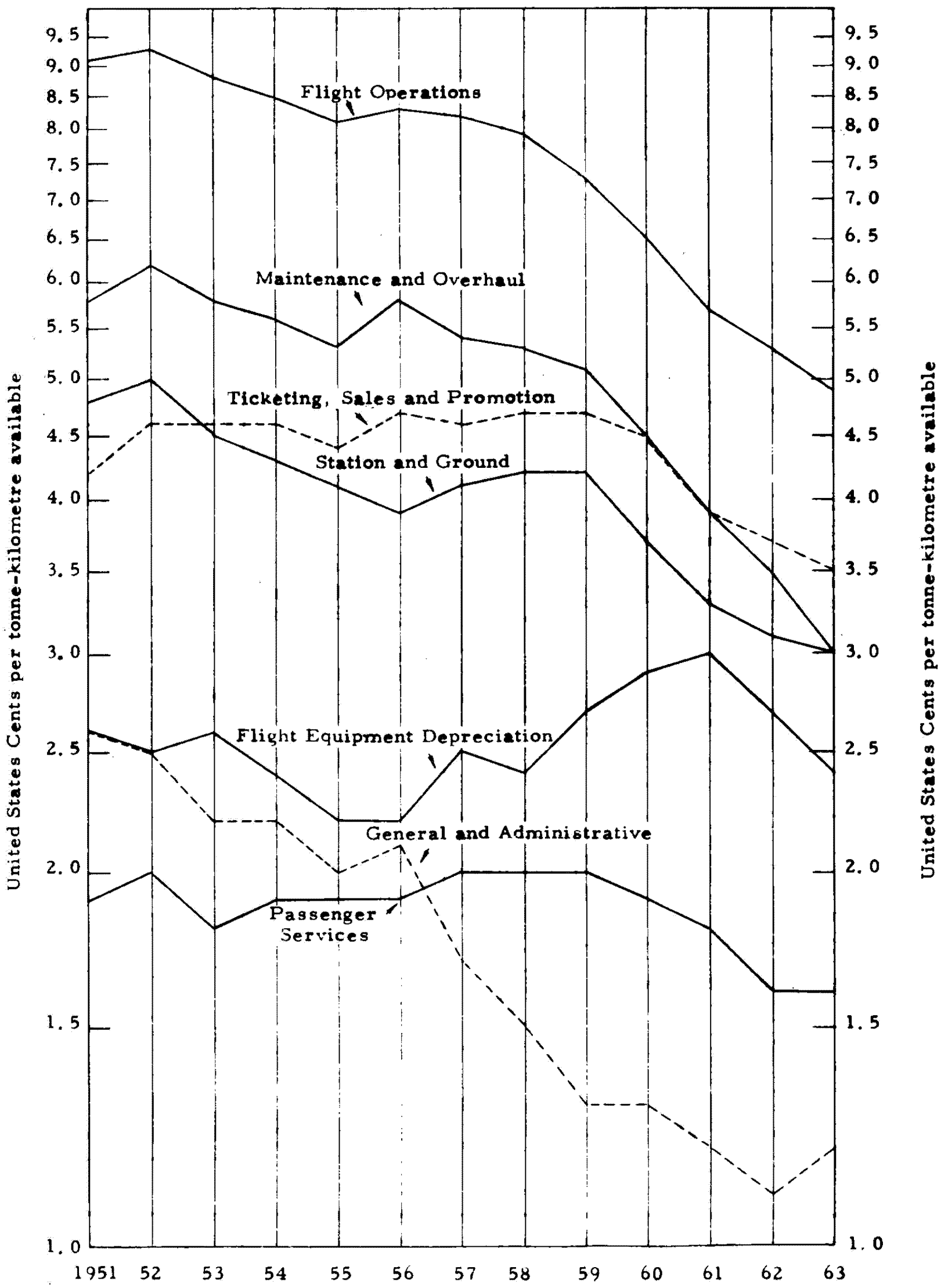
ICAO Economics & Statistics Branch (May 1965)

DIAGRAM 6

OPERATING EXPENSES PER TONNE-KILOMETRE AVAILABLE, 1951-1963

Scheduled and non-Scheduled Services of the Scheduled Airlines

INTERNATIONAL SERVICES



This diagram is drawn on a logarithmic scale to compare rates of change.
See Table 8 for basic data.

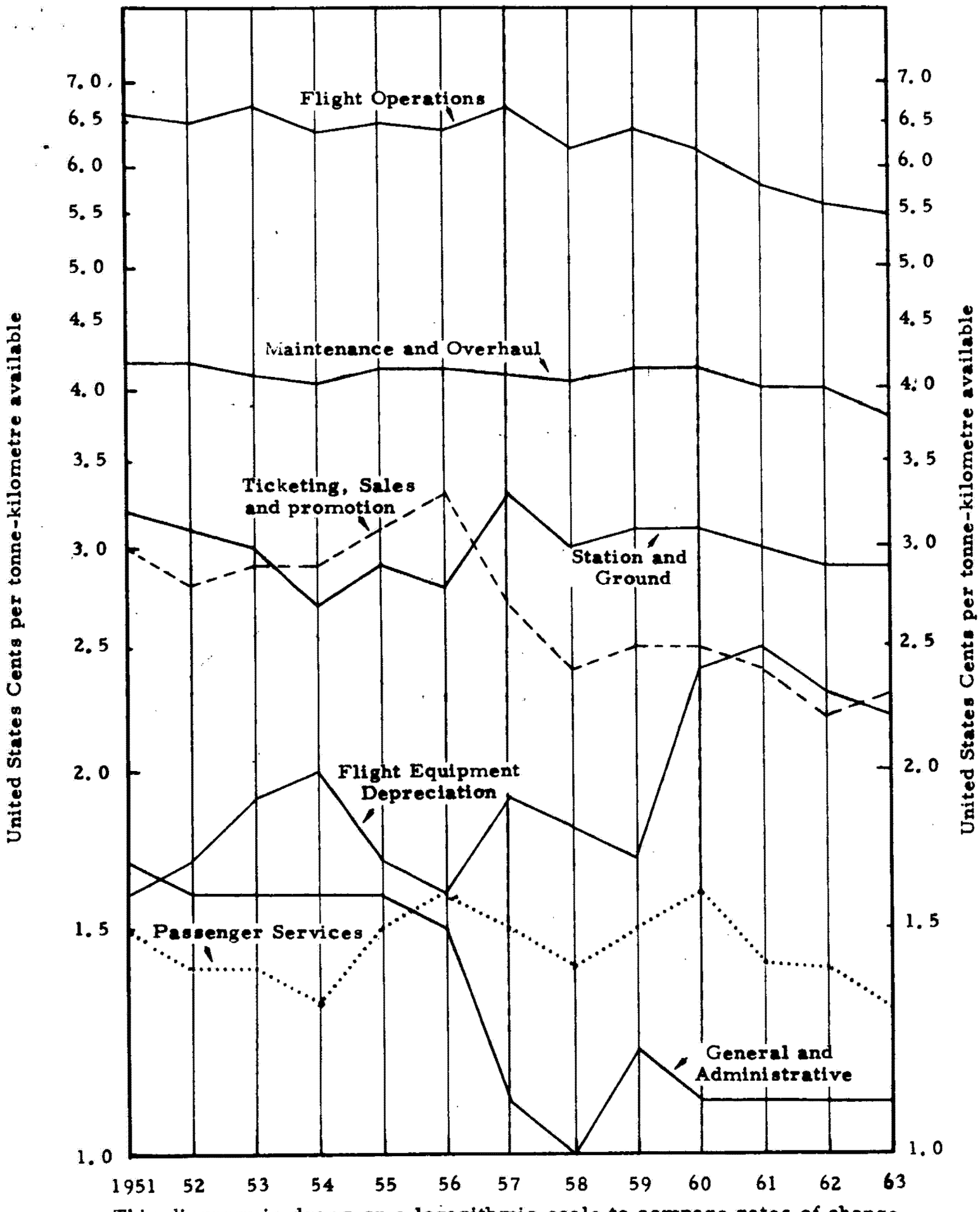
ICAO Economics & Statistics Branch (May 1965)

DIAGRAM 7

OPERATING EXPENSES PER TONNE-KILOMETRE AVAILABLE, 1951-1963

Scheduled and non-Scheduled Services of the Scheduled Airlines

DOMESTIC SERVICES



This diagram is drawn on a logarithmic scale to compare rates of change.
See Table 9 for basic data.

ICAO Economics & Statistics Branch (May 1965)

about 7.5 cents per tonne-kilometre available, which is more than 40 per cent below the average for 4-engine piston aircraft in 1960 of about 13 cents.* These very low direct unit operating costs have had the effect, as the jets were progressively introduced, of appreciably lowering the overall average direct cost per tonne-kilometre available for all aircraft flown by the airlines of ICAO States. In fact these costs have fallen 26.7 per cent in the six years from 1958--from 13.5 cents per tonne-kilometre available in 1958 to 9.9 cents in 1964. Against this, the decline over the previous six years from 1952 was only 7.5 per cent (from 14.6 to 13.5 cents). The financial data for airlines of ICAO States from which these and following figures are extracted are presented in Tables 7 to 16.

49. Indirect and total unit operating expenses. - Indirect operating expenses per tonne-kilometre available have also fallen. However, the decline here has not been noticeably affected by the introduction of the jets. In the six years since 1958, indirect unit costs fell just over 9 per cent, which was slightly less than the decline of 11 per cent recorded over the previous six years from 1952. In sum, these developments have meant that total operating expenses per tonne-kilometre available have fallen nearly 20 per cent since 1958 as compared with about 9 per cent over the period 1952 to 1958. The behaviour of the individual components of these operating expenses is illustrated, for total, international, and domestic services, in Diagrams 5, 6 and 7 respectively. From these it may be seen that the only item that has not shown a more or less regular decline is flight equipment depreciation. The figures under this heading rose steadily for both total and international services from 1958 to 1961 as the expensive new aircraft were purchased, but by 1964 had fallen to their 1958 level.

50. Unit operating revenues. - While unit operating expenses were falling by about 20 per cent from 1958 to 1964, average operating revenues per tonne-kilometre performed for all services fell only about 5 per cent. The yearly development of these unit revenues for different classes of traffic is illustrated in Diagrams 8, 9 and 10 for total, international, and domestic services respectively. For scheduled cargo and

---

* United States Federal Aviation Agency, Direct Operating Costs of Transport Aircraft in Airline Service, 1960 and 1963.

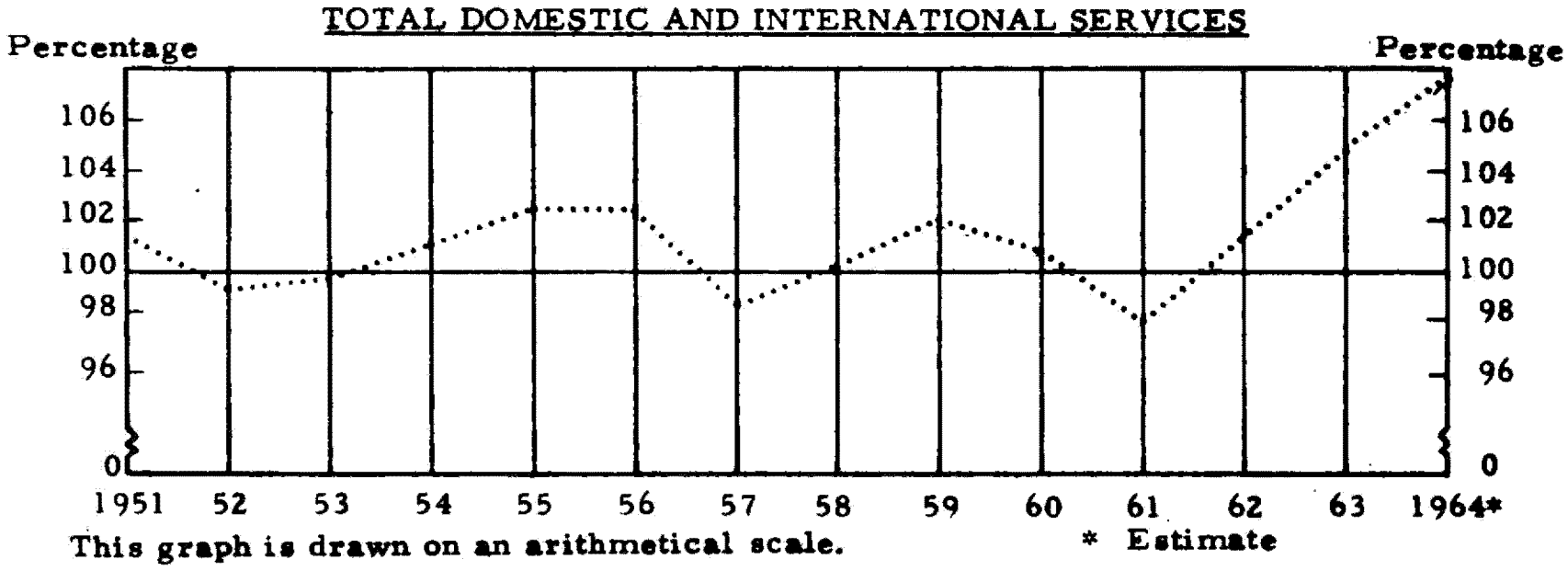
DIAGRAM 8

Chart 1

OPERATING REVENUES AS A PERCENTAGE OF OPERATING EXPENSES, 1951-1964

Scheduled and non-Scheduled Services of the Scheduled Airlines

TOTAL DOMESTIC AND INTERNATIONAL SERVICES



This graph is drawn on an arithmetical scale.

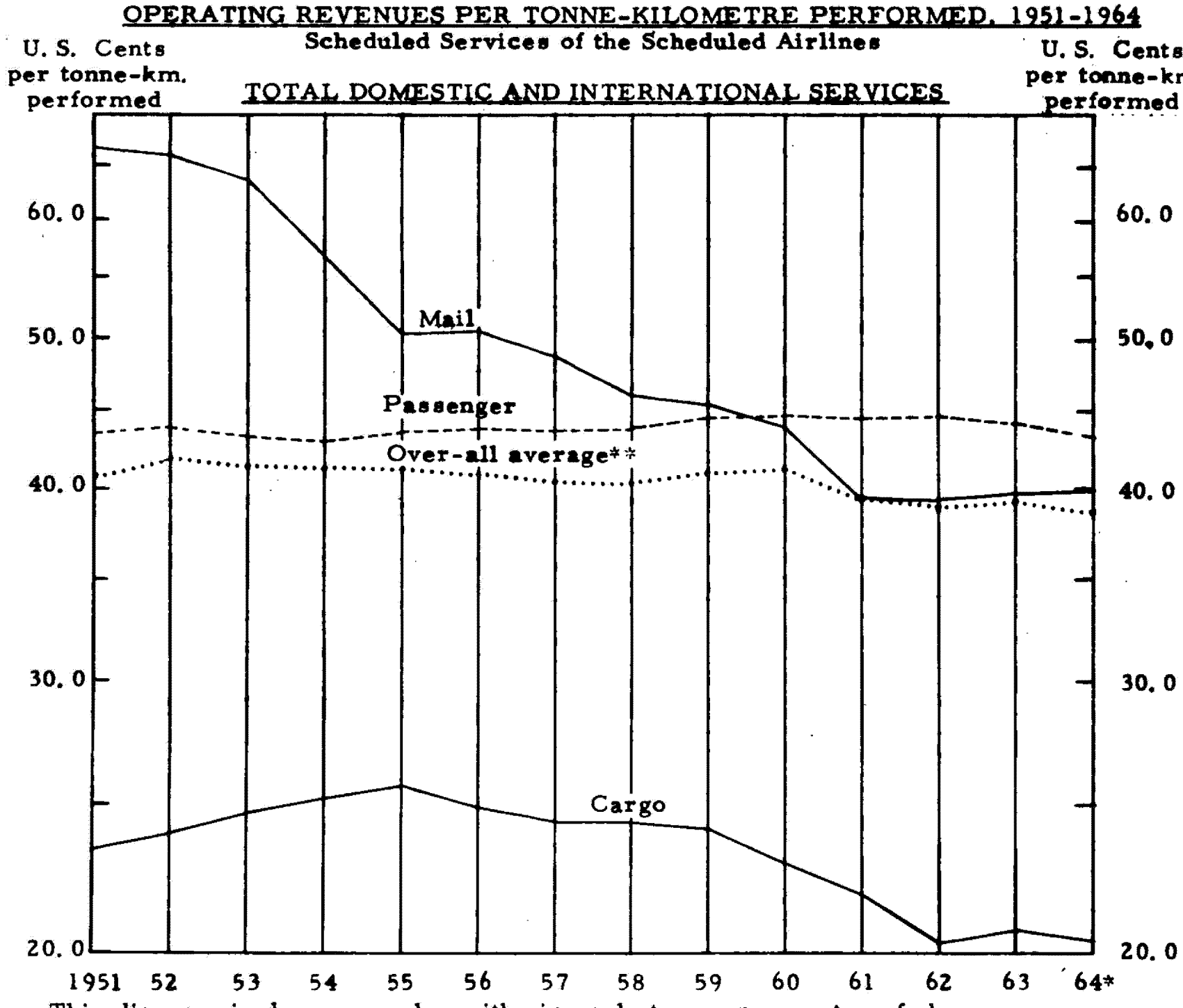
* Estimate

Chart 2

OPERATING REVENUES PER TONNE-KILOMETRE PERFORMED, 1951-1964

Scheduled Services of the Scheduled Airlines

TOTAL DOMESTIC AND INTERNATIONAL SERVICES



This diagram is drawn on a logarithmic scale to compare rates of change.

See Table 7 for basic data.

* Estimate

** Including non-scheduled services.

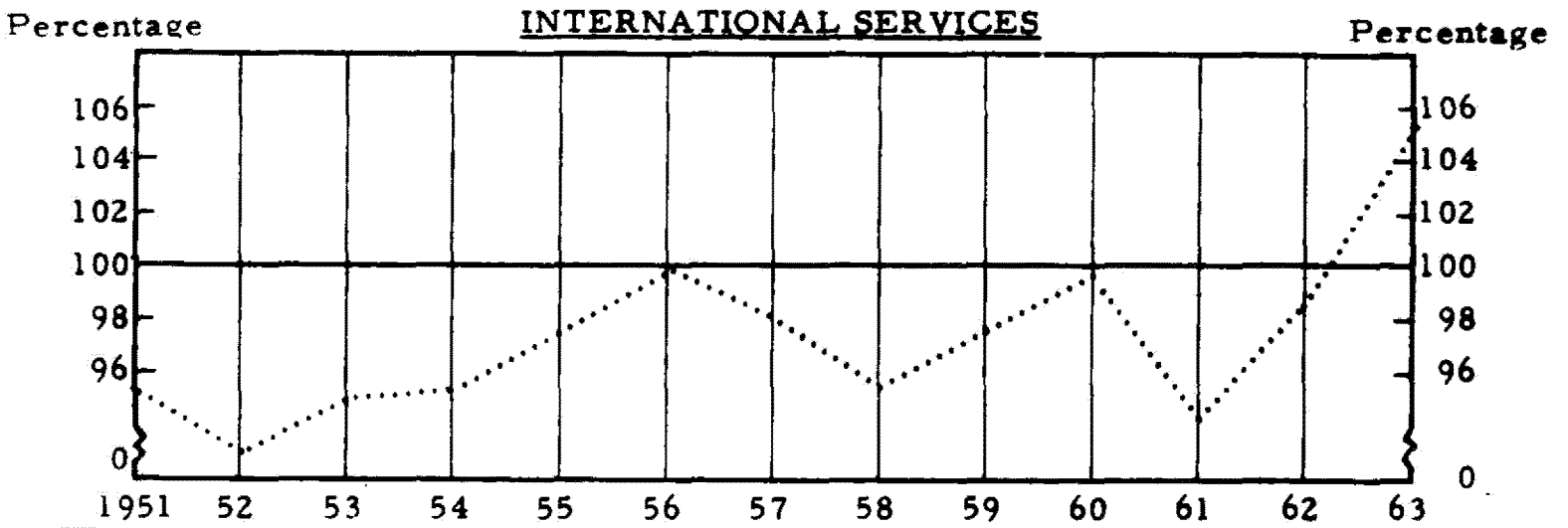
ICAO Economics & Statistics Branch (May 1965)

DIAGRAM 9

Chart 1

OPERATING REVENUES AS A PERCENTAGE OF OPERATING EXPENSES, 1951-1963

Scheduled and non-Scheduled Services of the Scheduled Airlines

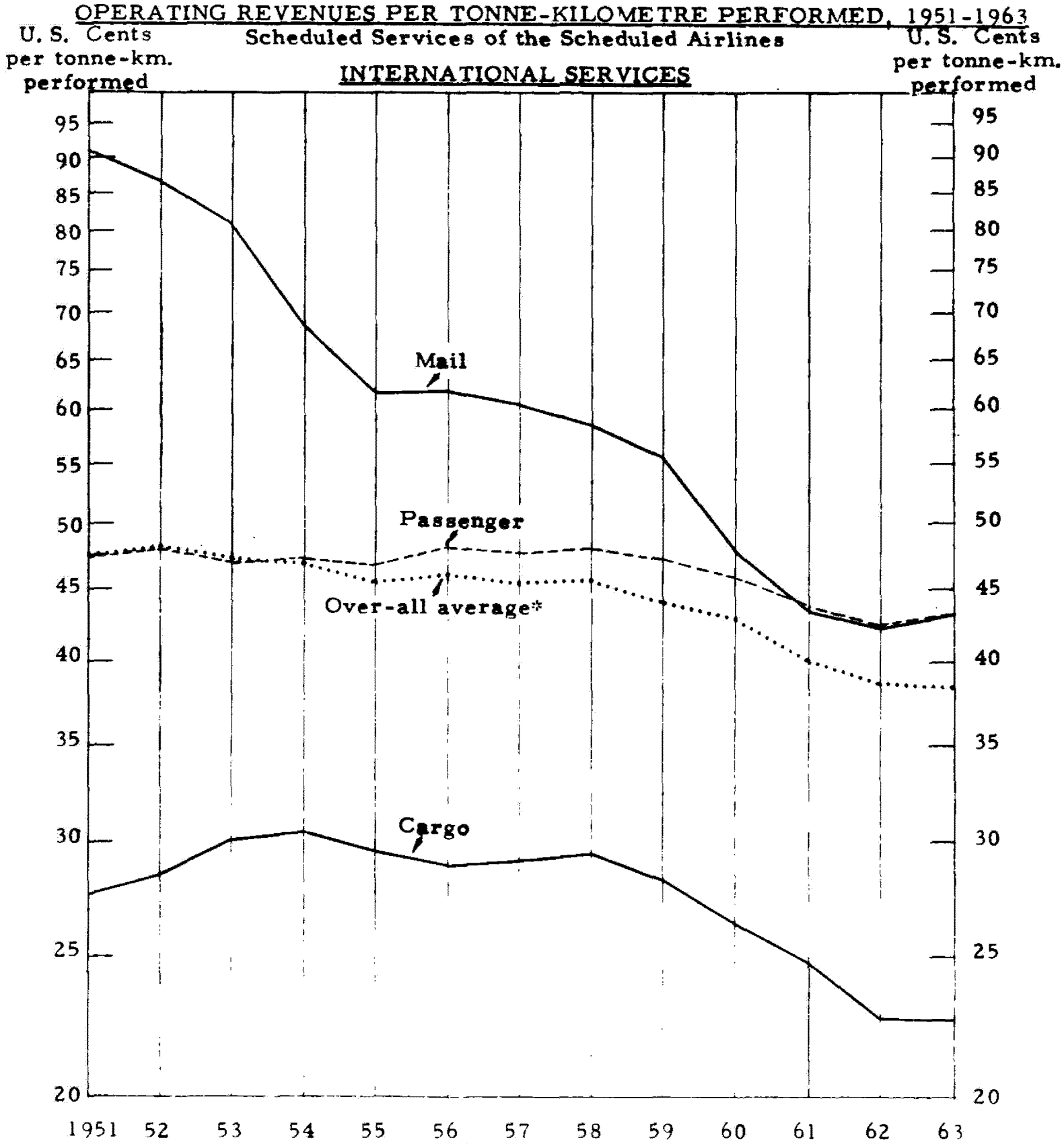


This graph is drawn on an arithmetical scale.

Chart 2

OPERATING REVENUES PER TONNE-KILOMETRE PERFORMED, 1951-1963

Scheduled Services of the Scheduled Airlines



This diagram is drawn on a logarithmic scale to compare rates of change.

See Table 8 for basic data.

* Including non-Scheduled Services.

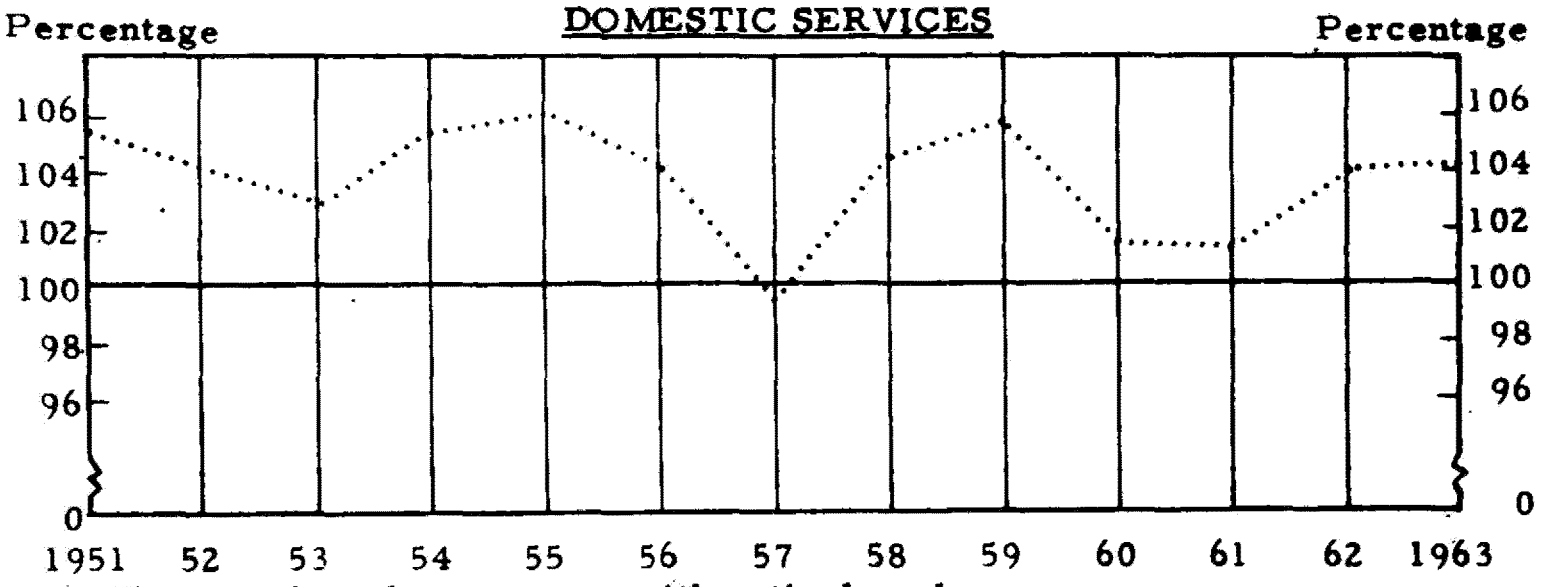
ICAO Economics & Statistics Branch (May 1965)

DIAGRAM 10

Chart 1

OPERATING REVENUES AS A PERCENTAGE OF OPERATING EXPENSES, 1951-1963

Scheduled and non-Scheduled Services of the Scheduled Airlines

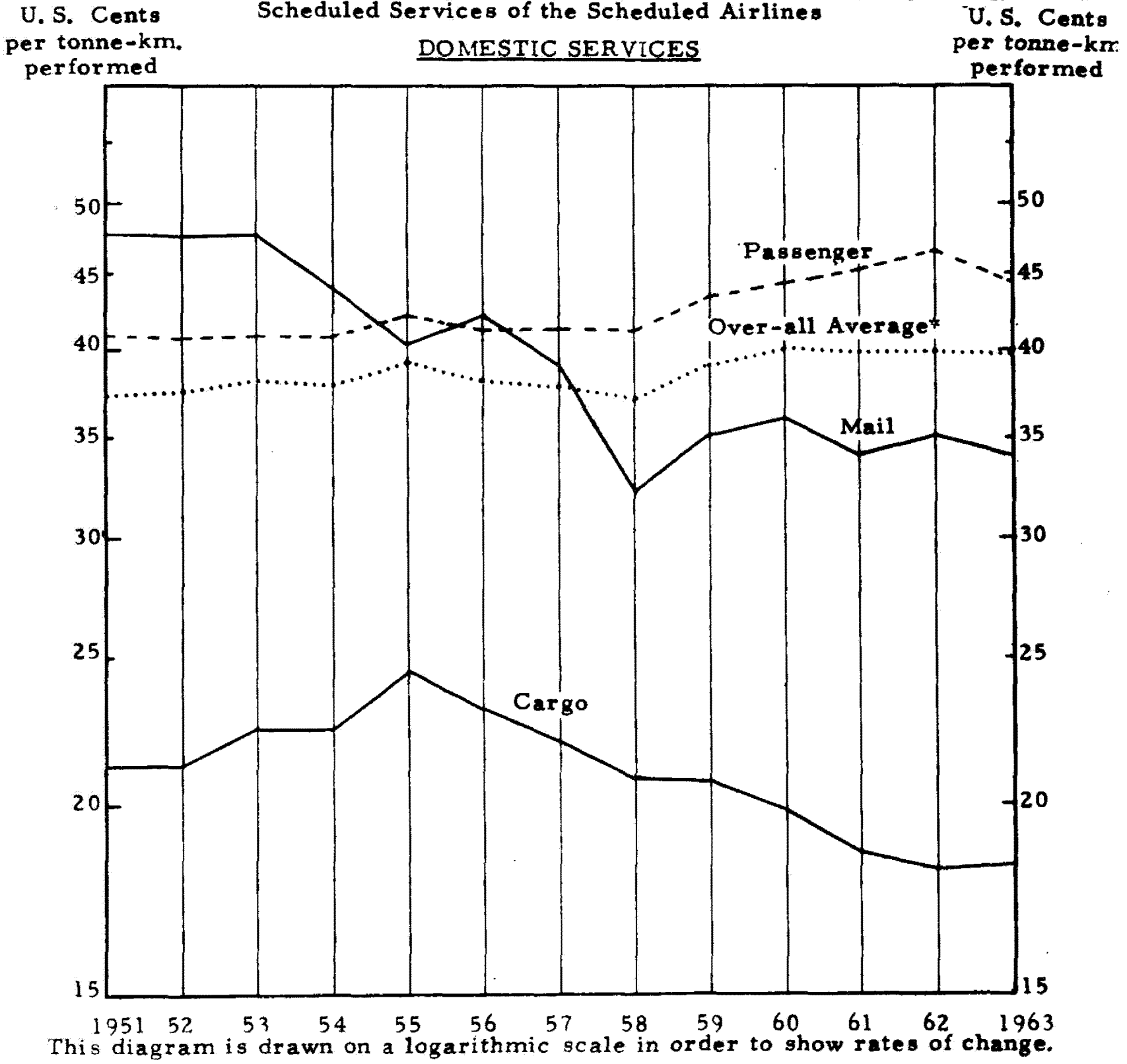


This graph is drawn on an arithmetical scale.

Chart 2

OPERATING REVENUES PER TONNE-KILOMETRE PERFORMED, 1951-1963

Scheduled Services of the Scheduled Airlines



This diagram is drawn on a logarithmic scale in order to show rates of change.

See Table 9 for basic data.

* Including non-Scheduled Services.

ICAO Economics & Statistics Branch (May 1965)

mail traffic, it will be seen that the unit revenues did show an appreciable decline, but for scheduled passenger traffic the average revenue level for all services remained more or less static.

51. International and domestic services. - The figures given thus far have referred to all services (international and domestic) of the scheduled airlines of ICAO States. It is, however, necessary to make a distinction between the international and domestic services, and Diagram 11 illustrates the separate development of average unit operating expenses and revenues on these two sectors, as well as on the two combined. It may thus be seen that the decline in overall unit operating expenses of approximately 20 per cent since 1958 was brought about almost entirely by a 30 per cent decline on the international services from 1958 to 1963. During the same period unit expenses on domestic services fell by only 4 per cent. As a consequence of this fall, unit expenses on international services, which were approximately 40 per cent higher than on domestic services in 1958, were, by 1963, at about the same level. The chief cause of this change would appear to be the predominance of jet aircraft, with their low operating costs, on international routes.

52. For all services combined it has been pointed out that unit operating revenues declined by 5 per cent from 1958 to 1964. However, on the international services they fell 15 per cent by 1963, while on the domestic services they rose almost 8 per cent in the same period. As with expenses the result of these developments was that by 1963 unit operating revenues were at about the same level on both international and domestic services.

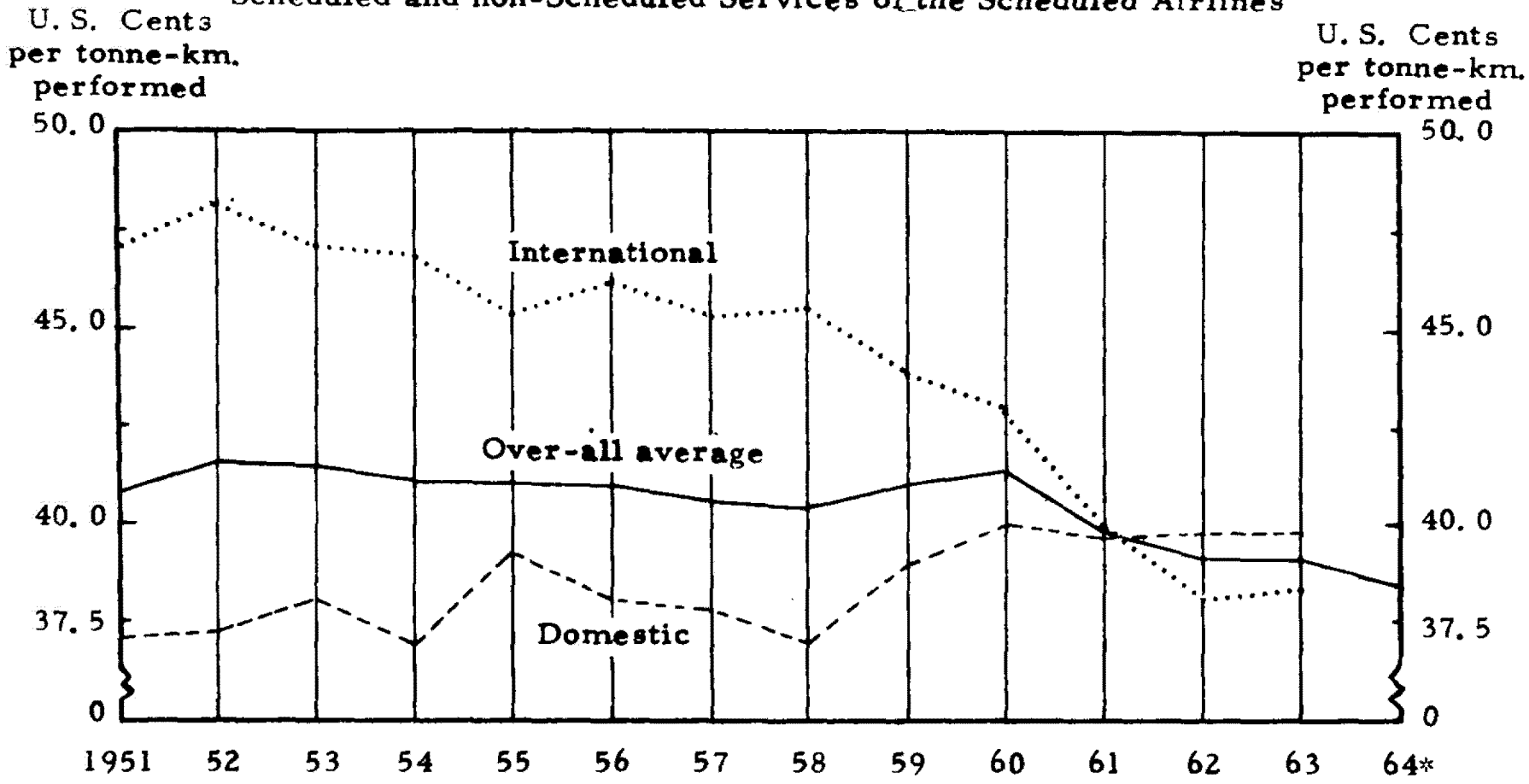
53. Ratio of revenues to expenses. - Since the introduction of the jets in 1958 unit operating revenues have exceeded expenses for all services in every year but 1961. This, moreover, has occurred in spite of conditions of excess capacity, low utilization of piston-engine aircraft, and falling load factors. However, although load factors have fallen, unit operating expenses have declined on average much more rapidly than revenues with the result that break-even load factors have also fallen. In fact the break-even load factor dropped 15 per cent, from 57.1 per cent in 1958 to 48.6 in 1964, and the weight load factor for all services exceeded the break-even point in every year since the introduction of the jets, except 1961. The development of the ratio between unit operating revenues and expenses is illustrated in Diagrams 8, 9, and 10 for total, international, and domestic services and it will be seen that the situation

DIAGRAM 11

Chart 1

AVERAGE UNIT REVENUES: PASSENGERS, CARGO AND MAIL, 1951-1964

Scheduled and non-Scheduled Services of the Scheduled Airlines

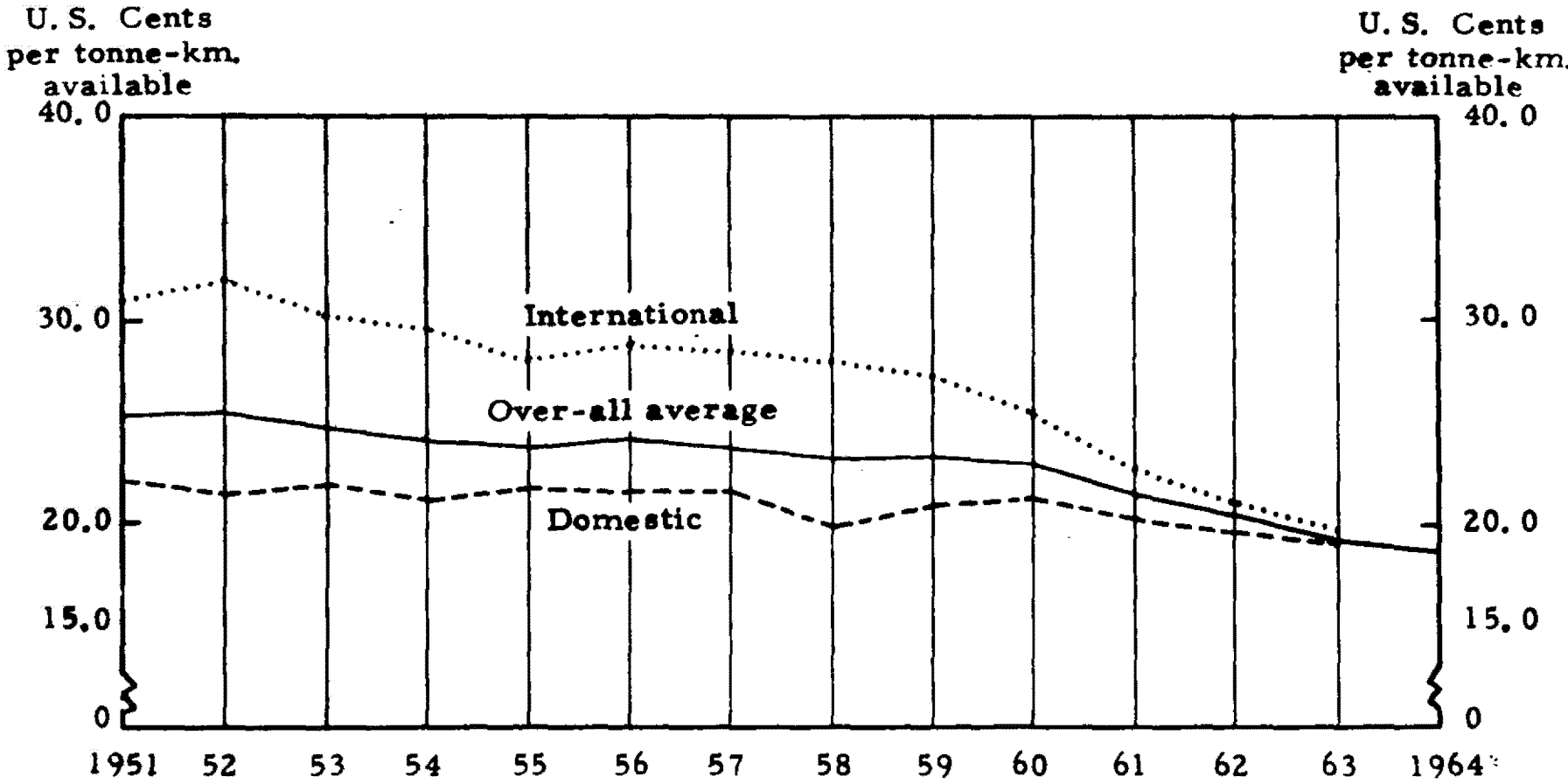


This graph is drawn on an arithmetical scale. * Estimate (over-all average only)

Chart 2

AVERAGE UNIT EXPENSES: PASSENGERS, CARGO AND MAIL, 1951-1964

Scheduled and non-Scheduled Services of the Scheduled Airlines



This graph is drawn on an arithmetical scale.

See Tables 7, 8 and 9 for basic data. * Estimate (over-all average only)

ICAO Economics & Statistics Branch (May 1965)

that has been described for all services has not held good for international and domestic services. On the international sector unit revenues were less than expenses every year until 1963, by which time the jets were being fully utilized and were in service in sufficient numbers to have a determining effect on the level of expenses. On the domestic sector, on the other hand, unit revenues have exceeded expenses during the whole period. By 1963, therefore, the ratio of revenues to expenses was, for the first time, more or less the same for both international and domestic services, both showing a margin of revenue.

THIS PAGE INTENTIONALLY LEFT BLANK

V. FUTURE TRENDS IN WORLD DEMAND FOR AIR TRANSPORT*

Recent changes in the general picture

54. Developments in the economic situation over the last five years have changed the general picture as it affects the probable future market for air transport in two important ways. In the first place, air fares have fallen less than was expected. World average operating costs per seat-mile and world average passenger load factors have both fallen substantially as was expected. This development has not, however, produced the general reductions in fares that would normally be expected to flow from such a situation. In fact air fares remained more or less constant until 1963 and 1964 and were then reduced only on some routes. This suggests that air fares are more inflexible than was thought and are not likely to be reduced generally and substantially in the period before the supersonic airliners are introduced. This is to the advantage of the latter since it will enable them to operate at higher unit costs without suffering losses.

55. The second development is that air transport demand has proved to be more vigorous than was expected five years ago. The poor volume increases recorded in 1958 and 1959 suggested at that time that the world air transport market was reaching a saturation point, and that the curve of expansion was due to fall off rather sharply. Later figures have shown, however, that the long-period rate of expansion is tending to diminish only slowly so that the prospects for future expansion are considerably better than the more conservative forecasts made at that time. This is particularly true of the United States' domestic system which still forms about 40 per cent of world air transport operations.

---

* Projection of future trends in world demand for air transport necessitates making assumptions concerning future world political and economic conditions on the one hand and air transport economic trends on the other. In this section, the usual assumptions are made concerning the absence of radical changes in world economic and social conditions such as might be caused by a major war or a general economic depression. No attempt has been made to adjust fares and costs, either in the future or in the past, for changes in the value of money, since none of the available indices of inflation seem applicable to air transport all over the world. The assumptions considered most probable are used as a basis for the forecast calculations, but it should be emphasized that more optimistic or more pessimistic assumptions would lead to different results. For the convenience of the reader, the assumptions are collected into a note at the end of the section.

56. The following paragraphs show some of the detailed statistics of these developments and the way in which they affect forecasts of future trends in the world demand for air transport in relation to the possible introduction of supersonic airliners in the early 1970's.

Trends in air transport fares

57. In order to consider future trends in the volume of demand for world air transport, it is necessary to make assumptions concerning the future trend of air transport fares and rates. The key figure is the level of passenger fares on the scheduled air services.*

58. The present situation, on scheduled services, is that world average air fares per kilometre or mile are about twice the airlines' operating cost per seat-kilometre or seat-mile, so that the global break-even load factor is about 52 per cent (see Diagram 12 and Table 2). The figures for 1965 will probably be approximately as follows:

1965 forecasts--scheduled passenger services

World average unit operating cost for passenger services	1.9 cents per seat-km 3.1 cents per seat-mile
World average passenger fare revenue	3.8 cents per pass-km 6.1 cents per pass-mile
World average break-even passenger load factor	52 per cent

59. The actual load factor in 1965 will probably also be low owing chiefly to increases in total capacity contributed by the new medium-range jet airliners (see Diagram 2, page 16, and Table 2, page 40). The older turbo-props and piston-engine aircraft displaced by these new jets will no doubt be operated at reduced utilization rates and some may be converted to cargo aircraft or sold to non-scheduled operators, but the net effect is likely to be an increase in scheduled service passenger capacity greater than the increase in the volume of demand, producing a world passenger load factor of about 53 per cent as compared with 56 per cent in 1964. Since there is no sign of slackening in the purchases of new aircraft, passenger load factors are taken at 52 per cent in 1970 and 1975.

---

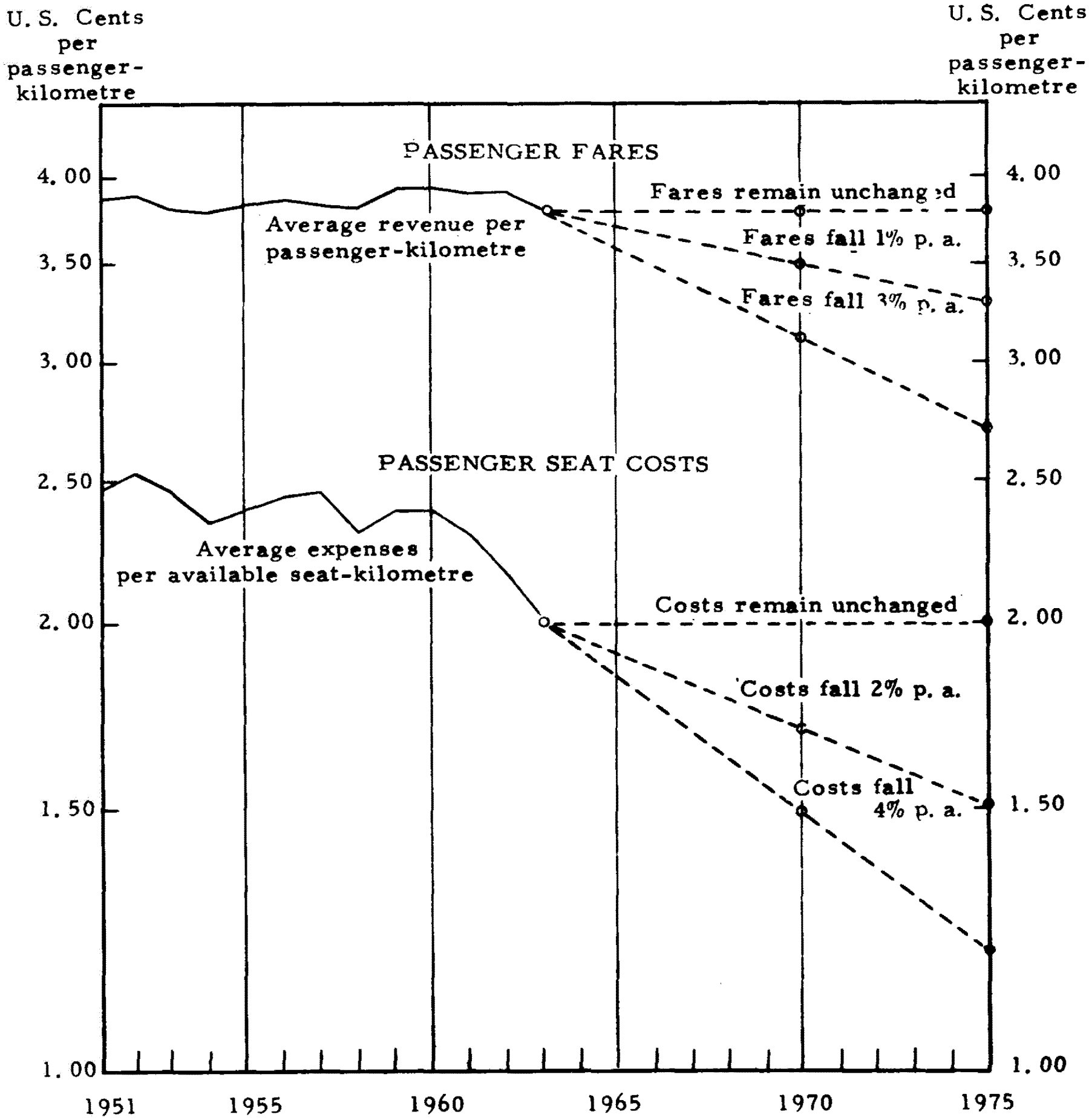
* Cargo and mail combined provide about 14 per cent of airline revenue; non-scheduled operations, about 4 per cent. Both cargo and non-scheduled operations are increasing faster than scheduled passenger traffic, but for the next ten years it seems probable that passenger operations will remain the determining factor in the economics of air transport.

DIAGRAM 12

TRENDS OF PASSENGER FARES AND COSTS, 1951-1975

Scheduled Services of the Scheduled Airlines

DOMESTIC AND INTERNATIONAL SERVICES



This diagram is drawn on a logarithmic scale to compare rates of change.

Actual figures to 1963; estimates beyond.

See Table 2 for basic data.

ICAO Economics & Statistics Branch (May 1965)

TABLE 2

POSSIBLE FUTURE TRENDS IN WORLD AIR TRANSPORT UNIT COSTS AND PASSENGER FARES

Scheduled Passenger Services

International and Domestic Combined

(Revenues from cargo, mail, and non-scheduled operations deducted from operating costs to give passenger operating costs)

	Average operating costs per unit of capacity	Average fare level (Revenue per unit of payload)	Break-even passenger load factor	Actual or estimated load factor
Base Year 1963	2.0¢ per seat-km 3.3¢ per seat-mile	3.8¢ per pass-km 6.2¢ per pass-mile	52.7%	53.5%
1965 (Estimate)	1.9¢ per seat-km 3.1¢ per seat-mile	3.8¢ per pass-km 6.1¢ per pass-mile	52%	53%
1970 (Assumptions)	1.7¢ per seat-km 2.8¢ per seat-mile (15% below 1963)	3.5¢ per pass-km 5.6¢ per pass-mile (10% below 1963)	50%	52%
1975 (Assumptions)	1.5¢ per seat-km 2.4¢ per seat-mile (25% below 1963)	3.3¢ per pass-km 5.3¢ per pass-mile (15% below 1963)	47%	52%

60. A situation where passenger fares are about twice seat-kilometre or seat-mile costs, combined with an average of nearly 50 per cent empty seats, will cause continued pressure from many quarters to reduce fares. This pressure will probably be helped by a general tendency for unit operating costs to fall. World air transport unit operating costs have been falling at nearly 5 per cent per year since 1960 as the low operating costs of the large jets became effective. More jets are steadily coming into service and their operating costs are continuing to fall. In the late 1960's the trend will probably be carried on by the gradual amortization of the jet fleets, by the introduction of stretched versions of the present generation of jets, and in the 1970's perhaps by the introduction of larger aircraft. The world average unit operating cost may be expected to continue to fall, therefore, although at a slower rate than recently. It is assumed that it will do so at about 2 per cent per year.*

61. It must be noted, however, that the unit operating costs of individual airlines vary greatly from the average (from about 1.5 cents to about 5 cents per seat-kilometre or from 2.4 cents to 8 cents per seat-mile), and those with higher than average operating costs are in the majority (those with lower than average operating costs include some of the very large airlines). It is estimated that, numerically, about half the international airlines at the present time have unit operating costs of over 2.5 cents per seat-kilometre or 4 cents per seat-mile (i.e., over 30 per cent higher than the world average figures of 1.9 and 3.1). Fares on these airlines' routes also tend to be higher than the world average, but their break-even load factors probably lie mostly in the range, 60 - 80 per cent, and many of them will be still showing a net operating loss or a very small margin of profit. Fare reductions would in the first instance tend to raise these break-even load factors and the airlines concerned feel that the result would be to make their economic situation worse.

62. It can, of course, be argued that a reduction in passenger fares will result in more passengers coming forward to travel and therefore bring actual load factors above the break-even point (or raise them enough to cause airlines to lose less money than they were doing before). In many parts of the world, however, the high seasonality of air passenger traffic is a serious obstacle to the

---

* The possible effect of the supersonic airliners being introduced between 1970 and 1975 is not taken into account here since the object of the analysis is to examine the air transport picture into which they might be introduced. It is also assumed that much larger passenger aircraft (e.g., 500 - 700 seats) will not be introduced before 1975, or not in sufficient numbers to affect world operating costs.

expansion of passenger traffic by the reduction of fares. European airlines, for example, have services in the summer months fully booked many weeks ahead and could not carry more passengers at these times. In order to improve load factors, fare reductions have to concentrate on the winter months and off-peak times, but these tend to be the times when the elasticity of demand is lowest.

63. Some airline authorities thus oppose fare reductions on principle, so that although a fall in the world level of passenger fares seems probable, it is likely to take place rather gradually by specific steps on particular routes rather than in a general way. Unit operating costs vary considerably from route to route, mainly according to the length of stage, volume of traffic, and size of aircraft operated. Since fares per kilometre do not vary as much as unit costs, break-even load factors also vary from route to route. The passenger elasticity of demand and the degree of seasonality also vary greatly. There are thus likely to be times when the conditions on particular routes are so favourable to fare reductions that they will achieve the unanimous agreement required by the IATA fare-regulating machinery, but the resultant reductions will probably be sporadic and relate to special periods or classes of travel.*

64. Taking all these factors into account, it has been assumed, for the purpose of this analysis, that the world average of passenger fares on scheduled services will fall rather slowly over the next decade, at about 1 per cent per year. Allowing for the more rapid fall in 1964 and 1965, this would mean that by 1970 they would be reduced by about 10 per cent below the 1963 figure and by a further 5 per cent by 1975.** (See Diagram 12 and Table 2.)

---

* There are likely also to be fare increases in sectors where, because of inflation or for any other reason, operating costs increase. In the domestic sector (world total), for example, unit operating costs rose about 7 per cent between 1958 and 1960, and fares increased about 8 per cent. It is considered probable, however, that downward movements will outweigh upward movements unless the rate of world inflation increases substantially.

** This is about half the rate of fare-reduction assumed in the supersonic airliner study in 1960 (para. 138), since passenger fares have shown themselves to be more inflexible than was expected.

Cargo rates

65. Cargo rates on world air services have been falling for many years. The figure of cargo revenue per tonne-kilometre performed has, in fact, tended to follow the figure of airline costs per tonne-kilometre available. Since cargo load factors (in relation to cargo capacity available) tend to be even lower than passenger load factors, this means that cargo loads are normally below the "break-even" figure if all costs were allocated. Cargo revenue, however, makes a substantial contribution towards basic operating costs (about 10 per cent) and since the added cost of loading the cargo in the holds of passenger aircraft is small, the airlines will probably continue to set many cargo rates on passenger aircraft below what might be considered "break-even figures" on a full cost allocation basis. Thus if we assume that unit air transport operating costs will continue to fall at about 2 per cent per year, we may assume that cargo rates will continue to fall at about the same rate.*

Air mail conveyance rates

66. The world level of rates paid the airlines for the carriage of air mail of all kinds has fallen about 65 per cent since 1947. This fall was partly because of reductions in the UPU international rates; partly because the rates paid by the U.S. Government for the carriage of the large volume of U.S. mail, both domestic and international, have been greatly reduced; and partly because the volume of second-class mail has increased more than that of first-class mail. It is assumed that world mail rates will continue to fall in the next decade at an average of about 2 per cent per year.

Non-scheduled operations

67. Rates received for the non-scheduled operations of the scheduled carriers tend, like cargo rates, to follow airline unit costs per tonne-kilometre available and may be expected to continue to do so. Complete statistics are not available for the operations of non-scheduled airlines, that is to say, airlines that operate no scheduled services, either domestic or international. It is assumed that their operating costs and rates are similar to those for the non-scheduled services of the scheduled airlines. Their volume of operations is believed to be about 2 per cent of world total tonne-kilometres performed.

---

* The downward trend in cargo rates is likely to be helped by the introduction within a few years of cargo aircraft considerably larger than the largest present civilian types, but for some time the majority of air cargo will continue to be carried in passenger aircraft.

Trends in air transport volume

68. In terms of volume of operations, cargo, mail, and non-scheduled services form a higher percentage of the airline total (respectively 18, 4 and 8 per cent of total tonne-kilometres performed) than in terms of revenue, but passenger volume remains the key figure in considering the overall development of world air transport. Cargo and mail loads are generally a long way from filling the capacity available for them on passenger aircraft, and non-scheduled operations mostly utilize the spare operating time of airlines' fleets.

69. The volume of world passenger operations has increased every year since scheduled air services were started (see Diagram 13). The rate of increase has been remarkably steady, but there has been a slight tendency for it to fall off, from averages of about 16 per cent per annum in the late 1940's and early 1950's to about 12 per cent in recent years. In the last five years it would seem that the basic rate of increase when fares were held steady was about 10 per cent per annum, a higher figure of 16 per cent being achieved in 1964 only when fares were reduced (about 2 per cent). If we assume that passenger fares fall an average of 1 per cent per annum* until 1975, it is estimated that the volume of demand will increase at an average rate of about 12 per cent per annum. The resultant figures for 1970 and 1975 are shown in Table 3.

70. The assumptions outlined in previous sections for the future trend of rates for cargo, mail, and non-scheduled operations would suggest that the volume for these types of traffic will continue to expand in the next decade approximately at the rates of expansion they have shown in recent years, that is to say, at an average of about 15 per cent** per annum for cargo and non-scheduled services, and about 12 per cent per annum for air mail. The resultant volume figures for 1970 and 1975 are shown in Table 3.

71. These rates of increase for passenger, cargo, mail, and non-scheduled traffic would produce an overall rate of increase in world tonne-kilometres performed of about 13 per cent per annum.

---

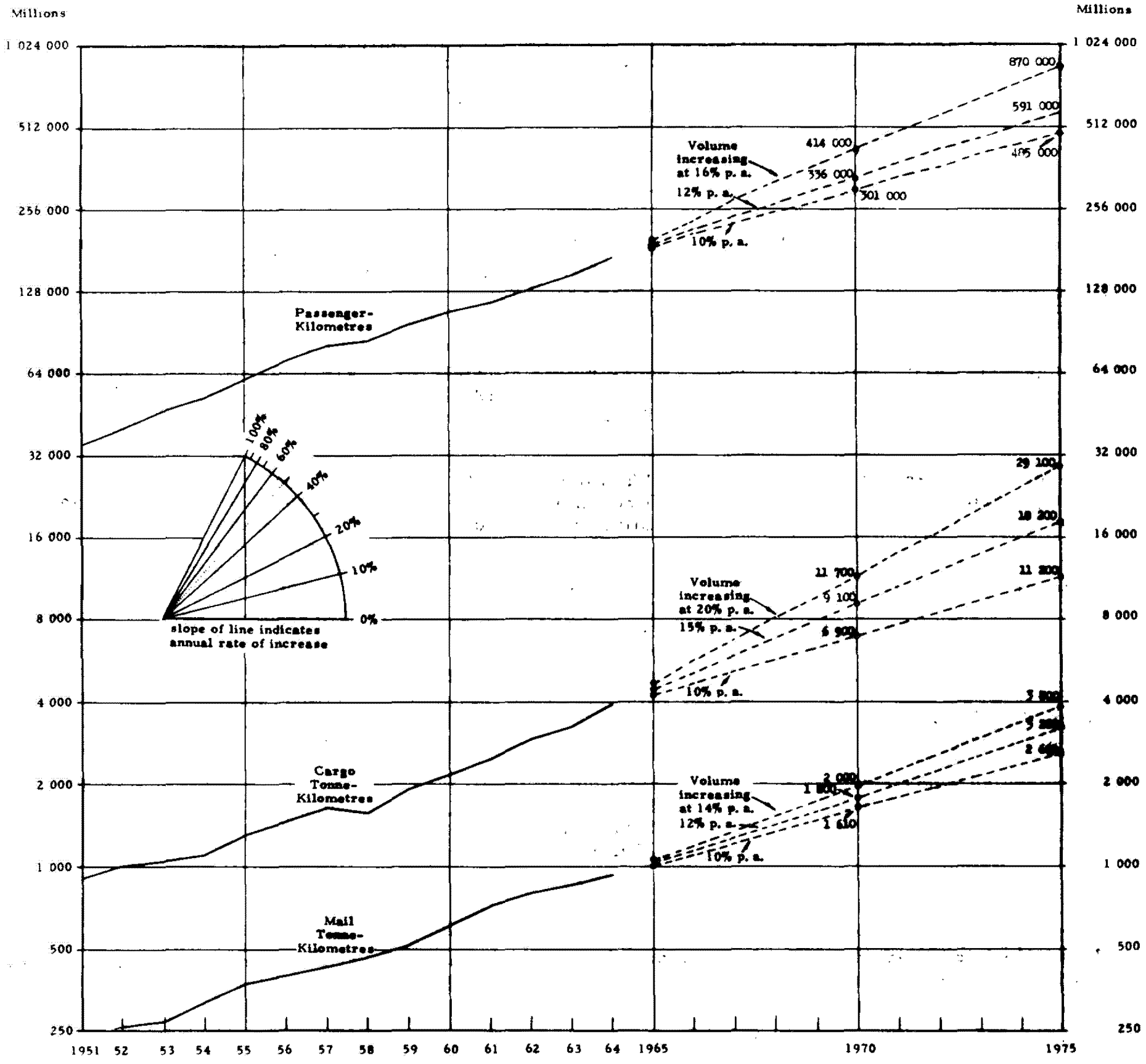
* See para. 64 for basis of this assumption.

** Latest figures suggest the increase in cargo traffic will be greater than 15 per cent in 1965, but in the past such high rates of increase have not been maintained.

DIAGRAM 13

DEVELOPMENT OF WORLD AIR TRANSPORT
REVENUE TRAFFIC 1951-1964 WITH PROJECTIONS TO 1965 AND 1975
Scheduled Services of the Scheduled Airlines

TOTAL DOMESTIC AND INTERNATIONAL SERVICES



See Table ? for basic data.

NOTE: This diagram is drawn to a logarithmic scale to compare rates of change.

ICAO Economics & Statistics Branch (May 1965)

TABLE 3

POSSIBLE FUTURE TRENDS IN WORLD AIR TRANSPORT VOLUME

International and Domestic Combined

Scheduled and Non-scheduled Separately

	1964 figure	Possible future average growth rates per annum		Resultant figures 1970	Resultant figures 1975
SCHEDULED SERVICES	millions			millions	
Passenger-km performed	170,000	Maximum	16%	414,000	870,000
		Probable rate	12%	336,000	591,000
		Minimum	10%	301,000	485,000
Cargo tonne-km performed (Passenger and cargo services)	3,920	Maximum	20%	11,700	29,100
		Probable rate	15%	9,100	18,200
		Minimum	10%	6,900	11,200
Mail tonne-km performed	910	Maximum	14%	2,000	3,800
		Probable rate	12%	1,800	3,200
		Minimum	10%	1,610	2,600
NON-SCHEDULED OPERATIONS*					
Non-scheduled tonne-km performed	2,210	Maximum	20%	6,600	16,400
		Probable rate	15%	5,100	10,500
		Minimum	10%	3,900	6,300

* Non-scheduled operations of scheduled airlines plus estimated operations of non-scheduled airlines (at 2 per cent of world total).

The effect of different assumptions concerning the trend of scheduled service passenger fares

72. Many factors might cause the actual volume of scheduled service passenger traffic to be different from the figures resulting from the assumed probable average rate of growth of 12 per cent per year as shown in Table 3. The most important of these factors is the trend of scheduled service passenger fares, which it has been assumed will fall by 10 per cent between 1963 and 1970 or 15 per cent by 1975, an average of about 1 per cent per year from 1965 onwards. As indicated above, the obstacles to any substantial and general reduction in air fares are considerable, but it is conceivable that these might be overcome, at least with respect to the main routes operated by the long-range jets, where unit operating costs are lowest. It is suggested that, conceivably, world fare levels might fall an average of about 3 per cent instead of 1 per cent per year, bringing the revenue per passenger-kilometre to 3.1 cents in 1970 and about 2.7 cents in 1975. With costs falling at about 2 per cent per year, the result would be break-even load factors of about 57 per cent and the airlines could still make substantial profits if actual load factors were brought up to about 60 per cent.

73. The effect of this considerably more rapid decline in passenger fare levels might be to produce an average annual increase in passenger traffic of about 16 per cent*, bringing the scheduled service total to 437,000 million passenger-kilometres in 1970 and 918,000 million in 1975 (see Table 3).

74. It is not considered likely that global passenger fare levels will fall more rapidly than this, or that the volume of passenger traffic will increase more than 16 per cent per year. The above figures are therefore considered as maximum figures for 1970 and 1975.

---

* Those interested in elasticity of demand calculations will note that this estimated maximum increase and the 12 per cent increase assumed to be "probable" imply an elasticity of demand of about 2:1. A zero decrease in fare levels is estimated to produce 10 per cent increase in traffic; a 1 per cent fall in fares, to produce an additional 2 per cent increase in traffic (i.e., +12 per cent); a 3 per cent fall in fares, to produce an additional 6 per cent increase in traffic (i.e., 16 per cent).

TABLE 4

ESTIMATED SITUATION OF LONG-RANGE JETS IN 1965

International and Domestic, Scheduled Passenger Services

	1965	Notes
Average no. of long-range passenger jets in service over year, approx.	780	See Table 19 for a/c included.
Average seats per aircraft	140	Average seats per a/c on North Atlantic in 1964 was 136.
Average passenger load factor	54%	North Atlantic 1964 figure was 57%, but load factors are falling.
Average passengers per aircraft	75	North Atlantic 1964 figure was 78.
Estimated (total) operating cost per unit of capacity	1.8¢ per seat-km 2.8¢ per seat-mile	These are taken at 30% below the figures for all other a/c (smaller jets, turbo-props, piston-engined a/c).
Estimated revenue per unit performed	3.8¢ per pass-km 6.1¢ per pass-mile	See Table 2 .
Break-even passenger load factor	47%	Low break-even load factor is produced if fares fall less than unit costs.

75. The possibility must also be envisaged that world fare levels will not be reduced at all from the rate of 3.8 cents per passenger-kilometre (6.1 cents per passenger-mile) in 1965. In this case the volume of passenger traffic might be expected to increase at the basic rate of about 10 per cent per year, producing the totals for 1970 and 1975 as shown in Table 3. These are considered to be minimum figures.

76. Somewhat similar estimates can be made concerning the maximum and minimum trends in volume for cargo and mail on the scheduled services and for non-scheduled operations. The results of these estimates are shown in Table 3. It may be observed that even if the maximum rates of increase are taken for both cargo and mail, the resultant volume in tonne-kilometres performed would still in 1975 not be as great as the probable total of passenger tonne-kilometres performed (about 51,000 million tonne-kilometres for the other types of traffic compared with about 54,000 million for passenger traffic). Thus even in this extreme case, the airlines would still be obtaining over 80 per cent of their revenue from their scheduled service passenger traffic.

Economic position of the long-range jets in 1970 and 1975

77. The assumptions outlined above enable approximate estimates to be made of the economic situation of the long-range subsonic jets in 1970 and 1975. This is of special interest in connection with the possible introduction of supersonic airliners, since broadly speaking they would operate on similar routes. Moreover, the two sizes of supersonic airliners that seem at present most likely to materialize, namely, one with about 120 seats and one with about 250 seats,* will be within the range of size of the subsonic jets, so that the simple number of subsonic jets being operated at any one time is a useful starting point for calculating the potential market for the supersonic aircraft.

78. At the present time (1965), it is estimated that there are about 780 long-range passenger jet airliners operating on world scheduled air services (see Table 4). Passenger load factors for the year are expected to average about 54 per cent for these aircraft (somewhat below the North Atlantic figure). The passenger break-even load factor is estimated at about 47 per cent at present fares, unit operating costs per seat-kilometre being about 30 per cent below those of all other aircraft combined and about 10 per cent below the overall global figure for all types of aircraft.

---

* The size of the supersonic airliners under design consideration has steadily increased, but it seems unlikely to go beyond 250 seats owing to limitations in the strength of runways, taxiways, and aprons.

79. If we assume that world trends of traffic volume, operating costs, and revenues are reflected in the operations of the long-range jets, and allowing for a continued increase in the average number of seats per aircraft as stretched versions of the present types are introduced, it would seem that there should be about 1,200 long-range passenger jets in operation in 1970, increasing to 1,900 in 1975 (the latter figure taking no account of the possible introduction either of supersonic aircraft or of the very large aircraft of the 500 to 700-seat size).

80. If we assume that the relationship between the unit cost of the long-range jets and the average for all other types of aircraft remains approximately as at present (a 30 per cent difference), and applying the trend figures for world costs and fare levels, we can estimate the break-even load factor for the long-range jets at 44 per cent in 1970 and 41 per cent in 1975, as shown in Table 5. These low break-even load factors are, of course, the result of assuming that fare levels will not be reduced as much as unit operating costs.

Economic situation of supersonic airliners in 1972 and 1974

81. Similar calculations can be applied to the possible introduction of supersonic airliners if, for example, they were introduced into service in 1972 with unit operating costs 20 per cent above those of the long-range jets in 1963, that is to say, about 2.2 cents per seat-kilometre (3.5 cents per seat-mile). Our assumptions would imply that the prevailing average fare level would be about 3.4 cents per passenger-kilometre (5.5 cents per passenger-mile), giving the supersonic aircraft a break-even load factor of 65 per cent without a premium fare. They should have little difficulty achieving higher load factors than this, at least in their early days, if they prove as attractive to the public as the subsonic jets.

82. If however, fares are reduced 3 per cent per year (instead of 1 per cent assumed as probable), the prevailing fare level in 1972 would be about 2.9 cents per passenger-kilometre (4.7 cents per passenger-mile), which would give the supersonic airliners a break-even load factor of about 76 per cent. A premium fare would then perhaps be necessary to avoid making a loss on supersonic operations.

83. Our assumptions also indicate that there are likely to be about 1,500 long-range subsonic jet airliners being operated on passenger services in 1972. If we assume that about half the services

TABLE 5

ESTIMATED SITUATION OF LONG-RANGE JETS IN 1970 AND 1975

compared with that in 1965

(Not allowing for introduction of SS a/c or very large a/c)

International and Domestic, Scheduled Passenger Services

	1965	1970	1975	Notes on 1970 and 1975 Estimates
Average no. of long-range subsonic passenger jets in service over year	780	1,200	1,900	Assuming 12% per annum increase in passenger demand with a/c increasing in size, but no SS a/c or very large a/c.
Average seats per aircraft	140	160	175	Assuming 250-seat a/c introduced by 1970, more by 1975. Excluding very large a/c and SS a/c.
Average passenger load factor	54%	54%	54%	Assumed constant at 1965 figure for long-range jets.
Average passengers per aircraft	75	86	94	From load factor and seats per a/c.
		US¢		
Operating cost (total) per seat-km	1.8	1.5	1.3	Using same reduction rates as
per seat-mile	2.8	2.4	2.1	for world averages (Table 2).
Revenue per passenger-km	3.8	3.4	3.2	Using same revenue figures as
per passenger-mile	6.1	5.5	5.1	for world averages (Table 2).
Passenger break-even load factor	47%	44%	41%	Break-even load factor falling since unit costs fall faster than fares

operated by these aircraft would be suitable (in stage lengths and volume of traffic) for supersonic aircraft, we can make certain tentative calculations concerning the market for the latter. For example, taking the normal annual increase in passenger demand on these routes to be 12 per cent, the airlines concerned would need to add this much new seat capacity each year. If the supersonic aircraft were not available, they might be expected to do so by purchasing about 60 of the 250-seat subsonic jets presumed to be available at that time. Since the productive capacity of a Mach 2.2 aircraft with 120 seats is about the same as that of a subsonic aircraft with 250 seats, they could, alternatively, provide themselves with the same additional capacity by purchasing 60 supersonic airliners of that size. Only a few airlines would probably make such purchases, but on the other hand, they might well purchase more than would provide their own needs for extra passenger capacity during the year, replacing some of their subsonic jets by the new aircraft. The figure of 60 supersonic airliners (of the 120-seat Mach 2.2 size) would be the theoretical limit for purchases in the year 1972 if no further subsonic jets were purchased and total capacity were not to be expanded more than passenger demand.

84. Similar calculations can be made for the introduction in 1974 of a Mach 3 supersonic airliner with a 250-seat capacity and an operating cost per seat-km 10 per cent above the world average for subsonic jets in 1963. The results are shown in tabular form in Table 6.

---oooOooo---

Notes on Assumptions

Since others may wish to base future projections on different assumptions from those made in this section, the main ones are listed below:

1) that general world economic expansion as it affects the demand for world transport will continue in the next decade approximately at the rate indicated by current trends, i.e., population and per capita income would continue to grow at about 2.5 and 2.0 per cent per year, and inflation of consumer prices (converted into dollars), at something over 1 per cent per year; also, that there will be no major war or general economic depression;

2) that there will continue to be an excess of world air transport capacity, thus keeping the world passenger load factor at just over 50 per cent;

TABLE 6

ILLUSTRATIVE CALCULATIONS RELATING TO THE INTRODUCTION OF POSSIBLE SUPERSONIC AIRLINERS IN 1972 AND 1974

	1972	1974
Total number of long range subsonic jets on passenger services if no SS or very large a/c were introduced ...	1,500	1,750
Number assumed on routes suitable for SS a/c ...	750	875
Average seats per aircraft	166	172
Average passengers per aircraft	89	92
Average load factor	54%	54%
Number of 250-seat subsonic jets required to be added each year to add 12% capacity to the routes suitable for SS a/c ...	60	72
Number of 120-seat Mach 2.2 a/c required to add 12% capacity in 1972	60	--
Number of 250-seat Mach 3.0 a/c required to add 12% capacity in 1974	--	24
Probable prevailing fare level: per pass-km	3.4¢	3.3¢
per pass-mile ...	5.5¢	5.4¢
Possible average operating cost of the SS airliner: per seat-km	2.2¢	2.0¢
per seat-mile ...	3.5¢	3.2¢
Break-even load factor of SS a/c at probable prevailing fare level	65%	60%
Lowest world average fare levels considered likely (falling 3% per annum from 1963):		
per pass-km	2.9¢	2.7¢
per pass-mile	4.7¢	4.4¢
If fares fall 3% per annum until 1975, break-even load factor for SS a/c, about	76%	74%

3) that unit air transport operating costs per tonne-kilometre available will fall an average of 2 per cent per year until 1975;

4) that the most probable trend of world average passenger fares is a slow reduction of about 1 per cent per year until 1975 (fares measured in dollars at current values);

5) that if fares were not reduced, the world demand for air transport would increase at an average of about 10 per cent per year over the next ten years due to general economic expansion (population, productivity, and inflation) and the increasing public acceptance of air transport;

6) that when the world average fare level is reduced (with due regard to seasonal and other relevant factors), the elasticity of demand is about 2:1, meaning that a 1 per cent reduction adds about 2 per cent to the increase in demand that would otherwise take place;

7) that world average rates per tonne-kilometre for cargo, mail, and non-scheduled operations will fall at about 2 per cent per year over the next decade;

8) that the volume of cargo, air mail, and non-scheduled traffic will continue to expand (on the average) for the next ten years at the average rate of the past five years;

9) that stretched versions of the present generation of long-range jets with maximum seating capacity up to 250 seats will be introduced in the next five years and, perhaps, larger aircraft up to 300 seats before 1975;

10) that, for combined technical and economic reasons, considerably larger aircraft with seating capacity in the 500 to 700 range will not be introduced in large numbers before 1975;

11) that, as at present seen, two interesting possibilities for the introduction of supersonic airliners are:

    a) a Mach 2+ airliner with 120 seats maximum, introduced in substantial numbers in the year 1972, at total operating costs of about 2.2 cents per seat-kilometre (3.5 cents per seat-mile);

b) a Mach 3 airliner with 250 seats maximum, introduced in substantial numbers in the year 1974, at total operating costs of about 2.0 cents per-seat kilometre (3.2 cents per seat-mile).

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE 7

FINANCIAL TRENDS IN CIVIL AVIATION, 1951-1964
Scheduled Airlines of all ICAO Contracting States

ESTIMATES FOR DOMESTIC AND INTERNATIONAL SERVICES

DESCRIPTION	1951	1952	1953	1954	1955	1956	1957 a/	1958	1959	1960	1961	1962	1963	1964 c/
FINANCIAL DATA (In millions of United States Dollars)														
OPERATING REVENUES														
Scheduled Services														
Passenger	1 340	1 552	1 772	1 990	2 367	2 741	3 109	3 256	3 819	4 283	4 560	5 107	5 645	6 453
Cargo	215	237	258	280	341	376	404	406	462	497	541	598	675	798
Mail	156	169	175	183	190	209	215	216	240	265	287	317	341	362
Total Scheduled Services	1 711	1 958	2 205	2 453	2 898	3 326	3 728	3 878	4 521	5 045	5 388	6 022	6 661	7 613
Non-scheduled Services	58	46	45	51	62	82	136	150	151	185	235	341	304	340
Incidental	35	46	64	56	65	102	107	94	133	170	180	207	250	285
TOTAL OPERATING REVENUES	1 804	2 050	2 314	2 560	3 025	3 510	3 971	4 122	4 805	5 400	5 803	6 570	7 215	8 238
OPERATING EXPENSES														
Flight Operations	528	609	694	753	873	1 005	1 219	1 226	1 368	1 481	1 599	1 756	1 863	2 029
Maintenance & Overhaul	344	413	448	487	574	689	771	812	933	1 052	1 092	1 205	1 217	1 362
Flight Equipment Depreciation b/	138	161	201	226	231	258	349	359	423	608	757	794	826	825
Station & Ground	266	307	330	346	408	452	606	614	705	785	873	970	1 047	1 201
Passenger Services	118	134	144	160	202	239	284	291	340	398	433	473	515	592
Ticketing, Sales and Promotion	243	281	329	369	443	537	565	585	678	783	848	925	1 016	1 166
General and Administrative	143	158	171	187	216	246	218	220	253	271	319	350	405	462
TOTAL OPERATING EXPENSES	1 780	2 063	2 317	2 528	2 947	3 426	4 012	4 107	4 700	5 358	5 921	6 473	6 869	7 637
OPERATING RESULT	+24	-13	-3	+32	+78	+84	-41	+15	+105	+42	-118	+97	+326	+601
UNITS PER TONNE-KILOMETRE PERFORMED (In United States Cents)														
OPERATING REVENUES														
Scheduled Services														
Passenger	43.6	43.8	43.1	43.0	43.4	43.8	43.7	43.7	44.7	44.9	44.6	44.8	44.0	43.1
Cargo	23.4	23.9	24.6	25.1	25.6	24.9	24.4	24.4	24.0	22.9	21.8	20.3	20.6	20.4
Mail	66.7	66.0	63.4	56.5	50.1	50.8	48.9	46.0	45.8	43.3	39.7	39.4	39.8	39.8
Total Scheduled Services	40.5	40.8	40.6	40.4	40.4	40.7	40.4	40.5	41.9	41.0	40.1	39.8	39.3	38.5
Non-scheduled Services	32.6	36.2	32.2	31.9	32.1	21.2	23.0	24.1	20.1	24.9	21.1	20.9	21.2	20.1
AVERAGE d/	40.9	41.6	41.5	41.1	41.1	41.0	40.5	40.4	41.0	41.3	39.9	39.2	39.2	38.3
OPERATING EXPENSES														
Flight Operations	12.0	12.4	12.4	12.1	11.9	11.7	12.4	12.0	11.7	11.3	11.0	10.5	10.1	9.5
Maintenance & Overhaul	7.8	8.4	8.0	7.8	7.8	8.1	7.9	8.0	8.0	7.9	7.5	7.2	6.6	6.3
Flight Equipment Depreciation b/	3.1	3.2	3.6	3.6	3.1	3.0	3.6	3.5	3.6	4.7	5.2	4.7	4.5	3.8
Station & Ground	6.0	6.3	5.9	5.6	5.6	5.3	6.2	6.0	6.0	6.0	6.0	5.8	5.7	5.6
Passenger Services	2.7	2.7	2.6	2.6	2.7	2.8	2.9	2.9	2.9	3.0	3.0	2.8	2.8	2.8
Ticketing, Sales and Promotion	5.5	5.7	5.9	5.9	6.0	6.2	5.7	5.7	5.8	6.0	5.8	5.5	5.5	5.4
General and Administrative	3.3	3.2	3.1	3.0	2.9	2.9	2.2	2.2	2.1	2.1	2.2	2.1	2.2	2.1
TOTAL	40.4	41.9	41.5	40.6	40.0	40.0	40.9	40.3	40.1	41.0	40.7	38.6	37.4	35.5
UNITS PER TONNE-KILOMETRE AVAILABLE (In United States Cents)														
OPERATING REVENUES														
Scheduled Services	25.3	24.8	24.2	23.9	23.9	24.1	22.9	22.8	23.4	22.6	20.7	20.2	19.8	19.7
Non-scheduled Services	20.3	22.0	19.5	19.2	17.3	17.6	18.4	19.0	15.6	17.6	14.4	15.6	15.3	14.3
AVERAGE d/	25.6	25.3	24.7	24.3	24.3	24.6	23.3	23.1	23.7	23.1	21.0	20.5	20.3	20.1
OPERATING EXPENSES														
Flight Operations	7.5	7.5	7.4	7.1	7.0	7.0	7.2	6.9	6.7	6.5	5.8	5.5	5.2	5.0
Maintenance & Overhaul	4.9	5.1	4.8	4.6	4.6	4.8	4.5	4.6	4.6	4.4	4.0	3.7	3.4	3.3
Flight Equipment Depreciation b/	1.9	2.0	2.2	2.2	1.9	1.8	2.1	2.0	2.1	2.6	2.7	2.5	2.3	2.0
Station & Ground	3.8	3.8	3.6	3.3	3.3	3.2	3.5	3.5	3.5	3.4	3.1	3.0	2.9	2.9
Passenger Services	1.7	1.6	1.5	1.5	1.6	1.7	1.7	1.6	1.7	1.7	1.6	1.5	1.5	1.5
Ticketing, Sales and Promotion	3.4	3.5	3.5	3.5	3.6	3.8	3.3	3.3	3.3	3.3	3.1	2.9	2.9	2.8
General and Administrative	2.0	1.9	1.8	1.8	1.7	1.7	1.3	1.2	1.3	1.2	1.1	1.1	1.1	1.1
TOTAL	25.2	25.4	24.8	24.0	23.7	24.0	23.6	23.1	23.2	22.9	21.4	20.2	19.3	18.6
UNIT PASSENGER REVENUE PER PASSENGER-KILOMETRE (In United States Cents)														
SCHEDULED SERVICES	3.86	3.88	3.81	3.79	3.82	3.86	3.84	3.83	3.93	3.94	3.91	3.93	3.85	3.79
PERCENTAGE DISTRIBUTION OF FINANCIAL DATA (In Percentages)														
OPERATING REVENUES														
Scheduled Services														
Passenger	74.3	75.7	76.6	77.7	78.2	78.1	78.3	79.0	79.4	79.3	78.6	77.8	78.2	78.3
Cargo	11.9	11.6	11.1	10.9	11.3	10.7	10.2	9.9	9.6	9.2	9.3	9.1	9.4	9.7
Mail	8.7	8.3	7.6	7.2	6.3	6.0	5.4	5.2	5.0	4.9	4.9	4.8	4.7	4.4
Total Scheduled Services	94.9	95.6	95.3	95.8	95.8	94.8	93.9	94.1	94.0	93.4	92.8	91.7	92.3	92.4
Non-scheduled Services	3.2	2.2	1.9	2.0	2.0	2.3	3.4	3.6	3.2	3.4	4.0	5.2	4.2	4.1
Incidental	1.9	2.2	2.8	2.2	2.2	2.9	2.7	2.3	2.8	3.2	3.2	3.1	3.5	3.5
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	100.0	100.0	100.0
OPERATING EXPENSES														
Flight Operations	29.7	29.5	30.0	29.8	29.6	29.3	30.4	29.9	29.1	27.6	27.0	27.1	27.0	26.6
Maintenance & Overhaul	19.3	20.0	19.3	19.3	19.5	20.1	19.2	19.8	19.9	19.3	18.4	18.6	17.7	17.8
Flight Equipment Depreciation b/	7.8	7.8	8.7	8.9	7.8	7.6	8.7	8.7	9.0	11.3	12.8	12.3	12.0	10.8
Station & Ground	14.9	14.9	14.2	13.7	13.9	13.2	15.1	14.9	15.0	14.7	14.8	15.0	15.2	15.7
Passenger Services	6.6	6.5	6.2	6.3	6.9	7.0	7.1	7.1	7.2	7.4	7.3	7.3	7.5	7.8
Ticketing, Sales & Promotion	13.6	13.6	14.2	14.6	15.0	15.6	14.1	14.2	14.4	14.6	14.3	14.5	14.7	15.3
General & Administrative	8.1	7.7	7.4	7.4	7.3	7.2	5.4	5.4	5.4	5.1	5.4	5.4	5.9	6.0
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	100.0	100.0	100.0

Notes: a/ On 1st January 1957, a new classification of Operating Expenses became effective in the United States, so that the figures shown for Station & Ground, Passenger Services, Ticketing, Sales & Promotion and General & Administrative expenses are not strictly comparable before and after this date.

b/ Beginning 1960, in accordance with the changes made in ICAO's Air Transport Reporting Form "F" (Profit and Loss Statement), the expense item "Flight Equipment Depreciation" also includes "Ground Property and Equipment Depreciation", and "Amortization of Development and Pre-operating Costs", the latter being previously classified as a non-operating expense.

c/ Provisional.

d/ Including Incidental Revenues.

TABLE 8

FINANCIAL TRENDS IN CIVIL AVIATION, 1951-1963

Scheduled Airlines of all ICAO Contracting States

ESTIMATES FOR INTERNATIONAL SERVICES

DESCRIPTION	1951	1952	1953	1954	1955	1956	1957 [a]	1958	1959	1960	1961	1962	1963
FINANCIAL DATA (In millions of United States Dollars)													
OPERATING REVENUES													
Scheduled Services													
Passenger	492	575	636	708	825	1 001	1 169	1 307	1 479	1 753	1 926	2 161	2 490
Cargo	84	95	104	124	138	165	186	204	237	269	316	347	400
Mail	98	104	106	111	118	125	133	145	155	167	187	205	228
Total Scheduled Services	674	774	846	943	1 081	1 291	1 488	1 656	1 871	2 189	2 429	2 713	3 118
Non-scheduled Services	28	28	30	37	41	58	74	92	95	128	161	215	192
Incidental	18	27	37	34	32	56	63	65	73	92	139	161	171
TOTAL OPERATING REVENUES	720	829	913	1 014	1 154	1 405	1 625	1 813	2 039	2 409	2 729	3 089	3 481
OPERATING EXPENSES													
Flight Operations	221	258	279	306	342	404	476	535	558	621	724	789	826
Maintenance & Overhaul	141	172	184	201	224	282	314	359	389	430	495	521	506
Flight Equipment Depreciation [b]	63	69	82	86	93	107	145	163	206	277	381	402	404
Station & Ground	117	139	142	155	173	190	238	264	321	354	419	462	506
Passenger Services	46	56	57	68	80	93	116	135	153	182	229	238	269
Ticketing, Sales and Promotion	102	128	146	166	186	229	267	328	359	430	495	551	590
General and Administrative	63	69	70	79	84	102	99	102	99	124	152	164	202
TOTAL OPERATING EXPENSES	753	891	960	1 061	1 182	1 407	1 655	1 896	2 085	2 418	2 895	3 127	3 303
OPERATING RESULT	-33	-62	-47	-47	-28	-2	-30	-83	-46	-9	-166	-38	+178
UNITS PER TONNE-KILOMETRE PERFORMED (In United States Cents)													
OPERATING REVENUES													
Scheduled Services													
Passenger	47.2	48.0	46.9	47.3	46.8	48.2	47.7	48.0	47.1	45.8	43.7	42.5	43.3
Cargo	27.7	28.5	30.0	30.5	29.5	28.8	29.1	29.4	28.3	26.3	24.8	22.6	22.6
Mail	90.7	86.7	80.9	68.9	61.5	61.9	60.2	58.5	55.4	48.8	43.4	42.3	43.4
Total Scheduled Services	46.4	46.9	45.8	45.7	44.6	45.3	44.9	45.2	44.0	42.2	39.8	38.2	38.8
Non-scheduled Services	40.6	40.0	33.3	36.6	33.6	30.7	27.6	29.4	24.0	30.9	22.4	23.0	19.5
AVERAGE [c]	47.2	48.2	47.2	46.9	45.3	46.2	45.4	45.6	43.8	43.0	40.0	38.4	38.6
OPERATING EXPENSES													
Flight Operations	14.5	15.0	14.4	14.1	13.4	13.3	13.3	13.5	12.0	11.1	10.6	9.8	9.2
Maintenance & Overhaul	9.3	10.0	9.5	9.3	8.8	9.3	8.8	9.0	8.4	7.7	7.2	6.5	5.6
Flight Equipment Depreciation [b]	4.1	4.0	4.2	4.0	3.7	3.5	4.0	4.1	4.4	4.9	5.6	5.0	4.5
Station & Ground	7.7	8.1	7.3	7.2	6.8	6.2	6.6	7.1	6.9	6.3	6.1	5.7	5.6
Passenger Services	3.0	3.3	3.0	3.1	3.1	3.1	3.2	3.4	3.3	3.2	3.4	3.0	3.0
Ticketing, Sales & Promotion	6.7	7.4	7.6	7.7	7.3	7.5	7.5	8.0	7.7	7.7	7.3	6.9	6.5
General and Administrative	4.1	4.0	3.6	3.6	3.3	3.4	2.8	2.6	2.1	2.2	2.2	2.0	2.2
TOTAL	49.4	51.8	49.6	49.0	46.4	46.3	46.2	47.7	44.8	43.1	42.4	38.9	36.6
UNITS PER TONNE-KILOMETRE AVAILABLE (In United States Cents)													
OPERATING REVENUES													
Scheduled Services	29.1	29.1	28.0	27.5	27.0	27.8	27.2	26.0	26.2	24.4	20.9	19.9	20.1
Non-scheduled Services	25.5	24.1	19.9	22.4	18.3	25.6	22.2	23.2	18.7	21.8	15.3	17.2	14.1
AVERAGE [c]	29.6	29.9	28.8	28.2	27.3	28.9	28.0	26.8	26.7	25.2	21.5	20.7	20.7
OPERATING EXPENSES													
Flight Operations	9.1	9.3	8.8	8.5	8.1	8.3	8.2	7.9	7.3	6.5	5.7	5.3	4.3
Maintenance & Overhaul	5.8	6.2	5.8	5.6	5.3	5.8	5.4	5.3	5.1	4.5	3.9	3.5	3.0
Flight Equipment Depreciation [b]	2.6	2.5	2.6	2.4	2.2	2.2	2.5	2.4	2.7	2.9	3.0	2.7	2.4
Station & Ground	4.8	5.0	4.5	4.3	4.1	3.9	4.1	4.2	4.2	3.7	3.3	3.1	3.0
Passenger Services	1.9	2.0	1.8	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.8	1.6	1.6
Ticketing, Sales and Promotion	4.2	4.6	4.6	4.6	4.4	4.7	4.6	4.7	4.7	4.5	3.9	3.7	3.5
General and Administrative	2.6	2.5	2.2	2.2	2.0	2.1	1.7	1.5	1.3	1.3	1.2	1.1	1.2
TOTAL	31.0	32.1	30.3	29.5	28.0	28.9	28.5	28.0	27.3	25.3	22.8	21.0	19.6
UNIT PASSENGER REVENUE PER PASSENGER-KILOMETRE (In United States Cents)													
SCHEDULED SERVICES	4.44	4.50	4.37	4.37	4.29	4.40	4.33	4.37	4.28	4.15	3.95	3.86	3.88
PERCENTAGE DISTRIBUTION OF FINANCIAL DATA (In Percentages)													
OPERATING REVENUES													
Scheduled Services													
Passenger	68.3	69.4	69.7	69.8	71.5	71.2	71.9	72.1	72.6	72.8	70.6	70.0	71.5
Cargo	11.7	11.5	11.4	12.2	12.0	11.8	11.4	11.2	11.6	11.2	11.6	11.2	11.5
Mail	13.6	12.5	11.6	11.0	10.2	8.9	8.2	8.0	7.6	6.9	6.8	6.6	6.6
Total Scheduled Services	93.6	93.4	92.7	93.0	93.7	91.9	91.5	91.3	91.8	90.9	89.0	87.8	89.6
Non-scheduled Services	3.9	3.4	3.3	3.6	3.5	4.1	4.6	5.1	4.6	5.3	5.9	7.0	5.5
Incidental	2.5	3.2	4.0	3.4	2.8	4.0	3.9	3.6	3.6	3.8	5.1	5.2	4.9
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	100.0	100.0
OPERATING EXPENSES													
Flight Operations	29.4	29.0	29.1	28.8	28.9	28.7	28.8	28.2	26.8	25.7	25.0	25.2	25.0
Maintenance & Overhaul	18.7	19.3	19.2	18.9	19.0	20.0	19.0	18.9	18.7	17.8	17.1	16.7	15.3
Flight Equipment Depreciation [b]	8.4	7.7	8.5	8.1	7.9	7.6	8.7	8.6	9.9	11.5	13.2	12.9	12.2
Station & Ground	15.5	15.6	14.8	14.6	14.6	13.5	14.4	15.0	15.4	14.6	14.5	14.8	15.3
Passenger Services	6.1	6.3	5.9	6.4	6.8	6.6	7.0	7.1	7.3	7.5	7.9	7.6	8.2
Ticketing, Sales & Promotion	13.5	14.4	15.2	15.7	15.7	16.3	16.1	16.8	17.2	17.8	17.1	17.6	17.9
General & Administrative	8.4	7.7	7.3	7.5	7.1	7.3	6.0	5.4	4.7	5.1	5.2	5.2	6.1
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	100.0	100.0

Notes: [a] On 1st January 1957, a new classification of Operating Expenses became effective in the United States, so that the figures shown for Station & Ground, Passenger Services, Ticketing, Sales & Promotion and General & Administrative expenses are not strictly comparable before and after this date.

[b] *Beginning 1960, in accordance with the changes made in ICAO's Air Transport Reporting Form "F" (Profit and Loss Statement), the expense item "Flight Equipment Depreciation" also includes "Ground Property and Equipment Depreciation", and "Amortization of Development and Pre-operating Costs", the latter being previously classified as a non-operating expense.*

[c] Including Incidental Revenues.

TABLE 9

FINANCIAL TRENDS IN CIVIL AVIATION, 1951-1963

Scheduled Airlines of all ICAO Contracting States

ESTIMATES FOR DOMESTIC SERVICES

DESCRIPTION	1951	1952	1953	1954	1955	1956	1957 a/	1958	1959	1960	1961	1962	1963
FINANCIAL DATA (In millions of United States Dollars)													
OPERATING REVENUES													
Scheduled Services													
Passenger	848	977	1 136	1 282	1 542	1 740	1 940	1 949	2 340	2 530	2 634	2 946	3 155
Cargo	131	142	154	156	203	211	218	202	225	228	225	251	275
Mail	58	65	69	72	72	84	82	71	85	98	100	112	113
Total Scheduled Services	1 037	1 184	1 359	1 510	1 817	2 035	2 240	2 222	2 650	2 856	2 959	3 309	3 543
Non-scheduled Services	30	18	15	14	21	24	62	58	56	57	74	126	112
Incidental	17	19	27	22	33	46	44	29	60	78	41	46	79
TOTAL OPERATING REVENUES	1 084	1 221	1 401	1 546	1 871	2 105	2 546	2 309	2 766	2 991	3 074	3 481	3 734
OPERATING EXPENSES													
Flight Operations	307	351	415	447	531	601	743	691	810	860	875	967	1 037
Maintenance & Overhaul	205	241	264	286	350	407	457	453	544	602	597	684	711
Flight Equipment Depreciation b/	75	92	119	140	138	151	204	196	217	331	376	392	422
Station & Ground	149	168	188	191	235	263	368	330	384	431	454	508	541
Passenger Services	72	78	87	92	122	146	168	156	187	216	204	235	246
Ticketing, Sales and Promotion	141	153	185	205	257	307	298	267	319	353	353	374	426
General and Administrative	80	89	101	108	132	144	119	118	154	147	167	186	205
TOTAL OPERATING EXPENSES	1 027	1 172	1 357	1 467	1 765	2 019	2 357	2 211	2 615	2 940	3 026	3 546	3 586
OPERATING RESULT	+57	+49	+44	+79	+106	+86	-11	+98	+151	+51	+48	+135	+148
UNITS PER TONNE-KILOMETRE PERFORMED (In United States Cents)													
OPERATING REVENUES													
Scheduled Services													
Passenger	40.9	40.6	40.8	40.7	42.1	41.3	41.4	41.2	43.3	44.2	45.1	46.5	44.4
Cargo	21.3	21.3	22.4	22.4	24.4	23.1	22.0	20.7	20.6	19.8	18.6	18.1	18.3
Mail	47.2	47.1	47.2	43.9	40.4	42.2	39.0	32.3	35.1	36.0	34.0	35.0	34.0
Total Scheduled Services	36.9	36.9	37.6	37.6	38.8	38.2	38.0	37.4	39.5	40.0	40.5	41.2	39.6
Non-scheduled Services	27.3	31.6	31.3	22.6	28.8	23.1	19.1	18.7	15.7	17.4	18.8	18.1	24.7
AVERAGE c/	37.1	37.4	38.2	37.9	39.4	38.1	37.8	37.0	39.0	40.0	39.7	39.8	39.8
OPERATING EXPENSES													
Flight Operations	10.5	10.7	11.3	11.0	11.2	10.9	11.9	11.1	11.4	11.5	11.3	11.1	11.0
Maintenance & Overhaul	6.9	7.4	7.2	7.0	7.4	7.4	7.4	7.2	7.7	8.0	7.7	7.8	7.6
Flight Equipment Depreciation b/	2.6	2.8	3.2	3.4	2.9	2.7	3.3	3.1	3.0	4.4	4.9	4.5	4.5
Station & Ground	5.1	5.1	5.1	4.7	4.9	4.8	5.9	5.3	5.4	5.8	5.9	5.8	5.8
Passenger Services	2.5	2.4	2.4	2.3	2.6	2.6	2.7	2.5	2.6	2.9	2.6	2.7	2.6
Ticketing, Sales and Promotion	4.8	4.7	5.0	5.0	5.4	5.5	4.8	4.3	4.5	4.7	4.6	4.3	4.5
General and Administrative	2.7	2.7	2.8	2.6	2.8	2.6	1.9	1.9	2.2	2.0	2.1	2.1	2.2
TOTAL	35.1	35.8	37.0	36.0	37.2	36.5	37.9	35.4	36.8	39.3	39.1	38.3	38.2
UNITS PER TONNE-KILOMETRE AVAILABLE (In United States Cents)													
OPERATING REVENUES													
Scheduled Services	23.1	22.1	22.1	22.0	22.6	22.2	21.2	20.8	21.8	21.3	20.5	20.4	19.5
Non-scheduled Services	17.0	19.4	18.8	13.9	15.6	10.0	15.3	14.8	12.2	12.3	12.8	13.5	17.9
AVERAGE c/	23.2	22.4	22.5	22.2	22.9	22.4	21.4	20.8	21.9	21.6	20.5	20.3	19.9
OPERATING EXPENSES													
Flight Operations	6.6	6.5	6.7	6.4	6.5	6.4	6.8	6.2	6.4	6.2	5.8	5.6	5.5
Maintenance & Overhaul	4.4	4.4	4.2	4.1	4.3	4.3	4.2	4.1	4.3	4.3	4.0	4.0	3.8
Flight Equipment Depreciation b/	1.6	1.7	1.9	2.0	1.7	1.6	1.9	1.8	1.7	2.4	2.5	2.3	2.2
Station & Ground	3.2	3.1	3.0	2.7	2.9	2.8	3.3	3.0	3.1	3.1	3.0	2.9	2.9
Passenger Services	1.5	1.4	1.4	1.3	1.5	1.6	1.5	1.4	1.5	1.6	1.4	1.4	1.3
Ticketing, Sales and Promotion	3.0	2.8	2.9	2.9	3.1	3.3	2.7	2.4	2.5	2.5	2.4	2.2	2.3
General and Administrative	1.7	1.6	1.6	1.6	1.6	1.5	1.1	1.0	1.2	1.1	1.1	1.1	1.1
TOTAL	22.0	21.5	21.7	21.0	21.6	21.5	21.5	19.9	20.7	21.2	20.2	19.5	19.1
UNIT PASSENGER REVENUE PER PASSENGER-KILOMETRE (In United States Cents)													
SCHEDULED SERVICES	3.56	3.54	3.55	3.55	3.66	3.60	3.56	3.53	3.72	3.80	3.88	4.00	3.81
PERCENTAGE DISTRIBUTION OF FINANCIAL DATA (In Percentages)													
OPERATING REVENUES													
Scheduled Services													
Passenger	78.2	80.0	81.1	82.9	82.4	82.7	82.7	84.4	84.6	84.6	85.7	84.7	84.5
Cargo	12.1	11.6	11.0	10.1	10.8	10.0	9.3	8.7	8.1	7.6	7.3	7.2	7.4
Mail	5.4	5.3	4.9	4.7	3.9	4.0	3.5	3.1	3.1	3.3	3.3	3.2	3.0
Total Scheduled Services	95.7	96.9	97.0	97.7	97.1	96.7	95.5	96.2	95.8	95.5	96.3	95.1	94.9
Non-scheduled Services	2.8	1.5	1.1	0.9	1.1	1.1	2.6	2.5	2.0	1.9	2.4	3.6	3.0
Incidental	1.5	1.6	1.9	1.4	1.8	2.2	1.9	1.3	2.2	2.6	1.3	1.3	2.1
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	100.0	100.0
OPERATING EXPENSES													
Flight Operations	29.9	29.9	30.6	30.5	30.1	29.8	31.5	31.3	31.0	29.2	28.9	28.9	28.9
Maintenance & Overhaul	19.8	20.5	19.5	19.5	19.8	20.2	19.4	20.5	20.8	20.5	19.7	20.4	19.8
Flight Equipment Depreciation b/	7.3	7.9	8.8	9.5	7.8	7.5	8.7	8.9	8.3	11.3	12.4	11.7	11.8
Station & Ground	14.5	14.3	13.8	13.0	13.3	13.0	15.6	14.9	14.7	14.7	15.0	15.2	15.1
Passenger Services	7.0	6.7	6.4	6.3	6.9	7.2	7.1	7.0	7.1	7.3	6.8	7.0	6.9
Ticketing, Sales & Promotion	13.7	13.1	13.5	13.8	14.6	15.2	12.6	12.1	12.2	12.0	11.7	11.2	11.9
General & Administrative	7.8	7.6	7.4	7.4	7.5	7.1	5.1	5.3	5.9	5.0	5.5	5.6	5.6
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	100.0	100.0

Notes: a/ On 1st January 1957, a new classification of Operating Expenses became effective in the United States, so that the figures shown for Station & Ground, Passenger Services, Ticketing, Sales & Promotion and General & Administrative expenses are not strictly comparable before and after this date.

b/ Beginning 1960, in accordance with the changes made in ICAO's Air Transport Reporting Form "F" (Profit and Loss Statement), the expense item "Flight Equipment Depreciation" also includes "Ground Property and Equipment Depreciation", and "Amortization of Development and Pre-operating Costs", the latter being previously classified as a non-operating expense.

c/ Including Incidental Revenues.

INTERNATIONAL CIVIL AVIATION ORGANIZATION — ECONOMICS AND STATISTICS BRANCH (May 1965)

TABLE 10

ANNUAL PERCENTAGE CHANGES IN OPERATING REVENUES AND EXPENSES, 1951-1964

Scheduled Airlines of all ICAO Contracting States

TOTAL DOMESTIC AND INTERNATIONAL SERVICES

DESCRIPTION	1952/51	1953/52	1954/53	1955/54	1956/55	1957/56	1958/57	1959/58	1960/59	1961/60	1962/61	1963/62	1964/63 a/
OPERATING REVENUES													
Scheduled Services													
Passenger	+ 15.8	+ 14.2	+ 12.3	+ 18.9	+ 15.8	+ 13.4	+ 4.7	+ 17.3	+ 12.1	+ 6.5	+ 12.0	+ 10.5	+ 14.3
Cargo	+ 10.2	+ 8.9	+ 8.5	+ 21.7	+ 10.3	+ 7.4	+ 0.4	+ 13.8	+ 7.6	+ 8.9	+ 10.5	+ 12.9	+ 18.2
Mail	+ 8.3	+ 3.6	+ 4.6	+ 3.8	+ 10.0	+ 2.9	+ 0.5	+ 11.1	+ 10.4	+ 8.3	+ 10.5	+ 7.6	+ 6.2
Total Scheduled Services	+ 14.4	+ 12.6	+ 11.2	+ 18.1	+ 14.8	+ 12.1	+ 4.0	+ 16.6	+ 11.6	+ 6.8	+ 11.8	+ 10.6	+ 14.3
Non-scheduled Services	- 20.7	- 2.2	+ 13.3	+ 21.6	+ 32.3	+ 65.9	+ 10.3	+ 0.7	+ 22.5	+ 27.0	+ 45.1	- 10.9	+ 11.8
Incidental	+ 31.4	+ 39.1	- 12.5	+ 16.1	+ 56.9	+ 4.9	- 12.1	+ 41.5	+ 27.8	+ 5.9	+ 15.0	+ 20.8	+ 14.0
TOTAL OPERATING REVENUES	+ 13.6	+ 12.9	+ 10.6	+ 18.2	+ 16.0	+ 13.1	+ 3.8	+ 16.6	+ 12.4	+ 7.5	+ 13.2	+ 9.8	+ 14.2
OPERATING EXPENSES													
Flight Operations	+ 15.3	+ 13.0	+ 8.5	+ 15.9	+ 15.1	+ 21.3	+ 0.6	+ 11.5	+ 8.3	+ 8.0	+ 9.8	+ 6.1	+ 8.9
Maintenance & Overhaul	+ 20.1	+ 8.4	+ 8.7	+ 17.9	+ 20.0	+ 11.9	+ 5.3	+ 14.9	+ 10.6	+ 5.8	+ 10.3	+ 1.0	+ 11.9
Flight Equipment Depreciation b/	+ 16.7	+ 24.8	+ 12.4	+ 2.2	+ 11.7	+ 35.2	+ 2.9	+ 17.8	+ 43.7 b/	+ 24.5	+ 4.9	+ 4.0	- 0.1
Other	+ 14.3	+ 10.7	+ 9.0	+ 19.5	+ 16.2	+ 13.5	+ 2.2	+ 15.5	+ 13.2	+ 10.5	+ 9.9	+ 9.7	+ 14.7
TOTAL OPERATING EXPENSES	+ 15.9	+ 12.3	+ 9.1	+ 16.6	+ 16.3	+ 17.1	+ 2.4	+ 14.4	+ 14.0	+ 10.5	+ 9.3	+ 6.4	+ 10.9

Notes: a/ 1964 figures estimated.

b/ Beginning 1960, in accordance with the changes made in ICAO's Air Transport Reporting Forms, the item Flight Equipment Depreciation also includes "Ground Property and Equipment Depreciation", and "Amortization of Development and Pre-Operating Costs", the latter being previously classified as a non-operating expense.

TABLE 11

CONSOLIDATED BALANCE SHEET, 1961-1963
Scheduled Airlines of all ICAO Contracting States

TOTAL DOMESTIC AND INTERNATIONAL SERVICES

ASSETS AND LIABILITIES	U.S. DOLLARS (MILLIONS)			PERCENTAGE DISTRIBUTION		
	1961	1962	1963	1961	1962	1963
ASSETS						
1. Current assets	2 042	2 401	2 522	25.2	27.5	28.1
2. Equipment purchase funds	246	238	411	3.0	2.7	4.6
3. Other special funds	74	60	39	0.9	0.7	0.4
4. Flight equipment before depreciation	(7 012)	(7 575)	(7 903)	-	-	-
4.1 **Less:** Reserve for depreciation	(-2 560)	(-2 844)	(-3 247)	-	-	-
4.2 Flight equipment after depreciation	4 452	4 731	4 656	55.1	54.1	51.9
5. Ground property and equipment before depreciation	(1 218)	(1 248)	(1 409)	-	-	-
5.1 **Less:** Reserve for depreciation	(-462)	(-524)	(-614)	-	-	-
5.2 Ground property and equipment after depreciation	756	724	795	9.3	8.3	8.9
6. Land	21	25	31	0.3	0.3	0.3
7. Investments in affiliated companies	129	146	115	1.6	1.7	1.3
8. Deferred charges	(237)	(251)	(233)	(3.0)	(2.9)	(2.6)
8.1 Development and pre-operating costs	143	117	96	1.8	1.3	1.1
8.2 Other deferred charges	94	134	137	1.2	1.6	1.5
9. Intangible assets	5	5	6	0.0	0.1	0.1
10. Other assets	129	160	161	1.6	1.7	1.8
11. TOTAL ASSETS	8 089	8 741	8 969	100.0	100.0	100.0
LIABILITIES						
12. Current liabilities	1 369	1 581	1 759	16.9	18.1	19.6
13. Unearned transportation revenues	271	337	361	3.3	3.9	4.0
14. Deferred credits	233	280	385	2.9	3.2	4.3
15. Operating reserves	81	90	72	1.0	1.0	0.8
16. Self insurance reserves	73	71	79	0.9	0.8	0.9
17. Other reserves	88	120	126	1.1	1.4	1.4
18. Advances from affiliated companies	37	38	13	0.5	0.4	0.2
19. Other liabilities	72	65	56	0.9	0.8	0.6
20. Long term debt	3 785	3 958	3 729	46.8	45.0	41.6
21. Capital stock	1 480	1 691	1 814	18.3	19.3	20.2
22. Capital surplus	492	522	564	6.1	6.0	6.3
23. Unappropriated Balance of Profit or Loss (—)	+108	+8	+11	1.3	0.1	0.1
24. TOTAL LIABILITIES	8 089	8 741	8 969	100.0	100.0	100.0

Note: The amounts indicated above contain estimates as to approximately 11% of the world totals in 1961 and 1962, and 8% in 1963.

TABLE 12

CONSOLIDATED PROFIT AND LOSS STATEMENT, 1961-1963

Scheduled Airlines of all ICAO Contracting States

TOTAL DOMESTIC AND INTERNATIONAL SERVICES

PROFIT AND LOSS STATEMENT		U.S. DOLLARS (MILLIONS)			PERCENTAGE DISTRIBUTION		
		1961	1962	1963	1961	1962	1963
REVENUES	1. Scheduled services	(5 388)	(6 022)	(6 661)	(92.8)	((91.7)	(92.3)
	1.1 Passenger	4 561	5 107	5 645	78.6	77.8	78.2
	1.2 Excess baggage	62	76	81	1.1	1.2	1.1
	1.3 Freight, express and diplomatic bags	478	522	594	8.2	7.9	8.3
	1.4 Mail	287	317	341	4.9	4.8	4.7
	2. Non-scheduled flights	235	341	304	4.1	5.2	4.2
	3. Incidental revenues	180	207	250	3.1	3.1	3.5
	4. TOTAL OPERATING REVENUES	5 803	6 570	7 215	100.0	100.0	100.0
EXPENSES	5. Flight operations	(1 599)	(1 756)	(1 863)	(27.0)	(27.1)	(27.0)
	5.1 Flight crew salaries and expenses	556	594	623	9.4	9.2	9.0
	5.2 Aircraft fuel and oil	774	845	897	13.1	13.0	13.0
	5.3 Flight equipment insurance and uninsured losses	131	141	143	2.2	2.2	2.1
	5.4 Rental of flight equipment	94	117	137	1.6	1.8	2.0
	5.5 Other flight expenses	44	59	63	0.7	0.9	0.9
	6. Maintenance and overhaul	1 092	1 205	1 217	18.5	18.6	17.7
	7. Depreciation and amortization	(757)	(794)	(826)	(12.8)	(12.3)	(12.0)
	7.1 Normal depreciation of flight equipment	633	648	663	10.7	10.0	9.6
	7.2 Normal depreciation of ground property and equip.	76	87	92	1.3	1.4	1.4
	7.3 Extra depreciation (in excess of cost)	2	1	1	0.0	0.0	0.0
	7.4 Amortization of develop. and pre-operating costs	46	58	70	0.8	0.9	1.0
	8. Station and other ground expenses	(873)	(970)	(1 047)	(14.7)	(15.0)	(15.2)
	8.1 Landing and departure fees	129	159	178	2.1	2.5	2.6
	8.2 Other expenses	744	811	869	12.6	12.5	12.6
	9. Passenger services	434	473	515	7.3	7.3	7.5
	10. Ticketing, sales and promotion	848	925	1 016	14.3	14.3	14.7
	11. General and administrative	299	329	383	5.1	5.1	5.6
	12. Other operating expenses	19	21	22	0.3	0.3	0.3
	13. TOTAL OPERATING EXPENSES	5 921	6 473	6 889	100.0	100.0	100.0
	14. OPERATING RESULT	-118	+97	+326			
NON-OPERATING	15. Retirement of property and equipment	+22	+27	+9			
	16. Interest	-188	-226	-212			
	17. Payments from public funds not allocated elsewhere	(+160)	(+168)	(+154)			
	17.1 Direct subsidies	+130	142	+142			
	17.2 Other payments	+30	26	+12			
	18. Affiliated companies	-1	-7	-2			
	19. Other non-operating items			-35			
	20. NON-OPERATING ITEMS (balance)	-7	-38	-86			
	21. PROFIT OR LOSS (—) BEFORE INCOME TAXES	-125	+59	+240			
	22. Income taxes	-8	-86	-128			
	23. PROFIT OR LOSS (—) AFTER INCOME TAXES	-133	-27	+112			

CONSOLIDATED STATEMENT OF RETAINED EARNINGS	U.S. DOLLARS (MILLIONS)		
	1961	1962	1963
1. Opening Balance (at beginning of the year)	330	108	8
2. Net Loss for 1961 (Item 23 of Profit and Loss Statement above)	-133	-27	+112
3. Adjustments to current and previous years' results	-51	-31	-25
4. Appropriations (adjustment)	6	6	-28
5. Dividends	-44	-48	-56
6. Closing Balance (at end of the year) (Carried to Item 23 of the Balance Sheet)	+108	+8	+11

Note: The amounts indicated above contain estimates as to approximately 11% of the world totals in 1961 and 1962, and 8% in 1963.

TABLE 13

REVENUES AND EXPENSES PER TONNE-KILOMETRE, 1961-1963

Scheduled Airlines of all ICAO Contracting States

TOTAL DOMESTIC AND INTERNATIONAL SERVICES

	ACCOUNTS	U.S. CENTS PER TONNE-KM PERFORMED			U.S. CENTS PER TONNE-KM AVAILABLE		
		1961	1962	1963	1961	1962	1963
REVENUES	1. Scheduled services	(40.1)	(39.8)	(39.3)	20.7	20.2	19.8
	1.1 Passenger	44.6	44.8	44.0	-	-	-
	1.2 Excess baggage	54.6	54.5	55.0	-	-	-
	1.3 Freight, express and diplomatic bags	20.2	18.0	19.0	-	-	-
	1.4 Mail	39.7	39.4	39.8	-	-	-
	2. Non-scheduled flights	21.1	20.9	21.2	14.4	15.6	15.3
	3. Incidental revenues	-	-	-	-	-	-
	4. TOTAL OPERATING REVENUES	39.9	39.2	39.2	21.0	20.5	20.2
EXPENSES	5. Flight operations	(11.0)	(10.5)	(10.1)	(5.8)	(5.5)	(5.2)
	5.1 Flight crew salaries and expenses	3.8	3.6	3.4	2.0	1.9	1.7
	5.2 Aircraft fuel and oil	5.3	5.0	4.9	2.8	2.6	2.5
	5.3 Flight equipment insurance and uninsured losses	0.9	0.8	0.8	0.5	0.4	0.4
	5.4 Rental of flight equipment	0.7	0.7	0.7	0.3	0.4	0.4
	5.5 Other flight expenses	0.3	0.4	0.3	0.2	0.2	0.2
	6. Maintenance and overhaul	7.5	7.2	6.6	3.9	3.7	3.4
	7. Depreciation and amortization	(5.2)	(4.7)	(4.5)	(2.7)	(2.5)	(2.3)
	7.1 Normal depreciation of flight equipment	4.4	3.8	3.6	2.3	2.0	1.9
	7.2 Normal depreciation of ground property and equip.	0.5	0.5	0.5	0.3	0.3	0.2
	7.3 Extra depreciation (in excess of cost)	0.0	0.1	0.0	0.0	0.0	0.0
	7.4 Amortization of develop. and pre-operating costs	0.3	0.3	0.4	0.1	0.2	0.2
	8. Station and other ground expenses	(6.0)	(5.8)	(5.7)	(3.2)	(3.0)	(2.9)
	8.1 Landing and departure fees	0.9	1.0	1.0	0.5	0.5	0.5
	8.2 Other expenses	5.1	4.8	4.7	2.7	2.5	2.4
	9. Passenger services	3.0	2.8	2.8	1.6	1.5	1.4
	10. Ticketing, sales and promotion	5.8	5.5	5.5	3.1	2.9	2.9
	11. General and administrative	2.1	2.0	2.1	1.1	1.0	1.1
	12. Other operating expenses	0.1	0.1	0.1	0.0	0.1	0.1
	13. TOTAL OPERATING EXPENSES	40.7	38.6	37.4	21.4	20.2	19.3
	14. OPERATING RESULT	-0.8	+0.6	+1.8	-0.4	+0.3	+0.9
NON-OPERATING	15. Retirement of property and equipment	+0.2	+0.2	+0.0	+0.1	+0.1	+0.0
	16. Interest	-1.3	-1.4	-1.1	-0.7	-0.7	-0.6
	17. Payments from public funds not allocated elsewhere	+1.1	+1.0	+0.8	+0.5	+0.5	+0.4
	17.1 Direct subsidies	+0.9	+0.8	+0.8	+0.4	+0.4	+0.4
	17.2 Other payments	+0.2	+0.2	+0.0	+0.1	+0.1	+0.0
	18. Affiliated companies	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	19. Other non-operating items			-0.2			-0.1
	20. NON-OPERATING ITEMS (balance)	-0.0	-0.2	-0.5	-0.1	-0.1	-0.3
	21. PROFIT OR LOSS (—) BEFORE INCOME TAXES	-0.8	+0.4	+1.3	-0.5	+0.2	+0.6
	22. Income taxes	-0.1	-0.5	-0.7	-0.0	-0.3	-0.4
	23. PROFIT OR LOSS (—) AFTER INCOME TAXES	-0.9	-0.1	+0.6	-0.5	-0.1	+0.2

Note: The amounts indicated above contain estimates as to approximately 11% of the world totals in 1961 and 1962, and 8% in 1963.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE 14

REGIONAL ANALYSIS - 1963

PERCENTAGE DISTRIBUTION OF ASSETS AND LIABILITIES IN 6 REGIONS OF THE WORLD

Scheduled Airlines of ICAO Contracting States in each Region*

TOTAL DOMESTIC AND INTERNATIONAL SERVICES

ASSETS AND LIABILITIES	PERCENTAGE DISTRIBUTION					
	NORTH AMERICA	EUROPE	FAR EAST (ASIA & OCEANIA)	LATIN AMERICA	AFRICA	MIDDLE EAST
ASSETS						
1. Current assets	28.06	26.94	27.92	29.56	46.23	20.95
2. Equipment purchase funds	4.22	6.61	3.55	0.42	2.30	-
3. Other special funds	0.25	0.35	1.22	0.98	2.18	0.03
4. Flight equipment before depreciation	(95.77)	(86.38)	(73.14)	(61.15)	(52.74)	(78.29)
4.1 **Less:** Reserve for depreciation	(-40.21)	(-38.07)	(-25.22)	(-12.60)	(-19.78)	(-21.87)
4.2 Flight equipment after depreciation	55.56	48.31	47.92	48.55	32.96	56.42
5. Ground property and equipment before depreciation	(15.22)	(17.95)	(16.68)	(6.58)	(17.68)	(14.18)
5.1 **Less:** Reserve for depreciation	(-7.27)	(-7.30)	(-6.04)	(-2.61)	(-5.24)	(-4.52)
5.2 Ground property and equipment after depreciation	7.95	10.65	10.64	3.97	12.44	9.66
6. Land	0.02	0.62	0.87	0.96	0.25	2.47
7. Investments in affiliated companies	1.34	1.16	0.79	2.35	0.14	2.19
8. Deferred charges	(1.85)	(1.79)	(3.76)	(12.27)	(0.85)	(6.96)
8.1 Development and pre-operating costs	1.16	0.20	2.61	2.63	0.40	3.88
8.2 Other deferred charges	0.69	1.59	1.15	9.64	0.45	3.08
9. Intangible assets	0.02	0.08	0.05	0.11	0.84	-
10. Other assets	0.73	3.49	3.28	0.83	1.81	1.32
11. TOTAL ASSETS	100.00	100.00	100.00	100.00	100.00	100.00
LIABILITIES						
12. Current liabilities	19.78	17.73	13.14	29.39	32.64	26.90
13. Unearned transportation revenues	2.48	6.20	4.30	4.58	6.79	7.79
14. Deferred credits	6.46	2.25	0.52	0.31	4.35	0.67
15. Operating reserves	0.67	0.82	0.57	1.54	2.70	0.21
16. Self insurance reserves	0.62	1.06	2.66	0.38	0.91	-
17. Other reserves	0.00	1.78	5.98	4.00	3.55	9.14
18. Advances from affiliated companies	0.18	0.17	-	0.08	-	-
19. Other liabilities	0.30	0.25	3.65	0.43	3.91	0.34
20. Long term debt	44.75	40.37	32.55	36.34	25.07	42.99
21. Capital stock	5.98	39.31	37.10	35.39	14.25	12.57
22. Capital surplus	10.50	1.53	0.29	1.81	4.47	0.25
23. Unappropriated Balance of Profit or Loss (—)	8.28	-11.47	-0.76	-14.25	1.36	-0.86
24. TOTAL LIABILITIES	100.00	100.00	100.00	100.00	100.00	100.00

* Reporting airlines only - See page 68 for list of reporting airlines with Headquarters in each Region. No estimates are included in the above figures.

The Regions are shown by order of importance in the amount of Total Assets.

TABLE 15

REGIONAL ANALYSIS - 1963

REVENUES AND EXPENSES PER TONNE-KILOMETRE PERFORMED IN 6 REGIONS OF THE WORLD

Scheduled Airlines of ICAO Contracting States in each Region*

TOTAL DOMESTIC AND INTERNATIONAL SERVICES

	ACCOUNTS	UNITED STATES CENTS PER TONNE-KILOMETRE PERFORMED					
		NORTH AMERICA	EUROPE	FAR EAST (ASIA & OCEANIA)	LATIN AMERICA	AFRICA	MIDDLE EAST
REVENUES	1. Scheduled services	(37.9)	(43.1)	(40.2)	(32.0)	(36.9)	(42.0)
	1.1 Passenger	43.2	47.2	42.2	34.2	40.5	45.5
	1.2 Excess baggage	47.3	66.8	67.2	47.1	82.8	80.2
	1.3 Freight, express and diplomatic bags	16.7	22.2	24.8	19.9	21.9	22.5
	1.4 Mail	28.9	62.1	60.3	86.9	41.2	60.5
	2. Non-scheduled flights	18.4	21.7	23.2	16.7	57.1	28.7
	3. Incidental revenues	-	-	-	-	-	-
	4. TOTAL OPERATING REVENUES	36.7	44.8	40.5	34.6	41.4	44.4
EXPENSES	5. Flight operations	(9.4)	(11.0)	(9.5)	(11.8)	(19.1)	(9.8)
	5.1 Flight crew salaries and expenses	3.6	3.2	2.2	3.3	2.8	2.7
	5.2 Aircraft fuel and oil	4.7	5.1	5.2	5.7	4.6	5.1
	5.3 Flight equipment insurance and uninsured losses	0.6	1.1	1.1	1.5	1.4	1.4
	5.4 Rental of flight equipment	0.4	0.8	0.7	0.3	10.0	0.6
	5.5 Other flight expenses	0.1	0.8	0.3	1.0	0.3	0.0
	6. Maintenance and overhaul	6.6	6.8	6.2	5.5	6.9	6.5
	7. Depreciation and amortization	(4.1)	(5.6)	(5.5)	(3.3)	(2.9)	(6.0)
	7.1 Normal depreciation of flight equipment	3.3	4.6	4.2	2.8	2.0	4.1
	7.2 Normal depreciation of ground property and equip	0.4	0.7	0.7	0.3	0.6	0.5
	7.3 Extra depreciation (in excess of cost)	-	0.0	0.0	0.0	0.0	-
	7.4 Amortization of develop. and pre-operating costs.	0.4	0.3	0.6	0.2	0.3	1.4
	8. Station and other ground expenses	(5.9)	(6.1)	(3.7)	(3.8)	(2.9)	(5.5)
	8.1 Landing and departure fees	0.7	1.6	1.2	0.9	1.2	1.4
	8.2 Other expenses	5.2	4.5	2.5	2.9	1.7	4.1
	9. Passenger services	2.6	3.3	2.5	3.2	1.7	2.4
	10. Ticketing, sales and promotion	4.3	8.3	6.6	6.4	5.3	7.0
	11. General and administrative	1.7	2.7	2.7	2.6	3.3	4.2
	12. Other operating expenses	-	0.2	0.0	1.1	0.6	0.1
	13. TOTAL OPERATING EXPENSES	34.6	44.0	36.7	37.7	42.7	41.5
	14. OPERATING RESULT	2.1	0.8	3.8	-3.1	-1.3	2.9
NON-OPERATING	15. Retirement of property and equipment	0.1	0.1	-0.1	-0.5	0.0	-0.1
	16. Interest	-1.1	-1.5	-0.9	-0.5	-0.4	-0.9
	17. Payments from public funds not allocated elsewhere	(0.8)	(0.9)	(0.0)	(1.5)	(3.3)	-
	17.1 Direct subsidies	0.8	0.8	0.0	0.9	3.0	-
	17.2 Other payments	-	0.1	-	0.6	0.3	-
	18. Affiliated companies	0.0	-0.1	0.0	0.0	0.3	-0.2
	19. Other non-operating items	0.1	-0.9	-0.2	-1.6	-0.0	-0.0
	20. NON-OPERATING ITEMS (balance)	-0.1	-1.5	-1.2	-1.1	3.2	-1.2
	21. PROFIT OR LOSS (—) BEFORE INCOME TAXES	2.0	-0.7	2.6	-4.2	1.9	1.7
	22. Income taxes	-1.0	-0.0	-0.5	-0.1	-0.0	-0.0
	23. PROFIT OR LOSS (—) AFTER INCOME TAXES	1.0	-0.7	2.1	-4.3	1.9	1.7

* Reporting airlines only - See page 68 for list of reporting airlines with Headquarters in each Region. No estimates are included in the above figures.

The Regions are shown by order of importance in the amount of Total Operating Revenues.

TABLE 16

REGIONAL ANALYSIS - 1963

REVENUES AND EXPENSES PER TONNE-KILOMETRE AVAILABLE IN 6 REGIONS OF THE WORLD

Scheduled Airlines of ICAO Contracting States in each Region*

TOTAL DOMESTIC AND INTERNATIONAL SERVICES

	ACCOUNTS	UNITED STATES CENTS PER TONNE-KILOMETRE AVAILABLE					
		NORTH AMERICA	EUROPE	FAR EAST (ASIA & OCEANIA)	LATIN AMERICA	AFRICA	MIDDLE EAST
REVENUES	1. Scheduled services	18.1	22.6	23.4	19.2	19.5	22.0
	1.1 Passenger	-	-	-	-	-	-
	1.2 Excess baggage	-	-	-	-	-	-
	1.3 Freight, express and diplomatic bags	-	-	-	-	-	-
	1.4 Mail	-	-	-	-	-	-
	2. Non-scheduled flights	14.1	17.3	18.6	13.3	44.1	22.9
	3. Incidental revenues	-	-	-	-	-	-
	4. TOTAL OPERATING REVENUES	18.1	24.1	23.9	21.2	22.7	24.2
EXPENSES	5. Flight operations	(4.7)	(5.9)	(5.6)	(7.2)	(10.5)	(5.3)
	5.1 Flight crew salaries and expenses	1.8	1.7	1.3	2.0	1.5	1.5
	5.2 Aircraft fuel and oil	2.3	2.7	3.0	3.5	2.5	2.7
	5.3 Flight equipment insurance and uninsured losses	0.3	0.6	0.7	0.9	0.8	0.8
	5.4 Rental of flight equipment	0.2	0.5	0.4	0.2	5.5	0.3
	5.5 Other flight expenses	0.1	0.4	0.2	0.6	0.2	0.0
	6. Maintenance and overhaul	3.3	3.7	3.7	3.4	3.8	3.5
	7. Depreciation and amortization	(2.0)	(3.0)	(3.2)	(2.0)	(1.6)	(3.3)
	7.1 Normal depreciation of flight equipment	1.6	2.5	2.5	1.7	1.1	2.2
	7.2 Normal depreciation of ground property and equip	0.2	0.4	0.4	0.2	0.3	0.3
	7.3 Extra depreciation (in excess of cost)	-	0.0	0.0	0.0	0.0	-
	7.4 Amortization of develop. and pre-operating costs	0.2	0.1	0.3	0.1	0.2	0.8
	8. Station and other ground expenses	(2.9)	(3.3)	(2.2)	(2.4)	(1.6)	(3.0)
	8.1 Landing and departure fees	0.3	0.9	0.7	0.6	0.6	0.8
	8.2 Other expenses	2.6	2.4	1.5	1.8	1.0	2.2
	9. Passenger services	1.3	1.8	1.5	1.9	0.9	1.3
	10. Ticketing, sales and promotion	2.1	4.4	3.9	3.9	2.9	3.8
	11. General and administrative	0.8	1.5	1.6	1.6	1.8	2.3
	12. Other operating expenses	-	0.1	0.0	0.7	0.3	0.1
	13. TOTAL OPERATING EXPENSES	17.1	23.7	21.7	23.1	23.4	22.6
	14. OPERATING RESULT	1.0	0.4	2.2	-1.9	-0.7	1.6
NON-OPERATING	15. Retirement of property and equipment	0.0	0.0	-0.1	-0.3	0.0	-0.1
	16. Interest	-0.5	-0.8	-0.5	-0.3	-0.2	-0.5
	17. Payments from public funds not allocated elsewhere	(0.4)	(0.5)	(0.0)	(0.9)	(1.8)	-
	17.1 Direct subsidies	0.4	0.4	0.0	0.5	1.7	-
	17.2 Other payments	-	0.1	-	0.4	0.1	-
	18. Affiliated companies	0.0	-0.0	0.0	0.0	0.1	-0.1
	19. Other non-operating items	0.1	-0.5	-0.1	-1.0	-0.0	-0.0
	20. NON-OPERATING ITEMS (balance)	-0.0	-0.8	-0.7	-0.7	1.7	-0.7
	21. PROFIT OR LOSS (—) BEFORE INCOME TAXES	1.0	-0.4	1.5	-2.6	1.0	0.9
	22. Income taxes	-0.5	-0.0	-0.3	-0.0	-0.0	-0.0
	23. PROFIT OR LOSS (—) AFTER INCOME TAXES	0.5	-0.4	1.2	-2.6	1.0	0.9

* Reporting airlines only - See page 68 for list of reporting airlines with Headquarters in each Region. No estimates are included in the above figures.

The Regions are shown by order of importance in the amount of Total Operating Revenues.

LIST OF AIRLINES INCLUDED IN EACH REGION

The regional statistics shown in Tables 14, 15 and 16 are not complete for each region, i. e. they refer only to the countries and airlines for which financial and traffic statistics have been filed with ICAO for the year 1963. The countries and airlines included in each Region are as follows:

NORTH AMERICA

CANADA	Air Canada
	Canadian Pacific Airlines
	Quebecair
UNITED STATES	
	Aerovias Sud Americana
	Airlift International
	Alaska Airlines
	Alaska Coastal-Ellis
	Allegheny Airlines
	Aloha Airlines
	American Airlines
	Bonanza Air Lines
	Braniff Airways
	Caribbean-Atlantic
	Central Airlines
	Chicago Helicopter
	Continental Air Lines
	Cordova Airlines
	Delta Air Lines
	Eastern Air Lines
	Flying Tiger Line
	Frontier Airlines
	Hawaiian Airlines
	Kodiak Airways
	Lake Central Airlines
	Los Angeles Airways
	Mackey Airlines
	Mays, Howard J.
	Mohawk Airlines
	National Airlines
	New York Airways
	North Central Airlines
	Northeast Airlines
	Northern Consolidated
	Northwest Airlines
	Ozark Air Lines
	Pacific Air Lines
	Pacific Northern
	Pan American-Grace
	Pan American World Airways
	Piedmont Aviation
	Reeve Aleutian
	Samoan Airlines
	San Francisco & Oakland Helicopter Airlines
	Seaboard World Airlines
	Slick Corporation
	South Pacific Air Lines
	Southern Airways
	Transportation Corporation America
	Trans-Texas Airways
	Trans World Airlines
	United Air Lines
	West Coast Airlines
	Western Air Lines
	Western Alaska Airlines
	Wien Alaska Airlines

EUROPE

AUSTRIA	Austrian Airlines
BELGIUM	SABENA
FINLAND	FINNAIR
	KAR-AIR
FRANCE	Air France
	Union de Transports Aériens
GERMANY	Deutsche Lufthansa
GREECE	Olympic Airways
ICELAND	Flugfelag H.F.
IRELAND	Aer Lingus
	Aerlinte
ITALY	ALITALIA
LUXEMBOURG	LUXAIR
NETHERLANDS	KLM - Royal Dutch Airlines
POLAND	Polish Airlines "LOT"
PORTUGAL	TAP
SCANDINAVIA	Scandinavian Airlines System
SPAIN	Aviación y Comercio
	IBERIA
SWITZERLAND	SWISSAIR
TURKEY	THY - Turkish Airlines
UNITED KINGDOM	British European Airways
	British Overseas Airways Corp

FAR EAST (ASIA AND OCEANIA)

AUSTRALIA	QUANTAS
CHINA	China Airlines
	Civil Air Transport
INDIA	Air India International
	Indian Airlines Corp.
INDONESIA	GARUDA Indonesian Airways
JAPAN	Japan Airlines
NEW ZEALAND	Tasman Empire Airways
PAKISTAN	Pakistan Int. Airlines
THAILAND	THAI Airways Co. Ltd.

LATIN AMERICA

ARGENTINA	Aerolineas Argentinas
	Aerotransportes Del Litoral
	AUSTRAL
BRAZIL	Cruzeiro Do Sul
	Panair Do Brasil
	VARIG
CHILE	LAN-Chile
COLOMBIA	Aerotaxi
	Aerovias Condor
	AVIANCA
	Soc. Aeronautica Medellin
	Taxader
COSTA RICA	Lineas Aereas Costarricenses
CUBA	CUBANA
HONDURAS	TAN
VENEZUELA	Aerovias Venezolanas
	Lineas Aeropostal Venezolana
	Venezolana International

AFRICA

AFRICA *	Air Afrique
CONGO (LEOPOLDVILLE)	Air Congo
ETHIOPIA	Ethiopian Airlines
EAST AFRICA	East African Airways Corp.
GHANA	Ghana Airways
MALAGASY	Air Madagascar
MOROCCO	Royal Air Maroc
MOZAMBIQUE	DETA
TUNISIA	Tunis Air
RHODESIA & NYASALAND	Central African Airways
UNITED ARAB REPUBLIC	United Arab Airlines

* 11 African States Signatories to the Yaoundé Treaty: Cameroun, Central African Rep., Chad, Congo (Brazzaville), Dahomey, Gabon, Ivory Coast, Mauritania, Niger, Senegal, Upper Volta.

MIDDLE EAST

ADEN	Aden Airways
CYPRUS	Cyprus Airways
ISRAEL	EL-AL Israel Airlines
LEBANON	Middle East Airlines

TABLE 17

NUMBER OF AIRCRAFT IN SCHEDULED AIRLINE FLEETS - INTERNATIONAL AND DOMESTIC ESTIMATED 1948-1964

(aircraft over 9 000 kg/20 000 lb maximum take-off weight)

AIRCRAFT TYPES (listed according to maximum take-off weight)	Year of first entry into service	NUMBER OF AIRCRAFT IN SERVICE at 31 December of year									
		1948	1952	1956	1958	1959	1960	1961	1962	1963	1964
	Col.1	Col.2	Col.3	Col.4	Col.5	Col.6	Col.7	Col.8	Col.9	Col.10	Col.11
TURBO-JETS											
Boeing 707	1958	-	-	-	6	71	143	159	187	210	242
Douglas DC-8	1959	-	-	-	-	17	113	149	168	185	205
Vickers VC-10	1964	-	-	-	-	-	-	-	-	-	14
Convair 990	1962	-	-	-	-	-	-	-	22	33	36
Boeing 720	1960	-	-	-	-	-	24	88	119	125	130
Convair 880	1960	-	-	-	-	-	12	45	56	60	64
Tupolev TU-104	1956	-	-	-	-	-	4	4	5	5	5
DH Comet 4	1958	-	-	-	6	27	42	53	61	60	59
Boeing 727	1963	-	-	-	-	-	-	-	-	6	101
DH-121 Trident	1963	-	-	-	-	-	-	-	-	1	13
DH-Comet 1	1951	-	12	-	-	-	-	-	-	-	-
SNCA-SUD-210 Caravelle	1959	-	-	-	-	15	56	91	128	146	168
Total		-	12	-	12	130	394	589	746	851	1 097
TURBO-PROPS											
Canadair CL-44D	1961	-	-	-	-	-	-	14	20	21	25
Bristol BR-175 Britannia	1956	-	-	-	47	57	57	59	48	47	49
Vickers "900" Vanguard	1960	-	-	-	-	-	6	37	42	42	42
Ilyushin IL-18	1959	-	-	-	-	-	4	17	23	26	23
Antonov AN-12	1959	-	-	-	-	-	-	2	3	2	2
Lockheed L-188 Electra	1958	-	-	-	7	122	135	151	151	151	151
Armstrong Whitworth Argosy AW-650	1961	-	-	-	-	-	-	8	3	3	3
Vickers "800" Viscount	1957	-	-	-	90	125	121	122	126	126	120
Vickers "700" Viscount	1953	-	-	165	243	259	246	253	251	238	238
Canadair/Allison/Convair 540	1959	-	-	-	-	-	7	5	-	-	13
HAMCO YS-11	1965	-	-	-	-	-	-	-	-	-	-
Hawker Siddeley-748	1962	-	-	-	-	-	-	-	10	16	21
Handley Page - Herald	1961	-	-	-	-	-	-	2	12	16	27
Fokker/Fairchild F-27	1958	-	-	-	29	76	91	125	137	163	194
Nord-260/262	1963	-	-	-	-	-	-	-	-	2	5
Total		-	-	165	416	639	667	793	826	853	913
PISTON-ENGINED											
SNCA-SE-2010 Armagnac	1951	-	4	-	-	-	-	-	-	-	-
Lockheed 1649 Starliner	1957	-	-	-	43	42	40	35	35	36	29
Boeing 377 Stratocruiser	1949	-	54	50	44	32	18	10	6	6	6
Douglas DC-7 (7B, 7C)	1953	-	-	164	325	329	264	260	248	213	184
Lockheed 1049D, E, G, H Super Const.	1952	-	29	182	232	295	223	196	165	151	138
Breguet 763 Deux Ponts, Provence	1953	-	-	12	12	12	12	12	12	12	12
Douglas DC-6, 6B, 6A	1947	125	230	399	469	466	476	407	386	369	349
Lockheed 49, 649, 749 Constellation	1945	107	200	179	171	178	150	112	83	77	74
HP Hermes 4A, HP-81	1950	-	19	18	16	14	-	-	-	-	-
Canadair C-4, North Star, Argonaut	1947	20	45	41	41	28	28	9	9	6	3
Short Solent 2 & 3, S-45	1948	15	6	6	2	2	-	-	-	-	-
Aviation Traders ATL-98, Carvair	1961	-	-	-	-	-	-	2	2	4	11
Douglas DC-4 Skymaster (C-54)	1939	434	376	305	284	288	240	231	226	226	214
Avro York, Tudor, Lancastrian	1944	80	9	37	25	14	17	12	9	3	3
Boeing B-17	1937	-	-	-	-	-	2	2	2	3	3
Short Sandringham 5 & 7, S-25	1944	30	16	11	8	8	10	10	2	2	2
Fairchild C-82, C-119 Packet	1945	-	-	7	13	14	12	13	13	11	11
Curtiss C-46, Commando	1941	98	161	180	186	221	185	179	175	169	163
DH Airspeed Ambassador AS-57-2	1952	-	20	19	17	17	8	8	10	14	13
SNCA-SE-161 Languedoc	1946	47	31	12	5	5	-	-	-	-	-
Convair 340, 440	1952	-	30	244	314	317	305	305	309	299	270
Boeing 307	1940	5	7	3	9	9	3	1	-	-	-
Bristol 170 Mk 31, 32	1946	17	50	59	51	65	43	45	49	51	47
Martin 202, 404	1947	29	136	127	125	111	100	92	82	80	71
SNCA-Nord 2501 Noratlas	1954	-	-	4	10	10	3	3	3	3	9
SNCA-SO-30P Bretagne	1950	-	14	-	-	-	-	-	-	-	-
Convair 240	1948	78	164	152	134	134	104	97	98	97	98
Ilyushin IL-14	1954	-	-	-	-	-	43	65	65	48	50
SAAB-90 A-2 Scandia	1950	-	12	17	16	14	15	15	14	14	14
Vickers Viking	1946	84	99	72	64	64	18	11	12	18	18
Douglas A-26 Invader	1944	-	-	-	-	-	1	1	1	1	1
Convair Catalina, Canso, PBY-5A	1938	50	45	32	28	28	20	18	17	19	20
Douglas DC-3, Dakota, C-47	1936	1 740	1 730	1 524	1 448	1 393	1 286	1 225	1 134	1 084	1 052
Lisunov Li-2	1946	-	-	-	-	-	24	14	14	12	6
Junkers JU-52	1933	58	16	-	-	-	1	1	1	1	1
Lockheed Lodestar, L-18	1940	-	-	-	-	-	7	6	4	4	4
Total		3 017	3 503	3 856	4 092	4 048	3 654	3 397	3 184	3 033	2 876
TOTAL - ALL TYPES		3 017	3 515	4 021	4 520	4 817	4 715	4 779	4 756	4 717	4 826

Sources: The main sources for the data in Table 17, for the years 1948 and 1952 (Columns 2 and 3), Jane's "All the World's Aircraft"; for the years 1956 to 1959 (Columns 4, 5 and 6), Aviation Studies (International) Ltd., "Scheduled Airline Fleets"; for the years 1960 to 1963 (Columns 7, 8, 9 & 10), ICAO Air Transport Reporting Form D, Flight International magazine and other publications; for the year 1964 (Column 11), such publications as Flight International, Aviation Studies (International) Ltd., "Inventories of Airline Fleets", "Asso's Turbine-Engined Fleets of the World's Airlines", as well as information from manufacturers. Where desirable and possible these sources have been checked against other sources such as the CAA Statistical Handbooks of Civil Aviation and reports published in the aviation press.

Notes:

Figures are for the number of aircraft for scheduled airlines of 107 member States of ICAO.

Under "Aircraft Types" are listed the main series only, in order of maximum take-off weight. Thus no distinction is made in the fleet count between the various sub-types of, for example, the Boeing 707, Bristol 175 Britannia, or Douglas DC-7 series.

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE 18 (Cont'd.)

CIVIL AIRCRAFT TYPE DATA

(samples of aircraft over 10 000 kg maximum take-off weight)

AIRCRAFT TYPES (listed according to maximum take-off weight)	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
	Maximum take-off weight	Mean cruise speed	Range (still air)		Payload		Approximate average productive capacity	Theoretical annual output at 3 000 hours per year	Passenger capacity	Freight holds capacity	Approximate price new aircraft during 1964
			Maximum	With cap. payload	With full tanks	Maximum					
	(kg)	(kmph)	(km)	(km)	(kg)	(kg)	(tonne-kmph)	(tonne-km '000)	(number)	(cu m)	(US$ '000)
CARGO AIRCRAFT											
Lockheed L-300	174 773	850	7 778	5 741	37 227	50 000	28 920	86 760	-	329	6 500
Boeing 707-320C	151 950	886	11 970	6 820	14 168	43 545	26 204	78 612	-	271	6 750
Douglas DC-8F	143 182	876	11 100	9 502	24 688	43 219	25 777	77 331	-	256	6 750
Canadair CL-44D	95 256	620	10 132	6 355	15 617	29 364	12 384	37 152	-	207	4 340
Lockheed L-1049D	60 329	457	7 792	4 876	10 088	15 196	4 714	14 142	-	161	-
Douglas DC-6A	48 535	451	6 550	4 458	7 974	12 782	3 920	11 760	-	142	-
Armstrong Whitworth Argosy AW-650	37 195	483	4 426	1 110	3 901	12 247	4 021	12 063	-	104	2 500
Douglas DC-4	33 113	354	6 598	3 734	3 515	7 711	1 854	5 562	-	95	-
Fairchild C-119F	33 022	346	2 736	222	6 593	12 701	2 993	8 979	-	76	-
Avro York 685	30 845	322	4 284	3 025	4 608	6 804	1 489	4 467	-	52	-
Curtiss C-46	21 773	338	2 623	966	2 994	5 534	1 278	3 834	-	76	-
SNCA-Nord 2501 Noratlas	21 002	306	2 414	2 205	4 962	5 216	1 088	3 264	-	51	-
Bristol 170 MK 32	19 958	266	2 784	974	3 175	5 670	1 022	3 066	-	70	-
RUSSIAN AIRCRAFT											
TURBO JETS											
Tupolev TU-104A	74 502	813	4 604	3 446	n.a.	8 845	4 885	14 655	50 - 70	35	n.a.
TURBO PROPS											
Ilyushin IL-18 Moskva	61 407	646	5 744	2 870	6 803	13 995	6 149	18 447	90 - 110	27	n.a.
Antonov AN-12A CAT	55 112	636	3 428	1 996	8 437	14 515	6 279	18 837	84 - 126	42	n.a.
PISTON											
Ilyushin IL-14	16 500	319	3 196	1 482	1 891	2 458	533	1 599	36	n.a.	-
Lisunov LI-2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-

Sources: The main sources for the data in Table 18 are Aviation Studies' "Civil Transport Data Sheets", Jane's "All the World's Aircraft", and specifications provided directly by the manufacturers. In some cases, particularly for the Russian aircraft, reference has been made to reports published in the aviation press.

Aircraft Types: In order that the specifications may be shown accurately the types listed are specific and in general only one type in each series is given. Thus of the Boeing 707 series only the 320 is shown.

Russian Aircraft: The accuracy of the data given for the Russian aircraft cannot be vouched for. The only available source has been the aviation press and the reports published therein have often been in conflict with each other.

Column 1: Maximum take-off weights are the latest maxima permitted by the licensing authority of the country of manufacture of the aircraft in conditions of International Standard Atmosphere (15°C.) at sea level.

Column 2: Mean cruise speed is at optimum altitude over the range of weights (starting at maximum take-off weight) from level-off to let-down on a typical flight stage assuming, for piston-engined aircraft, 50% of take-off power and, for jets, maximum continuous power.

Column 3: Maximum range is here understood to mean starting at maximum take-off weight, from full to empty tanks, no wind, using power for ultimate range (with full tanks payload).

Column 4: Range with capacity payload is the maximum range with the fuel that can be carried with maximum payload, starting at maximum take-off weight, no wind, using power for ultimate range.

Column 5: Payload with full tanks is weight limited. It is equal to the difference between the maximum take-off weight and the combined weight of maximum fuel load, empty aircraft, oil, crew, fittings, life-saving equipment, etc.

Column 6: Maximum payload is generally weight limited but in some cases space limited assuming maximum, high-density seating.

Column 7: The figure for approximate average productive capacity expressed in tonne-kilometres per hour is intended to provide a measure by which the potential productivity of the various aircraft types can be compared. It is the product of the average block speed and available payload for each aircraft type. The block speed figure is obtained by reducing the mean cruise speed (Column 2) by 15% to allow for time spent in climb and descent and in other delays in the air such as diversions and stacking. The available payload figure is obtained by reducing the maximum payload (Column 6) by 20% in order to allow for varying configurations and conditions of operation.

Column 8: These figures are obtained by multiplying those in Column 7 by 3,000 hours.

Column 9: The passenger capacity figures give the maximum high density seating and in most cases also the standard first-class arrangement.

Column 10: The freight holds capacity figures are for the total baggage and freight holds of passenger aircraft and the total cabin and holds of cargo aircraft. Average weights for 1 cubic metre in hold are 195 kg baggage and 247 kg mail or freight.

Column 11: The approximate prices given are for new aircraft without spares.

ICAO Economics & Statistics Branch (May 1965)

TABLE 19

UTILIZATION OF AIRCRAFT FLOWN BY INTERNATIONAL SCHEDULED AIRLINES
(In terms of revenue hours flown per day)

Reported 1953-1963, Estimated 1964

AIRCRAFT TYPES (listed according to maximum take-off weight)	Year of first entry into service	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	ESTIMATED 1964
TURBO-JETS													
Boeing 707	1958	-	-	-	-	-	6:53	7:17	7:41	8:27	8:44	9:07	9:30
Douglas DC-8	1959	-	-	-	-	-	-	5:26	7:03	8:18	8:55	9:20	9:30
Vickers VC-10	1964	-	-	-	-	-	-	-	-	-	-	-	7:00
Convair 990	1962	-	-	-	-	-	-	-	-	-	5:25	6:42	7:00
Boeing 720	1960	-	-	-	-	-	-	-	5:48	6:59	7:33	8:31	8:40
Convair 880	1960	-	-	-	-	-	-	-	5:54	6:27	7:04	7:02	7:20
BH Comet 4	1958	-	-	-	-	-	3:07	7:11	8:26	7:28	7:54	7:51	8:00
Tupolev TU-104	1956	-	-	-	-	-	-	...	6:00*	6:00*	6:00*	6:00*	6:00
Boeing 727	1963	-	-	-	-	-	-	-	-	-	-	-g/	6:00
BH-121 Trident	1963	-	-	-	-	-	-	-	-	-	-	6:00	6:00
SNCA-SUD 210-Caravelle	1959	-	-	-	-	-	-	4:53	5:29	5:25	5:48	5:54	6:00
BH-Comet 1	1951	5:20	2:52	-	-	-	-	-	-	-	-	-	-
TURBO-PROPS													
Canadair CL-44D	1961	-	-	-	-	-	-	-	-	5:31	7:52	8:10	8:30
Bristol BR-175 Britannia	1956	-	-	-	4:01	6:38	6:48	7:24	7:45	6:54	6:21	5:50	6:00
Vickers '900' Vanguard	1960	-	-	-	-	-	-	-	1:54	5:04	5:32	5:50	6:00
Ilyushin IL-18	1959	-	-	-	-	-	-	...	3:00*	3:00*	3:00*	3:20	3:50
Antonov AN-12	1959	-	-	-	-	-	-	-	-	5:30*	5:30*	5:30*	5:30
Lockheed L-188 Electra	1958	-	-	-	-	-	12:30	6:13	6:32	5:59	6:01	6:32	6:40
Armstrong Whitworth Argosy AW-650	1961	-	-	-	-	-	-	-	-	5:52	6:02	6:28	6:50
Vickers '800' Viscount	1957	-	-	-	-	5:12	5:00	5:51	6:27	6:07	5:28	5:32	5:30
Vickers '700' Viscount	1953	3:51	4:25	5:28	6:09	6:32	6:02	6:32	6:48	6:25	5:49	5:46	5:45
Canadian/Allison/Convair 540	1960	-	-	-	-	-	-	-	6:00	6:00	6:00	6:00	6:00
HAWCO YS-11	1965	-	-	-	-	-	-	-	-	-	-	-	-
Hawker Siddeley AVRO 748	1962	-	-	-	-	-	-	-	-	-	2:00	6:08	6:30
Handley Page Herald	1961	-	-	-	-	-	-	-	-	3:50	2:42	3:54	4:00
Fokker/Fairchild F-27	1958	-	-	-	-	-	1:36	3:02	4:08	6:24	6:51	5:20	6:00
Nord 260/262	1963	-	-	-	-	-	-	-	-	-	-	4:00	4:00
PISTON ENGINED													
Lockheed 1649 Starliner	1957	-	-	-	-	7:43	9:08	9:13	5:59	4:41	4:06	4:07	
Boeing 377 Stratocruiser	1949	6:46	6:53	7:55	8:54	7:54	7:58	7:11	4:45	...	...	...	
Douglas DC-7 (7B, 7C)	1953	5:59	7:14	8:35	9:27	9:28	9:06	8:59	7:37	6:11	5:36	5:24	5:00
Lockheed 1049D, E, G, H Super Const.	1952	8:20	8:30	8:36	9:12	7:52	8:35	8:14	6:54	5:21	4:17	4:14	4:00
Bréguet 763 Deux Ponts, Provence	1953	4:43	5:36	3:01	4:47	5:20	5:38	6:05	5:18	4:48	4:19	3:51	
Douglas DC-6, 6B, 6A	1947	8:24	7:41	8:26	8:45	8:29	7:58	7:55	6:34	5:31	5:19	5:31	5:30
Lockheed 49, 649, 749 Constellation	1945	8:33	8:43	8:41	8:33	8:00	6:55	5:54	4:52	5:03	3:48	3:38	
H.P. Hermes 4A, HP-81	1950	5:16	-	-	-	-	-	-	-	-	-	-	
Canadair C-4, North Star, Argonaut	1947	8:59	9:25	8:47	8:21	7:24	6:25	6:51	6:50	4:59	4:07	3:14	
Short Solent 2 & 3, S-45	1948	6:06	4:44	2:51	3:55	3:18	2:10	2:55	2:14	-	-	-	
Aviation Traders ATL-98, Carvair	1961	-	-	-	-	-	-	-	-	...	...	4:30	
Douglas DC-4, Skymaster, C-54	1939	6:36	5:40	6:16	8:04	6:18	6:01	5:41	5:15	4:54	4:28	4:38	4:50
Avro York, Tudor, Lancastrian	1944	1:47	0:59	0:12	0:01	4:50	4:20	...	...	3:38	0:06	...	
Short Sandringham 5 & 7, S-25	1944	1:52	3:16	2:07	2:01	3:00	2:55	2:52	2:23	2:51	2:52	...	
Fairchild C-82, C-119 Packet	1945	-	-	...	...	1:54	4:54	6:12	5:36	...	...	...	
Curtiss C-46, Commando	1941	4:25	4:36	3:43	5:28	3:22	4:46	3:46	4:29	4:06	4:40	4:48	
BH-Airspeed Ambassador, AS-57	1952	4:12	5:30	6:06	...	4:36	4:06	...	...	...	...	...	
SNCA-SE-161 Languedoc	1946	2:54	6:00	3:09	3:27	3:48	4:02	3:07	0:37	-	-	-	
Convair 340, 440	1952	5:23	6:06	6:13	6:35	6:37	6:13	6:18	5:57	5:35	5:22	5:48	
Boeing 307	1940	...	...	...	...	...	...	...	...	...	-	-	
Bristol 170 MK 31, 32	1946	3:01	3:20	3:22	3:27	3:25	2:53	3:11	3:27	1:22	1:45	0:21	
Martin 202, 404	1947	6:54	6:50	7:16	7:45	7:38	6:50	6:26	5:27	5:37	3:15	5:17	
SNCA-Nord 2501 Noratlas	1954	-	-	-	...	...	4:20	...	2:00	...	...	...	
Convair 240	1948	5:42	5:18	5:55	6:23	6:39	5:56	5:32	4:51	4:02	4:17	5:03	
Ilyushin IL-14	1954	-	-	-	-	-	-	...	...	1:39	...	...	
SAAB-90 A-2 Scandia	1950	-	3:47	5:00	3:58	2:17	-	-	-	-	-	-	
Vickers Viking	1946	4:19	3:33	6:07	3:28	5:23	3:58	...	2:36	2:37	...	...	
Convair Catalina, Canso, PBY-5A	1938	3:08	3:29	2:39	3:17	1:41	3:14	3:38	3:54	0:35	0:25	...	
Douglas DC-3, Dakota, C-47	1936	4:45	4:32	4:29	4:42	4:33	4:02	3:49	3:55	3:59	3:57	3:24	3:30
Lisunov LI-2	1946	-	-	-	-	-	...	...	...	...	...	...	
Lockheed Lodestar L-18	1940	3:36	4:10	3:06	2:42	1:32	1:01	2:24	...	3:45	1:26	0:44	
Junkers JU-52	1933	1:45	1:44	1:00	-	...	...	...	...	...	...	...	

NOTE: The information given above represents averages of utilization rates reported by international scheduled airlines published in the ICAO Digest of Statistics FLEET AND PERSONNEL Series FP Nos. 7 to 17 (including their addenda) for the years 1953 to 1963 and are not therefore claimed to be complete.
g/ Aircraft delivered but not operated.
See DIAGRAM 4.

Explanation of Symbols: - Magnitude nil.
... Data not available.
* Estimated by ICAO.
: Minutes.

ICAO Economics & Statistics Branch (May 1965)

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE 20

GLOBAL AIR TRANSPORT CAPACITY AVAILABLE COMPARED WITH GLOBAL DEMAND FOR AIR TRANSPORT
(Scheduled airlines of 107 Contracting States of ICAO)
TOTAL OPERATIONS - INTERNATIONAL AND DOMESTIC
Ten Years Estimated 1955-1964, Two Years Forecast 1965-1966

SCHEDULED AND NON-SCHEDULED OPERATIONS OF SCHEDULED AIRLINES	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
	PAST YEARS										FUTURE YEARS	
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964 (Preliminary)	1965	1966
	Millions of tonne-kilometres											
A. ESTIMATE OF CAPACITY AVAILABLE (by types of aircraft)												
1.a/ Turbo-Jets : Long Range - Delivered up to 1 January 1965	-	-	-	44	1 550	7 500	14 415	19 111	25 021	26 584	27 955	27 955
b/ - Entering service 1965-1966	-	-	-	-	-	-	-	-	-	-	2 420	5 940
2.a/ Turbo-Jets : Medium to Short-Range - Delivered up to 1 January 1965	-	-	-	-	91	328	658	1 028	1 291	2 877	4 690	4 690
b/ - Entering service 1965-1966	-	-	-	-	-	-	-	-	-	-	1 595	4 670
3.a/ Turbo-Props - Delivered up to 1 January 1965	279	609	1 218	2 091	3 855	4 433	4 889	5 611	5 664	6 090	6 210	6 210
b/ - Entering service 1965-1966	-	-	-	-	-	-	-	-	-	-	105	295
4. Piston Engined - (no allowance for future disposals)	12 131	13 701	15 592	15 815	14 764	11 219	7 778	6 350	5 724	5 359	5 095	4 840
ESTIMATED CAPACITY AVAILABLE - (no allowance for future disposals)	12 410	14 310	16 810	17 950	20 260	25 480	27 740	32 080	35 700	40 910	48 010	54 540
5. Annual rate of growth	17.0%	15.3%	17.5%	6.8%	12.9%	15.9%	18.1%	15.6%	11.3%	14.6%	17.4%	13.6%
B. AIR TRANSPORT DEMAND (by types of service)												
1. On scheduled services	7 100	8 180	9 200	9 610	11 000	12 340	13 460	15 130	16 970	19 740	22 400	25 430
2. On non-scheduled services of scheduled airlines (assumed load factor : 75%)	290	390	610	640	730	830	1 245	1 710	1 950	1 780	2 020	2 290
3. Total all services	7 390	8 570	9 810	10 250	11 730	13 170	14 705	16 840	18 920	21 520	24 420	27 720
4. Annual rate of growth	17.1%	16.0%	14.5%	4.5%	14.4%	12.3%	11.7%	14.5%	10.0%	16.8%	13.5%	13.5%
C. COMPARISONS OF CAPACITY WITH DEMAND												
1. LOAD FACTOR estimated for 1955-1964, and a COMPARISON of theoretical potential productive capacity with demand increasing at 13.5% per annum for 1965 and for 1966.	59.5%	59.9%	58.4%	57.1%	57.9%	56.1%	53.0%	52.5%	51.9%	52.6%	50.5%	50.8%

NOTES:

Estimates of Capacity Available (Section A): The estimates for aircraft entering service after 1 January 1965 (Columns 11 and 12) are taken from TABLE 21. The estimates for aircraft in service before 1 January 1965 are for past years (Columns 1 to 10), based on global estimates prepared by the ICAO Statistics Section. For future years (Columns 11 and 12), the estimates are based on the 1964 figures, increased in 1965 to allow for aircraft entering service during 1964, and in the case of piston-engined aircraft, allowing for a decrease due to physical wastage at an annual rate of 5%. No allowance has been made for disposals of used aircraft through such means as sales to non-scheduled operators, returns to manufacturers, or retirement.

The estimates for capacity for the years 1965 and 1966 are based on known orders up to 30 April 1965. It must be recognized however, that an undetermined number of jets are yet to be ordered for introduction into service in 1966 so that the capacity for that year is underestimated to this extent.

See also DIAGRAMS 2 and 3.

Air Transport Demand (Section B): The estimates for the past years (Columns 1 to 10) are based on global estimates published by the ICAO Statistics Section. Chartered and special flights of scheduled airlines have been estimated on the basis of year-to-year reporting and average about 7% of the world total. The estimates for future years (Columns 11 and 12) are based on an assumed annual growth rate of 13.5% for 1965 and for 1966.

Comparison of Capacity With Demand (Section C): The figures given in this section of TABLE 20 have been calculated from the figures in Sections A and B.

ICAO ECONOMICS AND STATISTICS BRANCH (May 1965)

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE 21

THEORETICAL POTENTIAL PRODUCTIVE CAPACITY OF TURBO-JET AND TURBO-PROP AIRCRAFT ORDERED FOR DELIVERY IN 1965-1966

Orders placed up to 30 April 1965

SCHEDULED AND NON-SCHEDULED OPERATIONS OF SCHEDULED AIRLINES - INTERNATIONAL AND DOMESTIC

(Aircraft over 10 000 Kg maximum take-off weight)

AIRCRAFT TYPES ON ORDER (by scheduled airlines of 107 States of ICAO)	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7
	Block speed	Payload capacity	Assumed aircraft utilization rate	Estimated total number of days aircraft will be available for service during year		Total theoretical productive capacity available in year	
				1965	1966		
	(Mean cruise speed less 15%)	(Maximum pay. cap. less 20%)	(Average revenue hours flown per day)	(Number of aircraft in service at end of year multiplied by average number of days expected to be available)			
						1965	1966
	kmph	tonnes	hours	a/c days	a/c days	tonne-kilometres available (millions)	
TURBO-JETS							
LONG-RANGE							
Boeing 707	750	14.7	9:30	72 x 199	91 x 358	1 500	3 410
Douglas DC-8	745	15.1	9:30	27 x 189	53 x 284	545	1 610
Vickers VC-10	755	14.6	9:30	7 x 244	23 x 222	180	535
Boeing 720	750	15.0	8:30	11 x 186	11 x 365	195	385
Total Operations: Long-Range				117 x 198	178 x 319	2 420	5 940
MEDIUM-RANGE to SHORT-RANGE							
Boeing 727	820	10.5	7:30	84 x 199	168 x 282	1 080	3 060
DH-121 Trident	780	9.1	7:30	10 x 172	20 x 296	90	315
SNCA-SUD-210 Caravelle	695	6.6	6:00	19 x 192	19 x 365	100	190
BAC 111	740	7.0	6:00	50 x 172	74 x 348	265	800
Douglas DC-9	765	7.0	6:00	- x -	48 x 199	-	305
Total Operations: Medium-Range to Short-Range				163 x 188	329 x 290	1 535	4 670
TOTAL OPERATIONS: TURBO-JETS				280 x 192	507 x 300	3 955	10 610
TURBO-PROP							
Armstrong Whitworth Argosy AW 650	410	9.8	7:00	5 x 184	5 x 365	25	50
NAMCO YS-11	395	4.4	6:00	15 x 184	30 x 275	30	85
Hawker Siddeley-748	365	4.5	6:30	7 x 184	7 x 365	15	30
Fokker/Fairchild F-27	410	3.3	6:00	17 x 184	17 x 365	25	50
Nord 260/262	305	2.6	5:30	11 x 184	11 x 365	10	20
TOTAL OPERATIONS: TURBO-PROPS				55 x 184	70 x 326	105	235
TOTAL TURBO-JET AND TURBO-PROPS PUT INTO OPERATION DURING EACH YEAR				335 x 191	577 x 305	4 060	10 845

NOTES:

Columns 1 and 2: The figures for average block speed and payload are obtained by reducing the figures for mean cruise speed and maximum payload (TABLE 18, Columns 2 and 6) by 15% and 20% respectively in order to approximate actual operating conditions as explained in the note to TABLE 18, Column 7.

Column 3: Utilization rates expressed as revenue hours flown per day per aircraft, are intended to be daily averages for the whole period that the aircraft is in service including time required for normal maintenance. The figures are assumed as conservative global averages projected from estimated rates for 1964 given in TABLE 19.

Columns 4 and 5: The numbers of aircraft estimated to be in service at the end of each year 1965 and 1966 are shown on the left-hand side of each column. The figures on the right-hand side of each column show the estimated average number of days the aircraft of each type will be in service for the year in question. These estimates are based on information concerning the orders placed by airlines with manufacturers as provided directly by the manufacturer themselves, and by Aviation Studies Ltd. and various periodicals.

Columns 6 and 7: The totals of available productive capacity given for each year 1965 and 1966 are calculated by multiplying together block speed, payload available, daily utilization rates and aircraft-days available, as given in the preceding columns.

The estimates for capacity for the years 1965 and 1966 are based on known orders up to 30 April 1965. It must be recognised however, that an undetermined number of jets are yet to be ordered for introduction into service in 1966 so that the capacity for that year is underestimated to this extent.

ICAO ECONOMICS AND STATISTICS BRANCH (May 1965)

- END -

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the ICAO Aeronautical Chart Catalogue *or the* Meteorological Tables for International Air Navigation.

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications comprised in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

PROCEDURES FOR AIR NAVIGATION SERVICES (PANS) are approved by the Council for worldwide application. They comprise, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome. As in the case of Recommended Practices, the Council has invited Contracting States to notify any differences between their national practices and the PANS when the knowledge of such differences is important for the safety of air navigation.

REGIONAL SUPPLEMENTARY PROCEDURES (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

ICAO FIELD MANUALS derive their status from the International Standards, Recommended Practices and PANS from which they are compiled. They are prepared primarily for the use of personnel engaged in operations in the field, as a service to those Contracting States who do not find it practicable, for various reasons, to prepare them for their own use.

TECHNICAL MANUALS provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

AIR NAVIGATION PLANS detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

ICAO CIRCULARS make available specialized information of interest to Contracting States. This includes studies on technical subjects as well as texts of Provisional Acceptable Means of Compliance.

EXTRACT FROM THE CATALOGUE

ICAO SALABLE PUBLICATIONS

The Technical, Economic and Social Consequences of the Introduction into Commercial Service of Supersonic Aircraft - A Preliminary Study.
(Doc 8087-C/925). August 1960. 124 pp. $1.25

The Economic Implications of the Introduction into Service of Long-Range Jet Aircraft.
(Doc 7894-C/907). June 1958. 66 pp. $1.25

Air Freight Study.
(Doc 8235-C/937). 1962. 117 pp. $2.00

Air Mail Study.
(Doc 8240-AT/716). April 1962. 37 pp. $0.50

Inclusive Tour Services in International Air Transport.
(Doc 8244-AT/717). 1962. 41 pp. $0.75

Aerial Work - A General Study of the Use of Civil Aviation for Aerial Work.
(Doc 8337-C/944). June 1963. 138 pp. $2.25

N.B.—*Cash remittance should accompany each order.*
Catalogue sent free on request.

PRICE: U.S. $1.50
(or equivalent in other currencies)